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CHAPTER 2

Chemical Reaction and Equation

2.1 INTRODUCTION

Chemistry is the branch of science in which we study the composition, properties and transformation of matter. We observe changes in matter all around us. These changes are of two types:

2.1.1 Physical Change

A change in which there is a change in physical appearance of a substance but no change in its basic composition, is known as a physical change. For example, melting of butter and wax, boiling of water, dissolving of salt in water, breaking of glass, sublimation of a solid on heating, etc. No new chemical substance is formed in a physical change.

2.1.2 Chemical Change

A change in which one or more new substances having properties and compositions different from the original substance are formed, is known as a chemical change. For example, burning of paper, wood, coal and magnesium ribbon, making of curd from milk, digestion of food, ripening of fruits, bursting of a cracker, boiling of egg, etc. Chemical changes are also called chemical reactions.

A chemical reaction is accompanied by changes in physical state, formation of a precipitate, change of colour, change in temperature or evolution of a gas.

Normally, a chemical change is permanent and cannot be reversed easily.

2.2 CHEMICAL EQUATION

2.2.1 Word Equation

A word equation simply shows the change of reactants to products through an arrow placed between them. The reactants are written on the left-hand side (LHS) with a plus sign in case of two or more reactants and the products are written on the right-hand side (RHS) with a plus sign in case of two or more products. The arrowhead shows the direction of the reaction pointing towards the products.

2.2.2 Skeletal Chemical Equation

A chemical equation in which symbols and formulae are used instead of words to show a chemical reaction is called a skeletal chemical equation.

2.2.3 Balanced Chemical Equation

A chemical equation in which the number of atoms of each element of reactants is equal to that of products, is called a balanced chemical equation.

2.2.4 Balancing a Chemical Equation

Equalising the number of atoms of each element on reactants and products sides of a chemical equation is called balancing a chemical equation.

1. A chemical equation can be made more informative by adding physical states of reactants and products, reaction conditions, heat change during the reaction, i.e., heat released or absorbed, concentration of reactants and products, speed or rate of the reaction, i.e., slow or fast, and nature of the reaction, i.e., forward or backward to the

equation.

2.2.5 Characteristics of Chemical Equations

1. Chemical equation gives the names of different reactants and products of a chemical reaction.
2. It gives the number of atoms or molecules of reactants and products of a chemical reaction.
3. Chemical equation gives relative number of moles of reactants and products.
4. It gives the relative amount by mass or weight of reactants and products.
5. Chemical equation also gives relative volume of gaseous reactants and products.

2.3 TYPES OF CHEMICAL REACTIONS

2.3.1 Combination Reaction

A reaction in which two or more substances combine together to form a single product is known as a combination reaction.

The combination reaction is often called synthesis.

$$\underset{\text{Magnesium oxide}}{MgO(s)} + \underset{\text{Water}}{H_2O(l)} \xrightarrow{\text{Heat}} \underset{\text{Magnesium hydroxide}}{Mg(OH)_2(aq)} + \text{Heat}$$

2.3.2 Decomposition Reaction

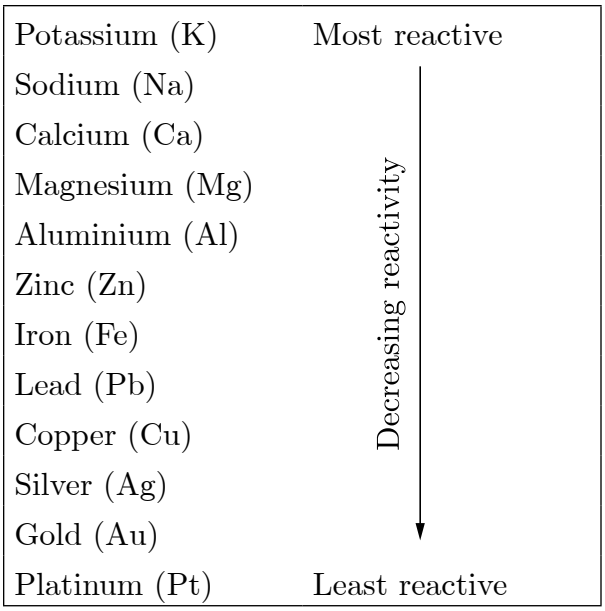
The reaction in which a single substance breaks down to form two or more substances, is called a decomposition reaction. For example, decomposition of $FeSO_4$ on heating.

$$\underset{\text{Ferric oxide}}{2FeSO_4(s)} \xrightarrow{\text{Heat}} Fe_2O_3(s) + SO_2(g) + SO_3(g)$$

2.3.3 Displacement Reaction

The reaction in which one atom or a group of atoms of a compound is replaced by another atom, is called a displacement reaction. Generally, a more reactive metal displaces a less reactive metal from its salt solution in displacement reaction.

The series in which metals are arranged in the decreasing order of their reactivity is called activity series of metals.



Activity series of some common metals

Few examples of displacement reactions are as follows:

1. Displacement of copper from a solution of copper sulphate by iron

$$Fe(s) + CuSO_4(aq) \rightarrow Cu(s) + FeSO_4(aq)$$

2. Displacement of silver from silver nitrate solution by copper

$$Cu(s) + 2AgNO_3(aq) \rightarrow 2Ag(s) + Cu(NO_3)_2(aq)$$

3. Displacement of iron from iron sulphate solution by magnesium

$$Mg(s) + FeSO_4(aq) \rightarrow MgSO_4(aq) + Fe(s)$$

4. Zinc displaces hydrogen from dilute sulphuric acid.

$$Zn(s) + \text{dil.}H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g) \uparrow$$

2.3.4 Double Displacement Reaction

The reaction in which anions and cations of two different molecules exchange places, forming two completely different compounds, is called double displacement reaction. For example,

$$\underset{\text{Sodium sulphate}}{Na_2SO_4(aq)} + \underset{\text{Barium chloride}}{BaCl_2(aq)} \rightarrow \underset{\text{Barium sulphate}}{BaSO_4(s)} \downarrow + \underset{\text{Sodium chloride}}{2NaCl(aq)}$$

The common types of double displacement reactions are as follows:

1. **Precipitation Reaction :** It is a chemical reaction in which one of the products is precipitated as an insoluble solid. For example,

$$AgNO_3(aq) + NaCl(aq) \rightarrow \underset{\text{(White ppt.)}}{AgCl(s)\downarrow} + NaNO_3(aq)$$

2. **Neutralisation Reaction :** It is chemical reaction in which a strong acid and a strong base react with each other to form water and salt. For example,

$$NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$$

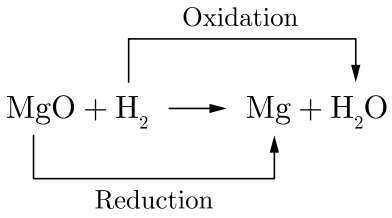
2.3.5 Redox Reaction

1. **Oxidation :** If a substance gains oxygen or loses hydrogen in a reaction, the substance is said to be oxidised and the process is known as oxidation.
2. **Reduction :** If a substance loses oxygen and gains hydrogen in a reaction, the substance is said to be reduced and the process involved is known as reduction.
   Reduction and oxidation take place simultaneously in few reactions. Such reactions are known as redox reactions.
3. **Oxidising Agent :** If a substance oxidises the other substance but itself gets reduced, then it is known as an oxidising agent.
4. **Reducing Agent :** If a substance reduces the other substance but itself gets oxidised, then it is known as a reducing agent.
   For example,

$$MgO + H_2 \longrightarrow Mg + H_2O$$

Here, H_2 is the reducing agent as it reduces MgO to Mg and itself gets oxidised to H_2O. On the other hand, magnesium oxide is the oxidising agent which oxidises H_2 to H_2O and itself gets reduced to Mg.

Thus, an oxidising agent gets reduced and a reducing agent gets oxidised in a redox reaction.



2.3.6 Electronic Concept of Oxidation and Reduction

Oxidation is the loss of electrons by a species (an atom, a molecule or an ion).

$$K \longrightarrow K^+ + e^-$$

$$Zn + Zn^{2+} \longrightarrow 2e^-$$

Reduction is the gain of electrons by a species (an atom, a molecule or an ion).

$$Ag^+ + e^- \longrightarrow Ag$$

$$S + 3e^- \longrightarrow S^{2-}$$

1. **Exothermic Reaction :** A chemical reaction in which heat is released along with the formation of product, is called exothermic reaction. For example,

$$C(s) + O_2(g) \longrightarrow CO_2(g) + \text{Heat}$$

$$\underset{\substack{\text{Calcium oxide}\\\text{(Lime)}}}{CaO(s)} + \underset{\text{Water}}{H_2O(l)} \longrightarrow \underset{\substack{\text{Calcium hydroxide}\\\text{(Slaked lime)}}}{Ca(OH)_2(aq)} + \text{Heat}$$

2. **Endothermic Reaction :** A chemical reaction in which heat is absorbed along with the formation of product, is called endothermic reaction. For example,

$$NH_4Cl(s) + H_2O(l) \longrightarrow NH_4Cl(aq) - \text{Heat}$$

$$N_2(g) + O_2(g) \longrightarrow 2NO(g) - \text{Heat}$$

2.3.7 Corrosion

It is the process of slow conversion of metals into their undesirable compounds by the attack of air (oxygen) and moisture.

1. **Rusting :** When iron and iron articles are exposed to air and water, a reddish-brown layer is formed on the surface. This layer is called rust [hydrated iron(III) oxide, $Fe_2O_3 \cdot xH_2O$]. Hence, corrosion of iron is

known as rusting.

2. **Rancidity :** When cooked food items containing oil and fat are kept exposed and unprotected, they become rancid and produce an unpleasant smell and taste. The phenomenon involved here is known as rancidity.
3. **Prevention of Rancidity :** Rancidity can be prevented by adding antioxidants, keeping food items at low temperature, keeping food items in vacuum packing or airtight container and replacing air by nitrogen gas.

□□□□□□□

MULITIPLE CHOICE QUESTIONS

1. A solution of substance X is used for white washing. Here X is:
(a) CaO
(b) CaO_2
(c) NaCl
(d) KCl

Sol : www.cbse.site/sc/am101

2. Which of the following statements about the reaction below are incorrect?

$2PbO(s) + C(s) \longrightarrow 2Pb(s) + CO_2(g)$

1. Lead is getting reduced.
2. Carbon dioxide is getting oxidised.
3. Carbon is getting oxidised.
4. Lead oxide is getting reduced.

(a) 1 and 2
(b) 1 and 3
(c) 1, 2 and 3
(d) all of the above

Sol : www.cbse.site/sc/am102

3. $Fe_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Fe$
The above reaction is an example of a
(a) combination reaction.
(b) double displacement reaction.
(c) decomposition reaction.
(d) displacement reaction.

Sol : www.cbse.site/sc/am103

4. What happens when dilute hydrochloric acid is added to iron fillings?
(a) Hydrogen gas and iron chloride are produced.
(b) Chlorine gas and iron hydroxide are produced.

(c) No reaction takes place.
(d) Iron salt and water are produced.

Sol : www.cbse.site/sc/am104

5. Identify the substances that is oxidized and the substances that is reduced in the following reactions:

$4Na(s) + O_2(g) \longrightarrow 2Na_2O(s)$

(a) Na, O_2
(b) Na, Na
(c) O_2, Na
(d) O_2, O_2

Sol : www.cbse.site/sc/am105

6. Identify the substances that is oxidized and the substances that is reduced in the following reactions:

$CuO(s) + H_2(g) \longrightarrow Cu(s) + H_2O(l)$

(a) H_2, CuO
(b) H_2, H_2O
(c) H_2, Cu
(d) Cu, H_2

Sol : www.cbse.site/sc/am106

7. Translate the following statement into the chemical equation and choose the correct option "Hydrogen gas combines with nitrogen to form ammonia."

(a) $3H_2(g) + N_2(g) \longrightarrow 2NH_3(g)$
(b) $H_2(g) + N_2(g) \longrightarrow NH_2(g)$
(c) $2H(g) + N_2(g) \longrightarrow 2NH_3$
(d) None of these

Sol : www.cbse.site/sc/am107

8. Which one of the following is the example of precipitation reaction?

(a) $Cu(s) + 2AgNO_3(aq) \longrightarrow Cu(NO_3)_2(aq) + 2Ag(s)$
(b) $CuCO_3(s) \xrightarrow{\text{Heat}} CuO(s) + CO_2(g)$
(c) $N_2(g) + 3H_2(g) \longrightarrow 2H_3(g)$
(d) $AgNO_3(aq) + NaCl(aq) \longrightarrow AgCl(s) + NaNO_3(aq)$

Sol : www.cbse.site/sc/am108

9. Which one of the following is the example of oxidation?

(a) $2Mg(s) + O_2(g) \xrightarrow{\text{Burning}} 2MgO(s)$
(b) $CuO(s) + H_2(g) \xrightarrow{\text{Heat}} Cu(s) + H_2O(g)$
(c) $Fe_2O_3(s) + 2Al(s) \longrightarrow Al_2O_3(s) + 2Fe(s)$
(d) None of these

Sol : www.cbse.site/sc/am109

10. A shiny brown coloured element X on heating in air becomes black in colour. Here X is:

(a) Copper
(b) Silver
(c) Aluminium
(d) Mercury

Sol : www.cbse.site/sc/am110

11. Which of the following statement is correct regarding to physical changes?

(a) In physical change, new substance is formed.
(b) In physical change, no new substance is formed.
(c) In physical change, chemical composition of substance is changed.
(d) None of these

Sol : www.cbse.site/sc/am111

12. $FeS + H_2SO_4 \longrightarrow FeSO_4 + H_2S \uparrow$.
In the above equation $\uparrow$ indicates:
(a) gas evolved
(b) insoluble substance formed
(c) reactive element
(d) element is not useful in chemical equation

Sol : www.cbse.site/sc/am112

13. $CaO(s) + H_2O(l) \longrightarrow X(s) +$ Heat $+$ Hissing sound.
Here X is:
(a) $Cu(OH)$
(b) $Cu(OH)_2$
(c) $2CaOH$
(d) Ca_2OH

Sol : www.cbse.site/sc/am113

14. The balancing of chemical equation is based on:
(a) Law of conservation of energy
(b) Law of conservation of mass
(c) Law of conservation of heat
(d) None of these

Sol : www.cbse.site/sc/am114

15. When white silver chloride is left exposed to sunlight, it colours becomes:
(a) Gray
(b) Yellow
(c) Green
(d) Red

Sol : www.cbse.site/sc/am115

16. Complete the following chemical reaction with correct option:
$Pb(NO_3)_2 + 2KI \longrightarrow$ ..... $+ 2KNO_3$
(a) PbI_2
(b) $PbNO_3$
(c) $Pb(NO_3)_2$
(d) $PbIO_3$

Sol : www.cbse.site/sc/am116

17. Which of the following is not a chemical reaction?
(a) Souring of milk
(b) Dissolution of sugar in water
(c) Rusting of iron
(d) Digestion of food in the body

Sol : www.cbse.site/sc/am117

18. $Na_2CO_3 + XHCl \longrightarrow 2NaCl + CO_2 + H_2O$
In above reaction, the value of X is:
(a) 1
(b) 2
(c) 3
(d) 4

Sol : www.cbse.site/sc/am118

19. $PCl_5(s) + XH_2O(l) \longrightarrow YH_3PO_4(aq) + ZHCl(aq)$.
The value of X, Y and Z are:
(a) X-4, Y-3, Z-3
(b) X-4, Y-1, Z-5
(c) X-1, Y-2, Z-3
(d) X-5, Y-1, Z-2

Sol : www.cbse.site/sc/am119

20. What happens when ferrous sulphate crystals are heated?
(a) A gas having the smell of burning sulphur is evolved.
(b) No gas is evolved.
(c) Brown coloured gas is evolved.

(d) Colourless and odourless gas is evolved.

Sol : www.cbse.site/sc/am120

21. In the reaction $Br_2 + 2I \longrightarrow 2Br^- + I_2$, the oxidising agent is:
(a) Br_2
(b) I^-
(c) Br^-
(d) I_2

Sol : www.cbse.site/sc/am121

22. Which of the following is not a thermal decomposition reaction?
(a) $2KClO_3 \longrightarrow 2KCl + 3O_2$
(b) $ZnCO_3 \longrightarrow ZnO + CO_2$
(c) $2FeSO_4 \longrightarrow Fe_2O_3 + SO_2 + SO_3$
(d) $2H_2O \longrightarrow 2H_2 + O_2$

Sol : www.cbse.site/sc/am122

23. $Y + 2HCl \longrightarrow ZnCl_2 + H_2$. In the above reaction, Y is:
(a) Aluminium
(b) Copper
(c) Sodium
(d) Zinc

Sol : www.cbse.site/sc/am123

24. The chemical reactions in which one element takes the position or place of another element present in a compound are called ..... reaction.
(a) Decomposition
(b) Combination
(c) Precipitation
(d) Displacement

Sol : www.cbse.site/sc/am124

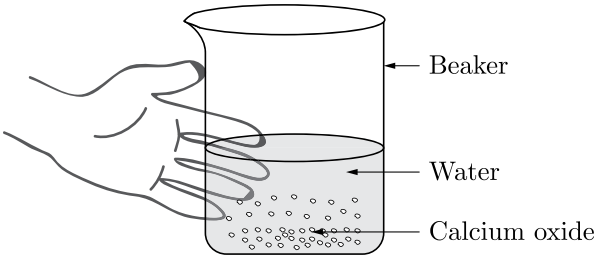
25. Which of the following example is a decomposition reaction?
(a) Evaporation of water
(b) Exposure of photographic film in the presence of light
(c) Heating sulphur in the presence of oxygen
(d) Dissolving salt in water

Sol : www.cbse.site/sc/am125

26. When petrol, in the presence of oxygen gas, burns inside the engine of a car, carbon dioxide and water are produced. The temperature inside the engine becomes very high. Which of the following statements is correct?
(a) The burning of petrol is an example of a physical change.
(b) Heat energy is taken out from the surroundings.
(c) Oxygen and petrol are the reactants in this process.
(d) This process is triggered by light energy.

Sol : www.cbse.site/sc/am126

27. Calcium oxide reacts vigorously with water.



Identify the incorrect statements.
1. It is an endothermic reaction.
2. Slaked lime is produced.
3. Quick lime is produced.
4. It is an exothermic reaction.
5. It is a combination reaction.

(a) 1 and 2
(b) 3 and 4
(c) 1 and 3
(d) 2, 4 and 5

Sol : www.cbse.site/sc/am127

28. Which of the following statements about the reaction given below are incorrect?

$2PbO(s) + C(s) \longrightarrow 2Pb(s) + CO_2(g)$

1. Lead is getting reduced.
2. Carbon dioxide is getting oxidised.
3. Carbon is getting oxidised.
4. Lead oxide is getting reduced.

(a) 1 and 2
(b) 3 and 4
(c) 1 and 3
(d) 2 and 4

Sol : www.cbse.site/sc/am128

29. When hydrogen sulphide gas is passed through a blue solution of copper sulphate, a black precipitate of copper sulphide is obtained and the sulphuric acid so formed remains in the solution. The reaction is an example of

(a) a combination reaction
(b) a displacement reaction
(c) a decomposition reaction
(d) a double displacement reaction

Sol : www.cbse.site/sc/am129

30. $3MnO_2 + 4Al \longrightarrow 3Mn + 2Al_2O_3$
The oxidising agent in the above reaction is:

(a) MnO_2
(b) Al
(c) Mn
(d) Al_2O_3

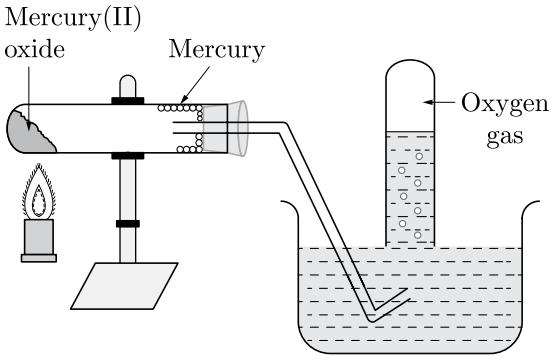
Sol : www.cbse.site/sc/am130

31. Which of the following processes does not involve either oxidation or reduction?

(a) Formation of slaked lime from quick lime
(b) Heating mercuric oxide
(c) Formation of manganese chloride from manganese oxide
(d) Formation of zinc from zinc blend

Sol : www.cbse.site/sc/am131

32. The given diagram represents a ..... reaction.



(a) Thermal decomposition
(b) Displacement
(c) Double displacement

(d) Combination

Sol : www.cbse.site/sc/am132

33. On burning magnesium ribbon in air, it is observed that it burns brightly leaving behind a ..... powder.

(a) White
(b) Green
(c) Yellow
(d) Black

Sol : www.cbse.site/sc/am133

34. Which of the following is not a physical change?

(a) Boiling of water to give water vapour
(b) Melting or ice to give water
(c) Dissolution of salt in water
(d) Combustion of Liquefied Petroleum Gas (LPG)

Sol : www.cbse.site/sc/am134

35. The following reaction is an example of a

$4NH_3(g) + 5O_2(g) \longrightarrow 4NO(g) + 4H_2O(g)$

1. displacement reaction
2. combination reaction
3. redox reaction
4. neutralisation reaction

(a) 1 and 4
(b) 2 and 3
(c) 1 and 3
(d) 3 and 4

Sol : www.cbse.site/sc/am135

36. Which of the following statements about the given reaction are correct?

$3Fe(s) + 4H_2O(g) \longrightarrow Fe_3O_4(s) + 4H_2(g)$

1. Iron metal is getting oxidised.
2. Water is getting reduced.
3. Water is acting as reducing agent.
4. Water is acting as oxidising agent.

(a) 1, 2 and 3
(b) 3 and 4
(c) 1, 2 and 4
(d) 2 and 4

Sol : www.cbse.site/sc/am136

37. Which of the following are exothermic processes?

1. Reaction of water with quick lime.
2. Dilution of an acid.
3. Evaporation of water.
4. Sublimation of camphor (crystals).

(a) 1 and 2
(b) 2 and 3
(c) 1 and 4
(d) 3 and 4

Sol : www.cbse.site/sc/am137

38. A dilute ferrous sulphate solution was gradually added to the beaker containing acidified permanganate solution. The light purple colour of the solution fades and finally disappears.

Which of the following is the correct explanation for the observation?

(a) $KMnO_4$ is an oxidising agent, it oxidises $FeSO_4$.
(b) $FeSO_4$ acts as an oxidising agent and oxidises $KMnO_4$.
(c) The colour disappears due to dilution; no reaction is involved.
(d) $KMnO_4$ is an unstable compound and decomposes in presence of $FeSO_4$ to a colourless compound.

Sol : www.cbse.site/sc/am138

39. Which among the following is (are) double

displacement reaction(s)?
1. $Pb + CuCl_2 \longrightarrow PbCl_2 + Cu$
2. $Na_2SO_4 + BaCl_2 \longrightarrow BaSO_4 + 2NaCl$
3. $C + O_2 \longrightarrow CO_2$
4. $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

(a) 1 and 4
(b) Only 2
(c) 1 and 2
(d) 3 and 4

Sol : www.cbse.site/sc/am139

40. Which among the following statement(s) is(are) true?
Exposure of silver chloride to sunlight for a long duration turns grey due to
1. the formation of silver by decomposition of silver chloride.
2. sublimation of silver chloride.
3. decomposition of chlorine gas from silver chloride.
4. oxidation of silver chloride.

(a) Only 1
(b) 1 and 3
(c) 2 and 3
(d) Only 4

Sol : www.cbse.site/sc/am140

41. Solid calcium oxide reacts vigorously with water to form calcium hydroxide accompanied by liberation of heat. This process is called slaking of lime. Calcium hydroxide dissolves in water to form its solution called lime water. Which among the following is (are) true about slaking of lime and the solution formed?
1. It is an endothermic reaction.
2. It is an exothermic reaction.
3. The pH of the resulting solution will be more than seven.
4. The pH of the resulting solution will be less than seven.

(a) 1 and 2
(b) 2 and 3
(c) 1 and 4
(d) 3 and 4

Sol : www.cbse.site/sc/am141

42. Barium chloride on reacting with ammonium sulphate forms barium sulphate and ammonium chloride. Which of the following correctly represents the type of the reaction involved?
1. Displacement reaction
2. Precipitation reaction
3. Combination reaction
4. Double displacement reaction

(a) Only 1
(b) Only 2
(c) Only 4
(d) 2 and 4

Sol : www.cbse.site/sc/am142

43. Electrolysis of water is a decomposition reaction. The mole ratio of hydrogen and oxygen gases liberated during electrolysis of water is
(a) 1 : 1
(b) 2 : 1
(c) 4 : 1
(d) 1 : 2

Sol : www.cbse.site/sc/am143

44. Which of the following is(are) an endothermic process(es)?
1. Dilution of sulphuric acid
2. Sublimation of dry ice
3. Condensation of water vapours
4. Evaporation of water

(a) 1 and 3
(b) Only 2
(c) Only 3

(d) 2 and 4

Sol : www.cbse.site/sc/am144

45. In the double displacement reaction between aqueous potassium iodide and aqueous lead nitrate, a yellow precipitate of lead iodide is formed. While performing the activity if lead nitrate is not available, which of the following can be used in place of lead nitrate?

(a) Lead sulphate (insoluble)
(b) Lead acetate
(c) Ammonium nitrate
(d) Potassium sulphate

Sol : www.cbse.site/sc/am145

46. Which of the following gases can be used for storage of fresh sample of an oil for a long time?

(a) Carbon dioxide or oxygen
(b) Nitrogen or oxygen
(c) Carbon dioxide or helium
(d) Helium or nitrogen

Sol : www.cbse.site/sc/am146

47. The following reaction is used for the preparation of oxygen gas in the laboratory $2KClO_3(s) \xrightarrow[\text{Catalyst}]{\text{Heat}} 2KCl(s) + 3O_2(g)$

Which of the following statement(s) is(are) correct about the reaction?

(a) It is a decomposition reaction and endothermic in nature.
(b) It is a combination reaction.
(c) It is a decomposition reaction and accompanied by release of heat.
(d) It is a photochemical decomposition reaction and exothermic in nature.

Sol : www.cbse.site/sc/am147

48. Which one of the following processes involve chemical reactions?

(a) Storing of oxygen gas under pressure in a gas cylinder
(b) Liquefaction of air
(c) Keeping petrol in a china dish in the open
(d) Heating copper wire in presence of air at high temperature

Sol : www.cbse.site/sc/am148

49. In which of the following chemical equations, the abbreviations represent the correct states of the reactants and products involved at reaction temperature?

(a) $2H_2(I) + O_2(I) \longrightarrow 2H_2O(g)$
(b) $2H_2(g) + O_2(I) \longrightarrow 2H_2O(I)$
(c) $2H_2(g) + O_2(g) \longrightarrow 2H_2O(I)$
(d) $2H_2(g) + O_2(g) \longrightarrow 2H_2O(g)$

Sol : www.cbse.site/sc/am149

50. Which of the following are combination reaction?

1. $2KClO_3 \xrightarrow{\text{Heat}} 2KCl + 3O_2$
2. $MgO + H_2O \longrightarrow Mg(OH)_2$
3. $4Al + 3O_2 \longrightarrow 2Al_2O_3$
4. $Zn + FeSO_4 \longrightarrow ZnSO_4 + Fe$

(a) 1 and 3
(b) 3 and 4
(c) 2 and 4
(d) 2 and 3

Sol : www.cbse.site/sc/am150

51. The addition of hydrogen to a substance is known as:

(a) Oxidation
(b) Reduction
(c) Redox reaction
(d) Precipitation

Sol : www.cbse.site/sc/am151

52. The oxidation of oils or fats in a food is known as:
(a) Corrosion
(b) Rust
(c) Rancidity
(d) Oxidisation

Sol : www.cbse.site/sc/am152

53. The necessary conditions for combustion precess to occur are
1. availability of air/oxygen.
2. availability or air/oxygen and fuel.
3. temperature of fuel below ignition temperature.
4. temperature of fuel above ignition temperature.

Select the correct alternative.
(a) 1 and 2
(b) 2 and 4
(c) 3 and 1
(d) 4 and 1

Sol : www.cbse.site/sc/am153

54. The reaction between carbon and oxygen can be represented as

$$C(s) + O_2(g) \xrightarrow{\Delta} CO_2(g) + \text{Heat}$$

In which of the following type(s), the above reaction can be classified?
1. Combustion reaction
2. Displacement reaction
3. Endothermic reaction
4. Combination reaction

(a) 1 and 3
(b) 1, 3 and 4
(c) 1 and 4
(d) 1 Only

Sol : www.cbse.site/sc/am154

55. Oxygen gas reacts with hydrogen to produce water. The reaction is represented by the equation:

$$O_2(g) + H_2(g) \longrightarrow H_2O(I)$$

The above reaction is an example of
1. Oxidation of hydrogen
2. Reduction of oxygen
3. Reduction of hydrogen
4. Redox reaction

(a) 1, 2 and 3
(b) 2, 3 and 4
(c) 1, 3 and 4
(d) 1, 2 and 4

Sol : www.cbse.site/sc/am155

56. Compound A on strong heating in a boiling tube gives off reddish brown fumes and a yellow residue. When the aqueous solution of A is treated with few drops of sodium hydroxide solution, a white precipitate appeared. Identify the cation and anion present in the compound A.
(a) Copper(II) and nitrate
(b) Lead(II) and chloride
(c) Zinc and sulphate
(d) Lead(II) and nitrate

Sol : www.cbse.site/sc/am156

57. Magnesium ribbon is rubbed with sand paper before making it to burn. The reason of rubbing the ribbon is to:
(a) remove moisture condensed over the surface of ribbon.
(b) generate heat due to exothermic reaction.
(c) remove magnesium oxide formed over the surface of magnesium.
(d) mix silicon from sand paper (silicon dioxide) with magnesium for lowering ignition temperature of the ribbon.

Sol : www.cbse.site/sc/am157

58. Which of the following is a feasible reaction?

(a) $Ba(s) + K_2SO_4(aq) \longrightarrow BaSO_4(aq) + 2K(s)$

(b) $Zn(s) + 2AgNO_3(aq) \longrightarrow Zn(NO_3)_2(aq) + 2Ag(s)$

(c) $Mg(s) + Na_2SO_4(aq) \longrightarrow MgSO_4(aq) + 2Na(s)$

(d) $Cu(s) + MgSO_4(aq) \longrightarrow CuSO_4(aq) + Mg(s)$

Sol : www.cbse.site/sc/am158

59. The symbolic representation of an actual chemical change is known as

(a) Chemical equation

(b) Chemical formula

(c) Chemical symbol

(d) Physical formula

Sol : www.cbse.site/sc/am159

60. Which of the following chemical reaction is correct?

(a) $2Mg(s) + O_2(g) \longrightarrow 2MgO(s)$

(b) $2Mg(s) + O_2(g) \longrightarrow MgO + O_2$

(c) $Mg(s) + O_2 \longrightarrow 2MgO(s)$

(d) $2Mg(s) + 2O_2 \longrightarrow 2MgO + O_2$

Sol : www.cbse.site/sc/am160

61. $N_2 + 3H_2 \longrightarrow 2NH_3$

In the above reaction and products are:

	Reactants	**Products**
(a)	N_2, H_2	NH_3
(b)	NH_3	N_2, H_2
(c)	N_2	H_2, NH_3
(d)	N_2NH_3	H_2

Sol : www.cbse.site/sc/am161

62. An integer precedes the formula of each substance; is known as ..... coefficients.

(a) chemical

(b) physical

(c) stoichiometric

(d) thermal

Sol : www.cbse.site/sc/am162

63. $2Mg(s) + O_2(g) \longrightarrow 2MgO(s)$

The stoichiometric coefficient of O_2 is:

(a) 1

(b) 2

(c) 3

(d) 4

Sol : www.cbse.site/sc/am163

64. The statement of law of conservation of mass is:

(a) mass can neither be created nor destroy.

(b) mass can be created nor destroy.

(c) mass of the body cannot be remain same.

(d) none of these.

Sol : www.cbse.site/sc/am164

65. Which of the following statement is correct regarding to chemical equation?

(a) A chemical equation does not indicate about the condition for the reaction.

(b) It gives the idea about the rate of reaction.

(c) It gives the information about the heat.

(d) It gives idea about the mechanism of the reaction.

Sol : www.cbse.site/sc/am165

66. Which one of the following is the decomposition reaction?

(a) $H_2 + Cl_2 \xrightarrow{\text{Sunlight}} 2HCl$

(b) $2Mg + O_2 \xrightarrow{\text{Heat}} 2MgO$

(c) $CaO + H_2O \longrightarrow Ca(OH)_2$

(d) $2KClO_3 \longrightarrow 2KCl + 3O_2$

Sol : www.cbse.site/sc/am166

67. The oxidation and reduction takes place simultaneously in ..... reaction.

(a) displacement

(b) redox

(c) combination

(d) decomposition

Sol : www.cbse.site/sc/am167

68. Which of the following is correct regarding the oxidizing agent?

(a) It gives oxygen for oxidation.

(b) It does not gives oxygen for oxidation.

(c) It does not remove hydrogen.

(d) It gives oxygen and does not remove hydrogen.

Sol : www.cbse.site/sc/am168

69. $CuO + H_2 \longrightarrow Cu + H_2O$

Which of the following pair is correct regarding to oxidation and reduction?

	Oxidation	**Reduction**
(a)	CuO	H_2
(b)	H_2	CuO
(c)	H_2O	H_2
(d)	H_2	H_2O

Sol : www.cbse.site/sc/am169

70. Which of the following equation is exothermic reaction?

(a) $N_2 + 3H_2 \longrightarrow 2NH_3 + \text{Heat}$

(b) $N_2 + O_2 \longrightarrow 2NO - \text{Heat}$

(c) $CuO + H_2 \longrightarrow Cu + H_2O$

(d) $Mg + Cl_2 \longrightarrow MgCl_2$

Sol : www.cbse.site/sc/am170

71. Which of the following is the factor of influence the corrosion?

(a) Reactivity of metals

(b) Presence of impunities

(c) Strain in the metal

(d) All of the above

Sol : www.cbse.site/sc/am171

72. Which method is used for preventing corrosions?

(a) Galvanization

(b) Electroplating

(c) Both (a) and (b)

(d) Thermosetting

Sol : www.cbse.site/sc/am172

73. $BaCl_2 + H_2SO_4 \longrightarrow X BaSO_4 + Y HCl$

The value of X and Y in the above chemical equation are:

(a) 1, 2

(b) 2, 1

(c) 1, 1

(d) 1, 3

Sol : www.cbse.site/sc/am173

74. The balancing chemical equation of following statement is:

"Silver bromide on exposure to sunlight decomposes into silver and bromine".

(a) $2AgBr \longrightarrow 2Ag + Br$

(b) $2AgBr \xrightarrow{\text{Sunlight}} 2Ag + Br_2$
(c) $2AgBr \xrightarrow{\text{Sunlight}} Ag + Br_2$
(d) $AgBr \xrightarrow{\text{Sunlight}} Ag + 2Br$

Sol : www.cbse.site/sc/am174

75. The indication of chemical reaction in an activity is/are:
(a) change in state
(b) change in colour
(c) change in temperature
(d) all of the above

Sol : www.cbse.site/sc/am175

76. When potassium iodine solution is added to a solution of lead nitrate ..... reaction occurs.
(a) combination
(b) decomposition
(c) displacement
(d) redox

Sol : www.cbse.site/sc/am176

77. X + Barium chloride $\longrightarrow$ $\underset{\text{(White ppt)}}{Y}$ + Sodium chloride
Here X and Y are:
(a) $NaSO_4$, $BaSO_4$
(b) $BaSO_4$, Na_2SO_4
(c) $BaSO_2$, $NaSO_4$
(d) Na_2SO_4, $BaSO_4$

Sol : www.cbse.site/sc/am177

78. Which of the following pair is incorrect?

	Reaction	**Reaction Name**
(a)	$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$	Combustion reaction and oxidation reaction
(b)	$Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$	Double displacement and precipitation reaction
(c)	$CaO + H_2O \rightarrow Ca(OH)_2$	Combination reaction
(d)	$CuSO_4 + Zn \rightarrow ZnSO_4 + Cu$	Combination reaction

Sol : www.cbse.site/sc/am178

79. Which one reaction shows the property of double displacement reaction?
(a) $CuSO_4 + Zn \longrightarrow ZnSO_4 + Cu$
(b) $Cu + 2AgNO_3 \longrightarrow Cu(NO_3)_2 + 2Ag$
(c) $NaOH + HCl \longrightarrow NaCl + H_2O$
(d) None of these

Sol : www.cbse.site/sc/am179

80. When the powder of a common metal is heated in an open china dish, its colour turns black. However, when hydrogen is passed over the hot black substance so formed, it regains its original colour.
Which type of chemical reaction take place in each step?
(a) oxidation, redox
(b) redox, oxidation
(c) oxidation, oxidation

(d) redox, redox

Sol : www.cbse.site/sc/am180

81. Which one of the following pair is correct?

	Reaction	**Reaction Type**
(a)	$2KNO_3(s) \rightarrow 2KNO_2(s) + O_2(g)$	Displacement reaction
(b)	$Zn_{(s)} + 2AgNO_{3(aq)} \rightarrow Zn(NO_3)_2 + 2Ag(s)$	Combination reaction
(c)	$Ni(NO_3)_2(aq) + 2NaOH \rightarrow Ni(OH)_2\downarrow + 2NaNO_3(aq)$	Double displacement reaction and precipitation reaction
(d)	$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$	Decomposition reaction

Sol : www.cbse.site/sc/am181

82. $3MnO_2 + 4Al \longrightarrow 3Mn + 2Al_2O_3$
The reducing agent in the above equation is:
(a) Al
(b) Mn
(c) C_2
(d) Mn, O_2

Sol : www.cbse.site/sc/am182

83. Which of the following reaction represents the rusting of iron?
(a) $Fe^{4+} \longrightarrow Fe^{3+} + e^-$
(b) $C + O_2 \longrightarrow CO_2 + \text{Heat}$
(c) $4Fe + 3O_2 \xrightarrow{\text{Moisture}} 2Fe_2O_3$
(d) $C + O_2 \longrightarrow CO_2 + \text{Heat}$

Sol : www.cbse.site/sc/am183

84. Which of the following reaction shows the change in colour?
(a) $Cu + 2AgNO_3 \longrightarrow Cu(NO_3)_2 + 2Ag$
(b) $NaOH + HCl \longrightarrow NaCl + H_2O + \text{Heat}$
(c) $Pb(NO_3)_2 + 2KI \longrightarrow PbI_2 + 2KNO_3$
(d) None of these.

Sol : www.cbse.site/sc/am184

85. Which reaction is used in photography?
(a) $CaO + H_2O \longrightarrow Ca(OH)_2 + \text{Heat}$
(b) $2FeSO_4 \xrightarrow{\text{Heat}} Fe_2O_3 + SO_2 + SO_3$
(c) $2Cu + O_2 \longrightarrow 2CuO$
(d) $2AgBr \xrightarrow{\text{sunlight}} 2Ag + Br$

Sol : www.cbse.site/sc/am185

86. Which metal have maximum reactivity?
(a) K
(b) Na
(c) Au
(d) Pt

Sol : www.cbse.site/sc/am186

87. The physical change is:
(a) melting of butter
(b) burning of paper
(c) digestion of food
(d) bursting of crackers

Sol : www.cbse.site/sc/am187

88. Which of the following is the chemical change?
(a) burning of paper
(b) boiling of water
(c) breaking of glass
(d) melting of butter

Sol : www.cbse.site/sc/am188

89. What happens when dilute hydrochloric acid is added to iron fillings?
(a) Hydrogen gas and iron chloride are produced.
(b) Chlorine gas and iron hydroxide are produced.
(c) No reaction takes place.
(d) Iron salt and water are produced.

Sol : www.cbse.site/sc/am189

90. The reaction $2Na + Cl_2 \longrightarrow 2NaCl$ is an example of
(a) combination reaction
(b) decomposition reaction
(c) displacement reaction
(d) double displacement reaction

Sol : www.cbse.site/sc/am190

91. Which of the following reactions involves the combination of two element?
(a) $CaO + CO_2 \longrightarrow CaCO_3$
(b) $4Na + O_2 \longrightarrow 2N_2O$
(c) $SO_2 + \frac{1}{2}O_2 \longrightarrow SO_3$
(d) $NH_3 + HCl \longrightarrow NH_4Cl$

Sol : www.cbse.site/sc/am191

92. When lead nitrate is heated, it breaks down into lead monoxide, nitrogen dioxide and oxygen.
$2Pb(NO_3)_2 \longrightarrow 2PbO + 4NO_2 + O_2$
The reaction is an example of:
(a) Combination reaction
(b) Decomposition reaction
(c) Double displacement reaction
(d) Displacement reaction

Sol : www.cbse.site/sc/am192

93. Which of the following is an example of displacement reaction?
(a) $NaOH + HNO_3 \rightarrow NaNO_3 + H_2O$
(b) $Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$
(c) $2Hg + O_2 \rightarrow 2HgO$
(d) $FeCl_3 + 2NaOH \rightarrow 3NaCl + Fe(OH)_3$

Sol : www.cbse.site/sc/am193

94. The reaction in which two compounds exchange their ions to form two new compounds is called:
(a) displacement reaction
(b) decomposition reaction
(c) isomerization reaction
(d) metathesis reaction or double decomposition reaction

Sol : www.cbse.site/sc/am194

95. When hydrogen sulphide gas is passed through a blue solution of copper sulphate, a black precipitate of copper sulphide is obtained and the sulphuric acid so formed remains in the solution. The reaction is an example of:
(a) combination reaction
(b) displacement reaction
(c) decomposition reaction
(d) double displacement reaction

Sol : www.cbse.site/sc/am195

96. When the gases sulphur dioxide and hydrogen sulphide mix in the presence of water, the following reaction takes places:
$SO_2 + 2H_2S \longrightarrow 2H_2O + 3S$
Here, hydrogen sulphide is acting as:
(a) an oxidizing agent
(b) a reducing agent
(c) a dehydrating agent
(d) a catalyst

Sol : www.cbse.site/sc/am196

97. In the reaction:
$2FeCl_2 + Cl_2 \longrightarrow 2FeCl_3$
Chlorine may be regarded as:
(a) an oxidizing agent
(b) a reducing agent
(c) a catalyst
(d) providing an inert medium

Sol : www.cbse.site/sc/am197

98. Which of the following is not a balanced equation?
(a) $Ca(HO)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$
(b) $Fe + CuSO_4 \longrightarrow FeSO_4 + Cu$
(c) $KClO_4 \xrightarrow{\Delta} KCl + 2O_2$
(d) $Cu + 2HNO_3 \longrightarrow Cu(NO_3)_2 + 2NO_2 + H_2O$

Sol : www.cbse.site/sc/am198

99. $Fe_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Fe$
(a) Combination reaction
(b) Double displacement reaction
(c) Decomposition reaction
(d) Displacement reaction

Sol : www.cbse.site/sc/am199

100. Which of the following are correctly matched?

1.	Dissolution	Solute gets dissolved in a solvent.
2.	Exothermic	Heat in absorbed.
3.	Reversible change	Reactants can be obtained.

Which of the above are correct?
(a) 1 and 2
(b) 2 and 3
(c) 1 and 3
(d) 1, 2 and 3

Sol : www.cbse.site/sc/am200

101. Which of the following is correct for a physical change?
1. Only physical properties change.
2. Large amount of heat is absorbed or evolved.

Which of the above statements is/are correct?
(a) Only 1
(b) Only 2
(c) Both 1 and 2
(d) Neither 1 and 2

Sol : www.cbse.site/sc/am201

102. Which of the following is not a chemical change?
(a) Burning of a candle.
(b) Cooking a food
(c) Sublimation
(d) Germination of seeds

Sol : www.cbse.site/sc/am202

103. Rusting of iron can be prevented by:
1. Painting
2. Galvanisation
3. Electrolytic refining
4. Alloying

Which of the above are correct?
(a) 1, 2 and 3
(b) 1, 2 and 4
(c) 2, 3 and 4
(d) 1, 2, 3 and 4

Sol : www.cbse.site/sc/am203

104. Which of the following is the observations of the chemical reaction?
1. Change in state
2. Evolution of a gas

3. Change in colour
4. Change in temperature

(a) 1, 2 and 3
(b) 1, 2 and 4
(c) 1, 3 and 4
(d) 1, 2, 3 and 4

Sol : www.cbse.site/sc/am204

105. Which of the following are correctly matched?

1. Reactant ..... substance which undergoes change.
2. Product ..... new substance.
3. Chemical reaction ..... simplest form.

(a) 1 and 2
(b) 2 and 3
(c) 1 and 3
(d) 1, 2 and 3

Sol : www.cbse.site/sc/am205

106. Which of the following is/are correct for a balanced chemical equation?

1. It is based on law of conservation of mass.
2. The physical states makes the chemical reaction less informative.

(a) Only 1
(b) Only 2
(c) Both 1 and 2
(d) Neither 1 nor 2

Sol : www.cbse.site/sc/am206

107. Which of the following are correctly matched?

	Symbol	**State**
1.	Aq	soluble in alcohol
2.	l	liquid
3.	s	solid

(a) 1 and 2
(b) 2 and 3
(c) 1 and 3
(d) 1, 2 and 3

Sol : www.cbse.site/sc/am207

108. Which of the following are correctly matched?

1.	Combination reaction	Formation of single product.
2.	Decomposition reaction	Break down of single, entity.
3.	Thermal decomposition	Heat is used.
4.	Displacement reaction	Based on reactivity series.

(a) 1, 2 and 3
(b) 1, 2 and 4
(c) 1, 3 and 4
(d) 1, 2, 3 and 4

Sol : www.cbse.site/sc/am208

109. Which of the statements about the reaction below are correct?

$$2PbO(s) + C(s) \longrightarrow 2Pb(s) + CO_2(g)$$

1. Lead is getting reduced.
2. Carbon dioxide is getting oxidised.
3. Carbon is getting oxidised.
4. Lead oxide is getting reduced.

(a) 1 and 2
(b) 1 and 3
(c) 1, 2 and 3
(d) All the above

Sol : www.cbse.site/sc/am209

110. When hydrogen sulphide gas is passed through a blue solution of copper sulphate,

a black precipitate of copper sulphide is obtained and the sulphuric acid so formed remains in the solution. The reaction is an example of-

(a) a combination reaction
(b) a displacement reaction
(c) a decomposition reaction
(d) a double decomposition reaction

Sol : www.cbse.site/sc/am210

111. What happens when copper rod is dipped in iron sulphate solution?

(a) Copper displaces iron
(b) Blue colour of copper sulphate solution is obtained
(c) No reaction takes place
(d) Reaction is exothermic

Sol : www.cbse.site/sc/am211

112. A student added dilute HCl to a test tube containing zinc granules and made following observations :

(a) the zinc surface became dull and black
(b) a gas evolved which burnt with a pop sound
(c) the solution remained colourless
(d) the solution becomes green in colour

Sol : www.cbse.site/sc/am212

113. A dilute solution of sodium carbonate was added to two test tubes - one containing dil HCl (A) and the other containing dilute NaOH(B). Which of the following was the correct observation?

(a) A brown coloured gas liberated in test tube A.
(b) A brown coloured gas liberated in test tube B.
(c) A colourless gas liberated in test tube A.
(d) A colourless gas liberated in test tube B.

Sol : www.cbse.site/sc/am213

114. When the gases sulphur dioxide and hydrogen sulphide mix in the presence of water, the reaction is $SO_2 + 2H_2S \rightarrow 2H_2O + 3S$.
Here hydrogen sulphide is acting as:

(a) an oxidising agent
(b) a reducing agent
(c) a dehydrating agent
(d) a catalyst

Sol : www.cbse.site/sc/am214

115. $CuO + H_2 \rightarrow H_2O + Cu$, reaction is an example of:

(a) redox reaction
(b) synthesis reaction
(c) neutralisation
(d) analysis reaction

Sol : www.cbse.site/sc/am215

116. $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$
The above reaction is an example of a-

(a) combination reaction
(b) double displacement reaction
(c) decomposition reaction
(d) displacement reaction

Sol : www.cbse.site/sc/am216

117. When $Ca(NO_3)_2$ is heated, it gives CaO, $NO_2(g)$ and $O_2(g)$. The correct number of moles of $Ca(NO_3)_2$, CaO, $NO_2(g)$ and $O_2(g)$ are present in the reaction are respectively

(a) 1, 2, 4, 1
(b) 2, 2, 4, 1

(c) 2, 1, 3, 2
(d) 2, 2, 2, 1

Sol : www.cbse.site/sc/am217

118. Which of the following reaction is characterised by the yellow colour of product?
(a) $2Pb_3O_4 \xrightarrow{\Delta} 6PbO\,(s) + O_2(g)$
(b) $Zn\,(s) + H_2SO_4 \longrightarrow ZnSO_4 + H_2$
(c) $Na_2CO_3 + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O + CO_2$
(d) $2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2(g)$

Sol : www.cbse.site/sc/am218

119. Which one of the following involve a chemical reaction?
(a) Heating magnesium wire in the presence of air at high temperature
(b) Evaporation of water
(c) Storing on nitrogen gas under pressure
(d) Keeping petrol in a China dish in open

Sol : www.cbse.site/sc/am219

120. Ethane (C_2H_6) on complete combustion gave CO_2 and water. It shows that the results are in accordance with the law of conservation of mass. Then, the coefficient of oxygen is equal to
(a) 7/2
(b) 3/2
(c) 5/2
(d) 9/2

Sol : www.cbse.site/sc/am220

121. **Assertion :** Corrosion of iron is a serious problem.
Reason : Every year an enormous amount of money is spent to replace damaged iron.
(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.
(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.
(c) Assertion is True but the Reason is False.
(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am221

122. **Assertion :** Changing of colour of copper from reddish brown to black is an example of reduction.
Reason : Hydrogen is removed.
(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.
(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.
(c) Assertion is True but the Reason is False.
(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am222

123. **Assertion :** When iron nail is dipped in copper sulphate solution, the iron nail becomes brownish in colour and the blue colour of copper solution fade.
Reason : Equation representing this change is
$Cu + FeSO_4 \longrightarrow CuSO_4 + Fe$
(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.
(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.
(c) Assertion is True but the Reason is

False.

(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am223

124. **Assertion :** Silver chloride turns grey is sunlight.
Reason : Silver is one of the least reactive metals.

(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.

(c) Assertion is True but the Reason is False.

(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am224

125. **Assertion :** When water is added to calcium oxide, a large amount of heat is produced.
Reason : It is an endothermic reaction.

(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.

(c) Assertion is True but the Reason is False.

(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am225

126. **Assertion :** A chemical equation should be balanced.
Reason : Number of atoms of each element should be same on reactants as well as products side.

(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.

(c) Assertion is True but the Reason is False.

(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am226

127. **Assertion :** Chemical equations can be made more informative.
Reason : We can write physical state of reactants and products, temperature and pressure, name of catalyst used etc.

(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.

(c) Assertion is True but the Reason is False.

(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am227

128. **Assertion :** Equation
$C(s) + O_2(g) \longrightarrow CO_2(g)$ is an example of combination reaction.
Reason : In the given above equation, carbon and oxygen react to give carbon dioxide.

(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.

(c) Assertion is True but the Reason is False.

(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am228

129. **Assertion :** Chips manufacturers usually flush bags of chips with oxygen gas.
Reason : It adds taste to chips.
(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.
(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.
(c) Assertion is True but the Reason is False.
(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am229

130. **Assertion :** Precipitation reactions produce insoluble salts.
Reason : Precipitation reaction is a double decomposition reaction.
(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.
(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.
(c) Assertion is True but the Reason is False.
(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am230

131. **Assertion :** During digestion, carbohydrates are broken down to form glucose.
Reason : Glucose is necessary for breathing.
(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.
(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.
(c) Assertion is True but the Reason is False.
(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am231

132. **Assertion :** Decomposition reactions are similar to combination reactions.
Reason : Both reactions need a catalyst to occur.
(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.
(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.
(c) Assertion is True but the Reason is False.
(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am232

133. **Assertion :** Corrosion of iron is commonly known as rusting.
Reason : Corrosion of iron occurs in presence of water and air.
(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.
(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.
(c) Assertion is True but the Reason is False.
(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am233

134. **Assertion :** A reducing agent is a substance which can either accept electron.
Reason : A substance which helps in oxidation is known as reducing agent.
(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.
(b) Both Assertion and Reason are

True but Reason is not the Correct explanation of the Assertion.

(c) Assertion is True but the Reason is False.

(d) Assertion (A) is false but reason (R) is true.

Sol : www.cbse.site/sc/am234

135. **Assertion :** The balancing of chemical equations is based on law of conservation of mass.
Reason : Total mass of reactants is equal to total mass of products.

(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.

(c) Assertion is True but the Reason is False.

(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am235

136. **Assertion :** Carbon dioxide turns lime water milky.
Reason : Carbon dioxide sullies the water.

(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.

(c) Assertion is True but the Reason is False.

(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am236

137. **Assertion :** A chemical reaction becomes faster at higher temperatures.
Reason : At higher temperatures, molecular motion becomes more rapid.

(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.

(c) Assertion is True but the Reason is False.

(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am237

138. **Assertion :** The following chemical equation,

$2C_6H_6 + 7O_2 \longrightarrow 4CO_2 + 6H_2O$

is a balanced chemical equation.
Reason : In a balanced chemical equation, the total number of atoms of each element may or may not equal on both side of the equation.

(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.

(c) Assertion is True but the Reason is False.

(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am238

139. **Assertion :** $Fe_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Fe$
The above chemical equation is an example of displacement reaction.
Reason : Aluminium being more reactive than iron, displaces Fe from its oxide.

(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are

True but Reason is not the Correct explanation of the Assertion.

(c) Assertion is True but the Reason is False.

(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am239

140. **Assertion :** Photosynthesis is considered as an endothermic reaction.
Reason : Energy gets released in the process of photosynthesis.

(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.

(c) Assertion is True but the Reason is False.

(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am240

141. **Assertion :** In the following chemical equation,
$CuO(s) + Zn(s) \longrightarrow ZnO(s) + Cu(s)$
Zinc is getting oxidised and copper oxide is getting reduced.
Reason : The process in which oxygen is added to a substance is called oxidation whereas the process in which oxygen is removed from a substance is called reduction.

(a) Both Assertion and Reason are True and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are True but Reason is not the Correct explanation of the Assertion.

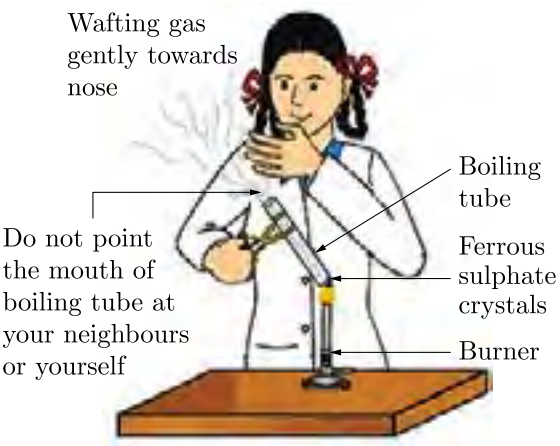
(c) Assertion is True but the Reason is False.

(d) Both Assertion and Reason are False.

Sol : www.cbse.site/sc/am241

COMPETENCY BASED QUESTIONS

142. Sunita takes about 2 g ferrous sulphate crystals in dry boiling tube and heat the boiling tube over the flame of a burner or spirit lamp as shown in the figure.



The colour of crystals after heating is:

(a) Black

(b) Brown

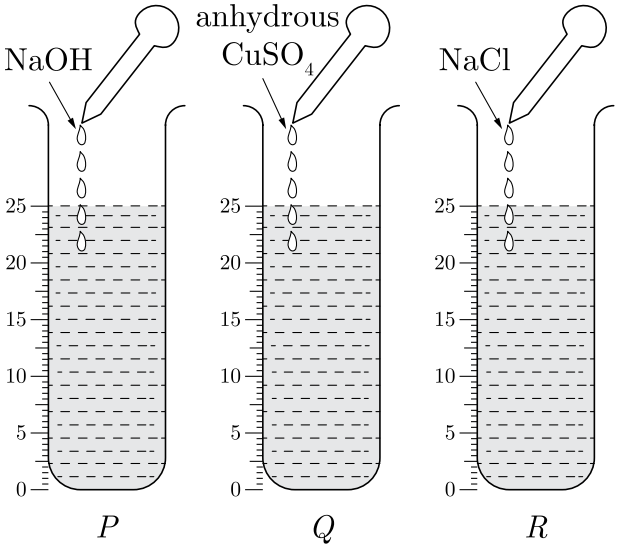
(c) Green

(d) Orange

Sol : www.cbse.site/sc/am242

143. Three beakers labelled as P, Q and R each containing 25 ml of water were taken. A small amount of NaOH, anhydrous $CuSO_4$ and NaCl were added to the beakers P, Q and R respectively. It was observed that there was an increase in the temperature of the solutions contained in beakers P and Q, whereas in case of breaker R, the temperature of the solution falls. Which one of the following statements(s) is (are)

correct?



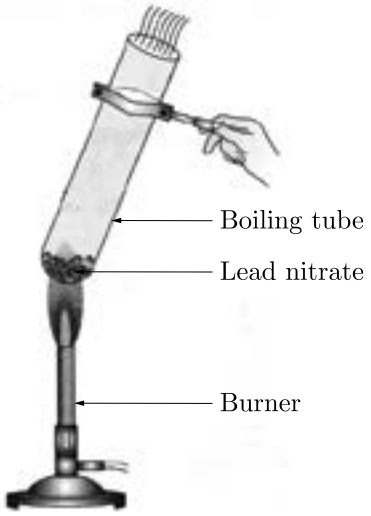
1. In beakers P and Q, exothermic process has occurred.
2. In beakers P and Q, endothermic process has occurred.
3. In beaker R, exothermic process has occurred.
4. In beaker R, endothermic process has occurred.

(a) Only 1
(b) Only 2
(c) 1 and 4
(d) 2 and 3

Sol : www.cbse.site/sc/am243

144. Ramesh is science teacher in Kendriya Vidyalya. He asked Sunita to perform following activity steps with lead nitrate powder.

- Take about 2 g lead nitrate powder in a boiling tube.
- Hold the boiling tube with a pair of tongs and heat it over a flame as shown in figure.

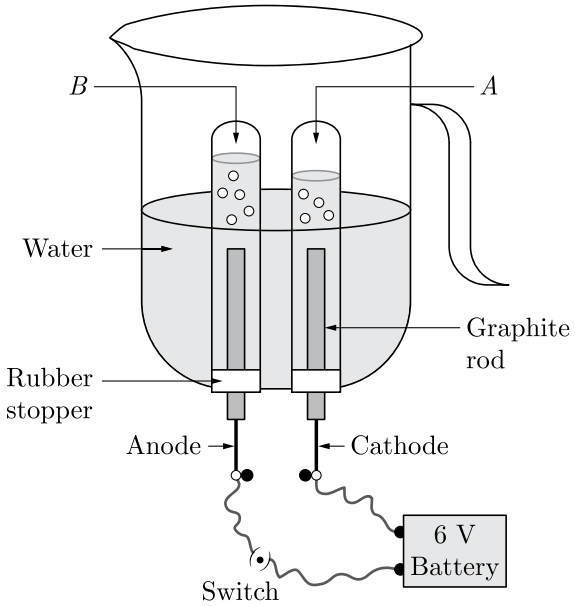


Which of the following product is formed in the above process?

(a) Lead oxide
(b) Lead carbonate
(c) Lead sulphide
(d) Lead sulphide

Sol : www.cbse.site/sc/am244

145. A experimental arrangement of formation of gas is shown in the figure:



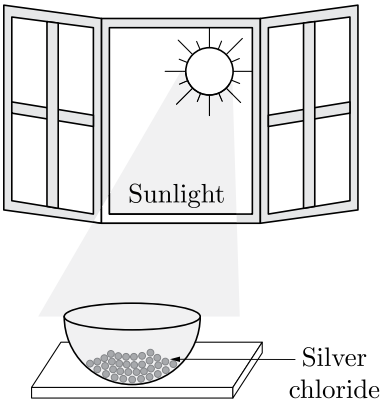
Which gas is present in tube A?

(a) Oxygen

(b) Hydrogen
(c) Helium
(d) Nitrogen

Sol : www.cbse.site/sc/am245

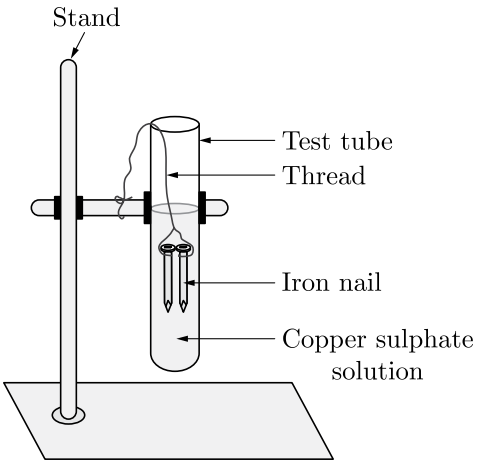
146. The silver chloride placed under the sunlight as shown in the figure:



The colour of silver chloride after some time is:
(a) Black
(b) Green
(c) Gray
(d) Yellow

Sol : www.cbse.site/sc/am246

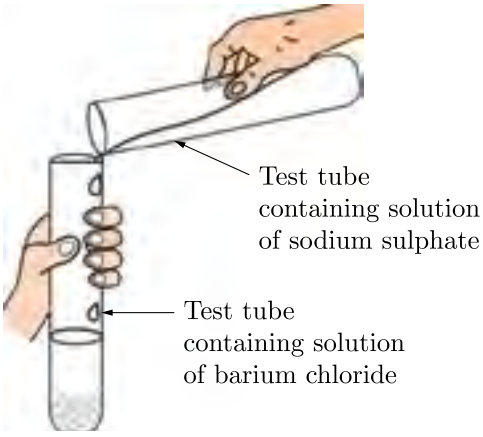
147. One day Mohan was performing an experiment in the laboratory. By mistake he leaves the iron mail in the copper sulphate solution for one week.



After one week, the colour of sulphate solution is:
(a) Green
(b) Yellow
(c) Red
(d) Colourless

Sol : www.cbse.site/sc/am247

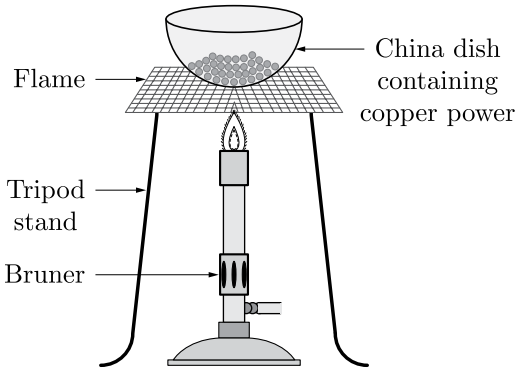
148. Sodium sulphate and barium chloride mixed together as shown in the figure.



Which colour substance is formed in the test tube?
(a) White
(b) Black
(c) Green
(d) Yellow

Sol : www.cbse.site/sc/am248

149. A small amount of copper power is heated as shown in the figure.



Which reaction shows the above process?

(a) $2Cu + O_2 \longrightarrow 2CuO$

(b) $CuO + H_2 \longrightarrow Cu + H_2O$

(c) $Cu + O_2 \longrightarrow 2CuO$

(d) $CuO + N_2 \longrightarrow Cu + N_2O$

Sol : www.cbse.site/sc/am249

150. The reason of colour changing of silver anklet after few day is:

(a) formation of silver sulphide.

(b) formation of silver nitrate.

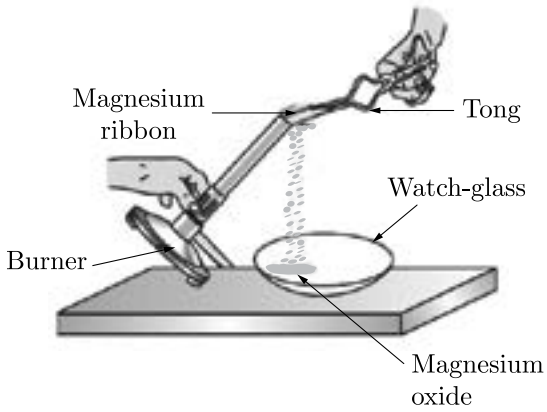
(c) formation of silver chloride.

(d) formation of silver bromide.

Sol : www.cbse.site/sc/am250

151. The science teacher ordered to Mohit done the following practical step with magnesium ribbon:

1. Clean a magnesium ribbon about 3-4 cm long by rubbing it with sandpaper.
2. Hold it with a pair of tongs. Burn it using a spirit lamp or burner and collect the ash so formed in a watch-glass as shown in Figure. Burn the magnesium ribbon keeping it away as far as possible from your eyes.



Which of the following reaction is take place here?

(a) $2Mg + O_2 \longrightarrow 2MgO$

(b) $2Mg + H_2 \longrightarrow 2MgH$

(c) $2Mg + N_2 \longrightarrow 2MgN$

(d) $2Mg + He_2 \longrightarrow 2MgHe$

Sol : www.cbse.site/sc/am251

152. The science teacher said to Ram to perform a experiment with lead nitrate and potassium iodide. He done the following steps under the observation of our teacher.

1. Take lead nitrate solution in a beaker.
2. Take potassium iodide solution in a test tube. (Both solutions are colourless).
3. Add potassium iodide solution slowly to the lead nitrate solution.

Which chemical reaction take place here?

(a) $Pb(NO_3)_2 + 2KI \longrightarrow PbI_2 + 2KNO_3$

(b) $Pb(NO_3)_2 + KI \longrightarrow PbI_2 + 2NO_3$

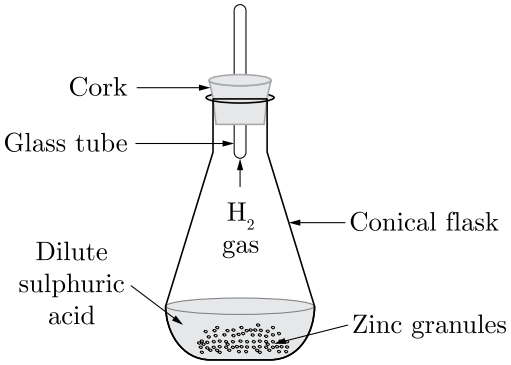
(c) $Pb(NO_3)_2 + I \longrightarrow PbI + 2K$

(d) $Pb(NO_3) + 2KI \longrightarrow 2PbI_2 + 2KNO_3$

Sol : www.cbse.site/sc/am252

153. One day Sunita went in the science lab and the take a few zinc granules in a conical flask or a test tube and add dilute hydrochloric

acid or sulphuric acid in it.



Which change is seen by Sunita in the above experimental process?

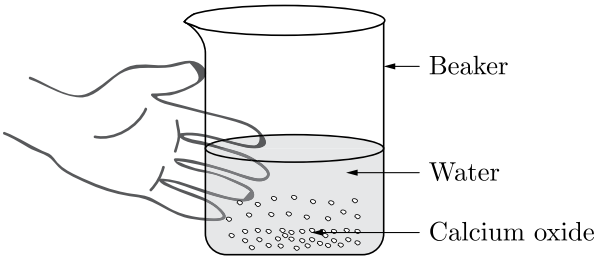
(a) Change in temperature
(b) Change in colour
(c) Evolution of gas
(d) Change in state

Sol : www.cbse.site/sc/am253

Direction For Questions (154-155)

Teacher asked Ganesh to do following experiment.

- Take a small amount of calcium oxide or quick lime in a beaker.
- Slowly add water to this.
- Touch the beaker as shown in Figure.



154. Which of the following reaction take place here?

(a) $CaO + H_2O \longrightarrow Ca(OH)_2 + \text{Heat}$
(b) $CaO + H_2O \longrightarrow Ca(OH)_2 - \text{Heat}$
(c) $CaO + H_2O \longrightarrow CaH_2 + \text{Heat}$
(d) $CaO + H_2O \longrightarrow Ca(OH)_2$

Sol : www.cbse.site/sc/am254

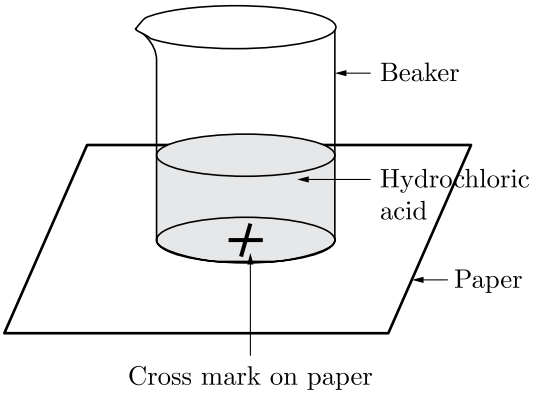
155. Which change is observed by Ganesh after touching the beaker?

(a) Change in temperature
(b) Change in the shape of beaker
(c) Change in the colour of water
(d) None of these

Sol : www.cbse.site/sc/am254

Direction For Questions (156-160)

In chemistry lab, a student took HCl in a beaker and was placed on a white paper with cross mark. When seen through the beaker the mark as shown in the figure was visible. On adding some sodium thiosulphate in the beaker the cross marked disappeared. When seen through the beaker. The student observed some reaction as the products formed were different than the reactants. Both the reactants were transparent.



156. Which of the following reaction is of similar type as observed in the given set up.

(a) $CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq)$
(b) $2FeSO_4(s) \xrightarrow{\Delta} Fe_2O_3(s) + SO_2(g) + SO_3(g)$
(c) $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$
(d) $Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$

Sol : www.cbse.site/sc/am255

157. Name the resultant insoluble substance formed in the flask.
(a) Sulphur
(b) Sodium sulphide
(c) Sodium sulphate
(d) Sodium carbonate

Sol : www.cbse.site/sc/am255

158. Which of the following reaction is done in the above arrangement?
(a) Double displacement reaction
(b) Displacement reaction
(c) Precipitation reaction
(d) Redox reaction

Sol : www.cbse.site/sc/am255

159. Why did the cross mark disappear?
(a) The solution so formed has ability to absorb black colour hence black coloured cross is not seen.
(b) The resultant solution has high viscosity due to which it refracts the light to other angle.
(c) The resultant solution is dark coloured which does not allow the light to pass through it.
(d) The insoluble precipitate that is formed in the flask does not allow the light to pass through it to see the cross mark.

Sol : www.cbse.site/sc/am255

160. Which of the following gas is formed in above reaction?
(a) Cl_2
(b) SO_2
(c) SO_3
(d) O_2

Sol : www.cbse.site/sc/am255

Direction For Questions (161-162)

A reaction in which a single reactant breaks down to form two or more products is known as decomposition reaction. Decomposition reaction is just the opposite of combination reaction.
The decomposition reaction takes place only when the energy in the form of heat, electricity or light is supplied.
Oxygen is prepared by catalytic decomposition of potassium chlorate ($KClO_3$). Decomposition of potassium chlorate gives potassium chloride (KCl) and oxygen (O_2). The following reaction takes place :
$KClO_3(s) \longrightarrow KCl(s) + O_2(g)$

161. How many moles of $KClO_3$ are required to produce 2.4 moles of O_2?
(a) 1.6
(b) 2.9
(c) 1.9
(d) 2.4

Sol : www.cbse.site/sc/am256

162. Which of following element is reduced in the given reaction?
(a) Oxygen
(b) Potassium
(c) Chlorine
(d) None of these

Sol : www.cbse.site/sc/am256

Direction For Questions (163-164)

Corrosion is the phenomenon of

deterioration of surface of metal in presence of air and moisture. It is a natural process and in the presence of a moist atmosphere, chemically active metals get corroded. This is oxidation reaction. Rusting is the process where iron corrodes due to exposure to the atmosphere. The main circumstance of corrosion occurs with iron because it is a structural material in construction, bridges, buildings, rail transport, ships, etc. Aluminium is also an important structural metal, but even aluminium undergoes oxidation reactions. However, aluminium doesn't corrode or oxidise as rapidly as its reactivity suggests. An alloy of aluminium or any other metal like magnesium can make aluminium stronger and harder.
Copper (Cu) corrodes and forms a basic green carbonate and lead corrodes to form a white lead oxide or carbonate.

163. Which two metals do not corrode easily?
(a) Gold
(b) Copper
(c) Platinum
(d) Both (a) and (b)

Sol : www.cbse.site/sc/am257

164. Select the incorrect statement from the following options :
(a) Replace of corroded equipment is time consuming.
(b) Corrosion is a type of oxidation reaction.
(c) Corrosion increases the electrical conductivity of metals.
(d) Corrosion causes leakage of toxic liquid or gases.

Sol : www.cbse.site/sc/am257

Direction For Questions (165-168)

Any process which involves addition of oxygen (or non-metallic element) or removal of hydrogen (or metallic element) or loss of electron(s) from an atom or an ion is called oxidation reaction. The substance which can bring about oxidation of other substances is called oxidising agent.
Any process which involves addition of hydrogen (or metallic element) or removal of oxygen (or non-metallic element) or gain of electrons(s) by atom an or ion is called reduction reaction.
The substance which can bring about reduction of other substances is called a reducing agent.
Oxidation and reduction always take place together and these type of reactions are known as redox reactions. Some of the examples of redox reactions are given below:

a. $Pb_3O_4 + 8HCl \rightarrow 3PbCl_2 + Cl_2 + 4H_2O$
b. $2Mg + O_2 \longrightarrow 2MgO$
c. $CuSO_4 + Zn \longrightarrow Cu + ZnSO_4$
d. $V_2O_5 + 5Ca \longrightarrow 2V + 5CaO$
e. $3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$
f. $CuO + H_2 \longrightarrow Cu + H_2O$

165. Which of the following is the example of oxidation reaction from your everyday life?
(a) Corrosion
(b) Rancidity
(c) Electricity in batteries
(d) Both (a) and (b)

Sol : www.cbse.site/sc/am258

166. The oxidising agent in the reaction c and f are:
(a) $CuSO_4$ and CuO
(b) CuO and $CuSO_4$
(c) Zn and CuO
(d) CuO and Zn

Sol : www.cbse.site/sc/am258

167. Which of the following is an oxidising agent?

(a) $LiAlH_4$

(b) Alkaline $KMnO_4$

(c) Acidified $K_2Cr_2O_7$

(d) Both (b) and (c)

Sol : www.cbse.site/sc/am258

168. A reaction in which a single reactant breaks down to form two or more products is known as decomposition reaction. Decomposition reaction is just the opposite of combination reaction. The decomposition reaction takes place only when the energy in the form of heat, electricity or light is supplied.

Example: Ferrous sulphate crystals on heating in a dry boiling tube gives the following reaction:

$$2FeSO_4(s) \xrightarrow{\text{Heat}} Fe_2O_3(s) + SO_2(g) + SO_3(g)$$

Which of the following gas has a smell of burning sulphur?

(a) Sulphur oxide

(b) Sulphur dioxide

(c) Sulphur chloride

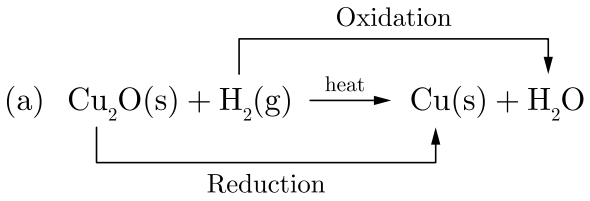
(d) None of these

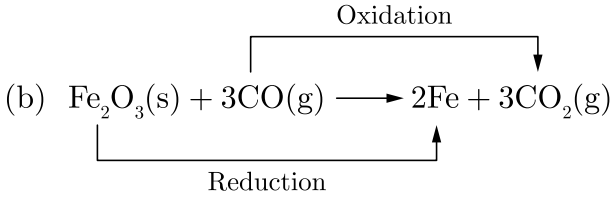
Sol : www.cbse.site/sc/am259

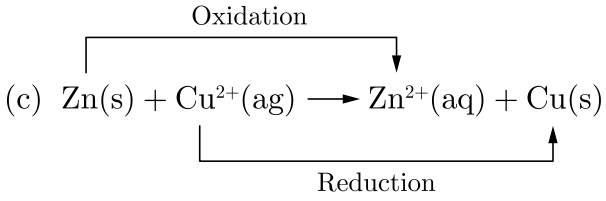
Direction For Questions (169-171)

Chemical reactions where oxidation and reduction both take place simultaneously are called redox reactions. In the word, 'REDOX' 'RED' stands for reduction and 'OX' stands for oxidation.

Examples:







Redox reactions play a vital role in our daily life. Generation of electricity in batteries, production of heat energy by burning chemical substances, extraction of metals, manufacture of a number of useful products are common examples of redox reactions.

169. Which of the following are the reducing agent in (a) and (c)?

(a) H_2, Zn

(b) Zn, H_2

(c) Cu, H_2

(d) H_2, Cu

Sol : www.cbse.site/sc/am260

170. Which of the following is not a example of redox reaction?

(a) $CO_2 + H_2 \rightarrow CO + H_2O$

(b) $Zn + CuSO_4 \rightarrow Cu + ZnSO_4$

(c) $MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$

(d) $HCl + NaOH \rightarrow NaCl + H_2O$

Sol : www.cbse.site/sc/am260

171. The other name of displacement reaction is:

(a) Decomposition reaction
(b) Combination reaction
(c) Displacement reaction
(d) None of these

Sol : www.cbse.site/sc/am260

172. Magnesium ribbon burns in air with a dazzling white flame. This is due to the formation of a white solid. This white solid dissolves in water and gives a solution which turns red litmus blue.
Which type of reaction is performed in above process?

(a) Combination reaction
(b) Decomposition reaction
(c) Redox reaction
(d) Oxidation reaction

Sol : www.cbse.site/sc/am261

173. A reaction in which two or more reactants combine to form a single product is called combination reaction. In combination reactions following three cases are observed:
Combination of two elements: Two elements combine to form a new compound. Some examples are:
Combination of hydrogen and chlorine:

$H_2(g) + Cl_2(g) \xrightarrow{\text{Sunlight}} 2HCl(g)$

Formation of iron sulphide:

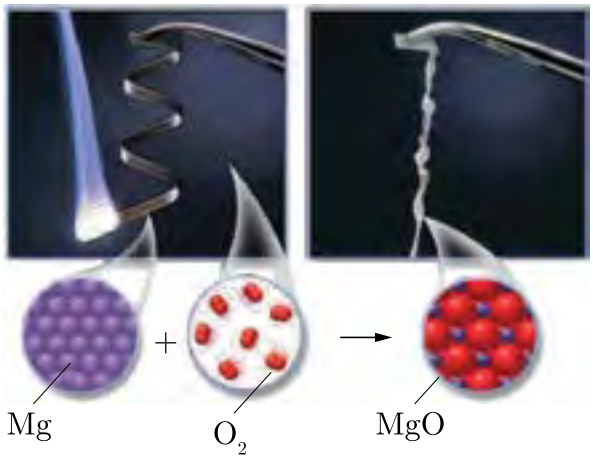
$Fe(s) + S(s) \xrightarrow{\text{Heat}} FeS(s)$

Burning of coal:

$C(s) + O_2(g) \longrightarrow CO_2(g)$

Combustion of hydrogen:

$2H_2(g) + O_2(g) \longrightarrow 2H_2O(I)$



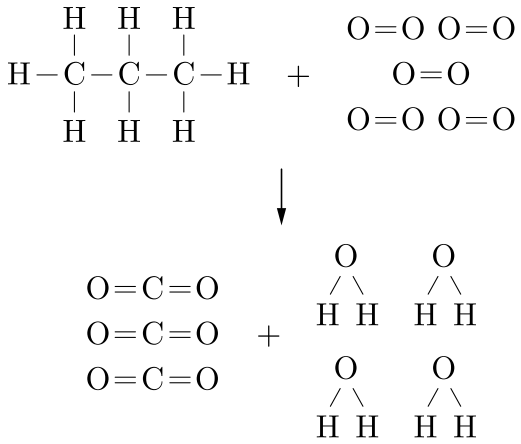
$2Mg(s) + O_2(g) \longrightarrow 2MgO(s)$

Which of the following is not a combination reaction?

(a) $NH_3 + HCl \longrightarrow NH_4Cl$
(b) $2NO + O_2 \longrightarrow 2NO_2$
(c) $2SO_2 + O_2 \longrightarrow 2SO_3$
(d) $Cu_2O + H_2 \longrightarrow Cu + H_2O$

Sol : www.cbse.site/sc/am262

174. A balanced chemical equation is one which contains an equal number of atoms of each element on both the sides of the equation. An unbalanced chemical equation is one in which the number of atoms of the elements on the two sides of the equation is not the same. An unbalanced chemical equation is also called skeletal chemical equation.
$Kl + Cl_2 \rightarrow KCl + l_2$ (Unbalanced chemical equation).
$2Kl + Cl_2 \rightarrow 2KCl + l_2$ (Balanced chemical equation).



$C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$

$Fe(s) + H_2O(g) \longrightarrow Fe_3O_4(s) + H_2(g)$

The balance chemical equation of above skeletal chemical equation is:

(a) $2Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$

(b) $3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$

(c) $5Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + H_2(g)$

(d) $3Fe(s) + 4H_2O(g) \rightarrow Fe_2O_4(s) + H_2(g)$

Sol : www.cbse.site/sc/am263

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CHAPTER 2

Acids, Bases and Salts

3.1 ACIDS

Acids are chemical compounds which have sour taste, consist of hydrogen (H), and turn blue litmus solution red. On the basis of their sources, acids can be classified as:

3.1.1 Organic Acids

They are derived from living organisms, i.e., plants and animals. For example, tomatoes contain oxalic acid and ants contain formic acid.

3.1.2 Mineral Acids

They are obtained from mineral sources, e.g., sulphuric acid, nitric acid and hydrochloric acid. They are inorganic acids. Many mineral acids find extensive use and application.

3.1.3 Arrhenius Theory of Acids

According to this theory, acids are substances that ionise to give H^+ ions when dissolved in water, e.g.,

$$HCl\,(aq) \rightleftharpoons H^+(aq) + Cl^-(aq)$$

3.1.4 Strong Acids

These acids ionise more or less completely when dissolved in water, e.g., sulphuric acid (H_2SO_4) nitric acid (HNO_3) and hydrochloric acid (HCl).

$$HCl\,(aq) \longrightarrow H^+(aq) + Cl^-(aq)$$

$$H_2SO_4(aq) \longrightarrow 2H^+(aq) + SO_4^{2-}(aq)$$

3.1.5 Weak Acids

These acids ionise to a small extent when dissolved in water, e.g., acetic acid (CH_3COOH), formic acid (HCOOH) and carbonic acid (H_2CO_3).

$$CH_2COOH\,(aq) \rightleftharpoons CH_3COO^-(aq) + H^+(aq)$$

$$H_2CO_3 \rightleftharpoons 2H^+(aq) + CO_3^{2-}(aq)$$

3.1.6 Reactions of Acids with Metals

Dilute acids react with metals to evolve hydrogen.

$$Zn\,(s) + \text{dil.}H_2SO_4 \longrightarrow ZnSO_4(aq) + H_2(g)$$

H_2 gas is not evolved when a metal reacts with nitric acid (HNO_3).

3.1.7 Reactions of Acids with Metal Oxides

Metal oxides, being basic in nature, react with acids to form salt and water.

$$CaO\,(s) + 2HCl\,(aq) \longrightarrow CaCl_2(aq) + H_2O\,(l)$$

3.1.8 Reactions of Acids with Metal Carbonates and Metal Hydrogen carbonates

Acids break up metal carbonates and metal hydrogen carbonates to evolve carbon dioxide gas with brisk effervescence.

$$NaCO_3(s) + 2HCl\,(aq) \longrightarrow 2NaCl\,(aq) + H_2O\,(l) + CO_2(g)$$

$$NaHCO_3(s) + HCl\,(aq) \longrightarrow NaCl\,(aq) + H_2O\,(l) + CO_2(g)$$

3.2 BASES

Bases are chemical compounds which have bitter taste, are soapy and slippery to touch, and turn red litmus solution blue, e.g., sodium hydroxide, potassium hydroxide, aluminium hydroxide, etc. Those bases which are soluble in water are called alkalis.

3.2.1 Arrhenius Theory of Bases

According to this theory, bases are substances that ionise to give hydroxyl ion (OH^-) when dissolved in water, e.g.,

$$NaOH\,(aq) \longrightarrow Na^+(aq) + OH^-(aq)$$

3.2.2 Strong Bases

They ionise more or less completely on dissolving in water, e.g., NaOH, KOH, $Ca(OH)_2$ etc.

$$NaOH\,(aq) \longrightarrow Na^+(aq) + OH^-(aq)$$

3.2.3 Weak Bases

They ionise to a small extent on dissolving in water, e.g., ammonium hydroxide (NH_4OH), copper hydroxide [$Cu(OH)_2$], etc.

$$NH_4OH\,(aq) \rightleftharpoons NH_4^+(aq) + OH^-(aq)$$

3.2.4 Indicators

Acid-base indicators (indicators) are natural or synthetic dyes which show a change of colour depending upon the acidity or alkalinity of a solution.

The indicator like litmus is red in acidic and blue in basic medium. Methyl orange is red in acidic and yellow in basic medium. Phenolphthalein is colourless in acidic and pinkish-red in basic medium.

1. **Olfactory Indicators :** Those substances whose odour changes in acidic or basic medium are called olfactory indicators, e.g., the smell of onion diminishes in a base but remains as such in an acid.

3.2.5 Reactions of Bases with Metals

Metals like Zn and Al react with strong alkalis to evolve H_2 gas.

$$Zn\,(s) + 2NaOH\,(aq) \rightarrow \underset{\text{Sodium zincate}}{Na_2ZnO_2(aq)} + H_2(g)$$

3.2.6 Reactions of Bases with Non-metallic Oxides

Bases react with acidic oxides to form salt and water.

$$2NaOH\,(aq) + CO_2(g) \longrightarrow Na_2CO_3(aq) + H_2O\,(l)$$

3.2.7 Neutralisation

When an acid reacts with a base, it gives salt and water, it is called neutralisation reaction, and also it is an exothermic process.

$$HCl\,(aq) + NaOH\,(aq) \rightarrow NaCl\,(aq) + H_2O\,(l)$$

3.2.8 pH

The negative exponent of 10 to which it must be raised in order to express the hydrogen ion concentration of the solution in mole per litre. Mathematically, $[H^+(aq)] = 10^{-pH}$

Higher the $H^+(aq)$ concentration, lower is the pH value.

3.2.9 pH Scale

In neutral solution and pure water, $pH = 7$, acidic solutions, $pH < 7$ and alkaline solutions, $pH > 7$.

3.2.10 Universal Indicator

It is a pH indicator composed of several compounds that exhibit colour changes over a pH value range from 0 to 14. It not only shows acidic or basic nature of solution but also shows approximate pH by giving a particular colour for a specific value of pH.

3.3 SALTS

They are ionic compounds formed by the combination of cation from base and anion from acid.

$$\underset{\text{(Base)}}{NaOH\,(aq)} + \underset{\text{(Acid)}}{HCl\,(aq)} \longrightarrow \underset{\text{(Salt)}}{NaCl\,(aq)} + \underset{\text{(Water)}}{H_2O\,(l)}$$

3.3.1 pH of Salt Solutions

1. The salt of a strong acid and a weak base gives acidic solution (pH less than 7).

$$NH_4Cl\,(s) + H_2O\,(l) \rightleftharpoons NH_4OH\,(aq)$$

$$+\mathrm{HCl(aq)}$$

Here, hydrochloric acid (strong acid) ionises to give $H^+(aq)$ ions which is greater than ammonium hydroxide (weak base) ionises to give $OH^-(aq)$ ions, so, the solution is acidic.

2. The salt of a strong base (NaOH) and a weak acid H_2CO_3 gives basic solution (pH more than 7).

$$\mathrm{NH_2CO_3(s) + H_2O(l) \rightleftharpoons 2NaOH(aq)}$$
$$+\mathrm{H_2CO_3(aq)}$$

Here, NaOH releases $OH^-(aq)$ ion more and H_2CO_3 releases $H^+(aq)$ ion less, so, the solution is basic.

3. The salt of a weak acid (HA) and a weak base (BOH) gives slightly acidic or slightly basic or neutral solution (BA).

$$\mathrm{BA + H_2O \rightleftharpoons HA + BOH}$$

If acid is stronger than base, the solution is acidic ($pH < 7$). If acid is weaker than the base, the solution is basic ($pH > 7$). If acid and base formed are of equal strength, the solution is neutral ($pH = 7$).

4. The salt of a strong acid and a strong base gives neutral solution($pH = 7$). Salts of strong acids and bases, e.g., NaCl, Na_2SO_4, etc., on dissolving in water do not hydrolyse, so, not disturb the $pH = 7$.

3.3.2 Sodium Chloride (NaCI)

It is common salt. It is obtained from sea water by the process of evaporation.

Uses of Sodium Chloride

1. Sodium chloride (NaCI) helps in proper functioning of the human body, i.e., in muscle contraction, etc. It helps the body to prepare hydrochloric acid in gastric juice.
2. It is used in cooking food and it improves the flavour of food.
3. It is used to prepare NaOH, Na_2CO_3, etc.

3.3.3 Sodium Hydroxide (NaOH)

It is prepared on a large scale by electrolysis of a conc. solution of sodium chloride. This solution is called brine.

$$\mathrm{2NaCl(aq) + 2H_2O(l) \xrightarrow[Current]{Electric} 2NaOH(aq)}$$
$$+\mathrm{H_2(g) + Cl_2(g)}$$

Hydrogen gas is obtained at cathode and chlorine gas at anode. NaOH remains in solution. The solution on evaporation gives solid NaOH. This process is called chlor-alkali process.

1. Sodium Hydroxide is used in manufacturing soaps, detergents, paper, artificial silk (rayon) and dyes. It is used in manufacturing chemicals, i.e., sodium hypochlorite, sodium chlorate, etc.

3.3.4 Uses of Hydrogen Gas

It is used In manufacturing of ammonia and methyl alcohol and to prepare hydrochloric acid. It is used fur hydrogenating oils to give fats. Vegetable oils on hydrogenation give margarine. Vegetable oil $+H_2 \rightarrow$ Margarine (vegetable ghee)

3.3.5 Uses of Chlorine Gas

It is used as a bleaching agent in textile industry and used for sterilising water.

3.3.6 Washing Soda ($Na_2CO_3 \cdot 10H_2O$)

It is obtained from sodium carbonate (Na_2CO_3) through ammonia-soda or Solvay process. Its chemical name is sodium carbonate decahydrate.
Uses of Washing Soda : It is used for washing clothes and in manufacturing glass, caustic soda, borax, etc.

3.3.7 Baking Soda ($NaHCO_3$)

It is prepared by passing carbon dioxide through an aqueous solution of sodium carbonate. Its chemical name is sodium hydrogen carbonate or sodium bicarbonate.

$$\mathrm{Na_2CO_3 + CO_2 + H_2O \longrightarrow 2NaHCO_3}$$

It Is a white crystalline solid, sparingly soluble in water and its aqueous solution is mildly alkaline. It decomposes on heating to give Na_2CO_3 and release CO_2. It reacts with acids (H^+) to evolve CO_2.

$$2NaHCO_3 \xrightarrow{\text{Heat}} Na_2CO_3 + H_2O + CO_2$$

$$NaHCO_3 + H^+ \longrightarrow Na^+ + H_2O + CO_2$$

3.3.8 Uses of Baking Soda

It is used in cooking and as an antacid to correct the acidity of stomach. It is used in making effervescent drinks and in fire extinguishers, and also in preparing baking powder.

3.3.9 Bleaching Powder

The chemical name of bleaching powder is calcium oxychloride ($CaOCl_2$). It is obtained by passing Cl_2 gas over dry slaked lime.

$$Ca(OH)_2(s) + Cl_2(g) \xrightarrow{30^\circ C - 35^\circ C} CaOCl_2(s) + H_2O(l)$$

3.3.10 Uses of Bleaching Powder

It is used for bleaching of wood pulp, cotton, and as a disinfectant.

3.3.11 Plaster of Paris

Its chemical name is calcium sulphate hemihydrate [$CaSO_4 \cdot (1/2)H_2O$]. It is obtained by heating gypsum ($CaSO_4 \cdot 2H_2O$).

$$CaSO_4 \cdot 2H_2O \xrightarrow[\text{In a kiln}]{373\,K - 398\,K} CaSO_4 \cdot (1/2)H_2O + (3/2)H_2O$$

Plaster of Paris on mixing with an adequate quantity of water, it forms a gypsum again.

$$CaSO_4 \cdot (1/2)H_2O + (3/2)H_2O \longrightarrow CaSO_4 \cdot 2H_2O$$

3.3.12 Uses of Plaster of Paris

It is used for immobilising the affected fractured part of bone leading to quick recovery. It is also used for making decorative pieces such as toys, statues, etc.

Plaster of Paris should be stored in moisture-proof container.

3.3.13 Water of Crystallisation

1. **Hydrated Salts :** A crystalline salt molecule that is loosely attached to a certain number of water molecules is called hydrated salt. These water molecules are water of crystallisation.
2. **Hygroscopy :** Those substances which absorb moisture from atmosphere at ordinary temperature, are called hygroscopic substances, and the property is known as hygroscopy, e.g., conc. H_2SO_4, etc.
3. **Deliquescence :** Those substances which absorb moisture from atmosphere at ordinary temperature and ultimately dissolve in the absorbed water to form a solution are called deliquescent substances and the phenomenon is called deliquescence, e.g., NaOH, KOH, etc.
4. **Efflorescence :** Certain hydrated salts when exposed to air at ordinary temperature lose their water of crystallisation either partially or completely, are called efflorescent salts and the phenomenon is called efflorescence, e.g., washing soda, epsom salt, etc.

□□□□□□□

MULITIPLE CHOICE QUESTIONS

1. A solution turns red litmus blue, its pH is likely to be
(a) 1
(b) 4
(c) 5
(d) 10

Sol : www.cbse.site/sc/bm101

2. A solution reacts with crushed egg-shells to give a gas that turns lime-water milky. The solution contains
(a) NaCl
(b) HCl
(c) LiCl
(d) KCl

Sol : www.cbse.site/sc/bm102

3. 10 mL of a solution of NaOH is found to be completely neutralised by 8 mL of a given solution of HCl. If we take 20 mL of the same solution of NaOH, the amount of HCl solution (the same solution as before) required to neutralise it will be-
(a) 4 mL
(b) 8 mL
(c) 12 mL
(d) 16 mL

Sol : www.cbse.site/sc/bm103

4. Which one of the following types of medicines is used for treating indigestion?
(a) Antibiotic
(b) Analgesic
(c) Antacid
(d) Antiseptic

Sol : www.cbse.site/sc/bm104

5. What happens when a solution of an acid is mixed with a solution of a base in a test tube?
1. Salt formation takes place.
2. The temperature of the solution remains the same.
3. The temperature of the solution decreases.
4. The temperature of the solution increases.

(a) Only 1
(b) 1 and 2
(c) 2 and 4
(d) 1 and 4

Sol : www.cbse.site/sc/bm105

6. An aqueous solution turns red litmus solution blue. Excess addition of which of the following solution would reverse the change?
(a) Baking powder
(b) Lime
(c) Ammonium hydroxide solution
(d) Hydrochloric acid

Sol : www.cbse.site/sc/bm106

7. During the preparation of hydrogen chloride gas on a humid day, the gas is usually passed through the guard tube containing calcium chloride. The role of calcium chloride taken in the guard tube is to
(a) absorb the evolved gas
(b) moisten the gas
(c) absorb moisture from the gas
(d) absorb Cl^- ions from the evolved gas.

Sol : www.cbse.site/sc/bm107

8. Which of the following salts does not contain water of crystallization?
(a) Blue vitriol
(b) Baking soda
(c) Washing soda
(d) Gypsum

Sol : www.cbse.site/sc/bm108

9. Sodium carbonate is a basic salt because it is a salt of
(a) strong acid and strong base
(b) weak acid and weak base
(c) strong acid and weak base
(d) weak acid and strong base

Sol : www.cbse.site/sc/bm109

10. Calcium phosphate is present in tooth enamel. Its nature is
(a) basic
(b) acidic
(c) neutral
(d) amphoteric

Sol : www.cbse.site/sc/bm110

11. A sample of soil is mixed with water and allowed to settle. The clear supernatant solution turns the pH paper yellowish-orange. Which of the following would change the colour of this pH paper to greenish-blue?
(a) Lemon Juice
(b) Vinegar
(c) Common salt
(d) An antacid

Sol : www.cbse.site/sc/bm111

12. Which of the following gives the correct increasing order of acidic strength?
(a) Water < Acetic < Hydrochloric
(b) Water < Hydrochloric < Acetic
(c) Acetic < Water < Hydrochloric
(d) Hydrochloric < Water < Acetic

Sol : www.cbse.site/sc/bm112

13. If a few drops of a concentrated acid accidentally spills over the hand of a student, what should be done?
(a) Wash the hand with saline solution.
(b) Wash the hand immediately with plenty of water and apply a paste of sodium hydrogen carbonate.
(c) After washing with plenty of water apply solution of sodium hydroxide on the hand.
(d) Neutralize the acid with a strong alkali.

Sol : www.cbse.site/sc/bm113

14. Sodium hydrogen carbonate when added to acetic acid evolves a gas. Which of the following statements are true about the gas evolved?
1. It turns lime water milky.
2. It extinguishes a burnings splinter.
3. it dissolves in a solution of sodium hydroxide.
4. It has a pungent odour.

(a) 1 and 2
(b) 1, 2 and 3
(c) 2, 3 and 4
(d) 1 and 4

Sol : www.cbse.site/sc/bm114

15. Common salt besides being used in kitchen can also be used as the raw material for making
1. washing soda

2. bleaching powder
3. baking soda
4. slaked lime

(a) 1 and 2
(b) 1, 2 and 4
(c) 1 and 3
(d) 1, 3 and 4

Sol : www.cbse.site/sc/bm115

16. One of the constituents of baking powder is sodium hydrogen carbonate, the other constituent is
(a) hydrochloric acid
(b) tartaric acid
(c) acetic acid
(d) sulphuric acid

Sol : www.cbse.site/sc/bm116

17. To protect tooth decay we are advised to brush our teeth regularly. The nature of the toothpaste commonly used is
(a) acidic
(b) neutral
(c) basic
(d) corrosive

Sol : www.cbse.site/sc/bm117

18. Which of the following statements is correct about an aqueous solution of an acid and of base?
1. Higher the pH, stronger the acid
2. Higher the pH, weaker the acid
3. Lower the pH, stronger the base
4. Lower the pH, weaker the base

(a) 1 and 3
(b) 2 and 3
(c) 1 and 4
(d) 2 and 4

Sol : www.cbse.site/sc/bm118

19. The pH of the gastric juices released during digestion is
(a) less than 7
(b) more than 7
(c) equal to 7
(d) equal to 0

Sol : www.cbse.site/sc/bm119

20. Which of the following phenomena occur, when a small amount of acid is added to water?
1. Ionization
2. Neutralization
3. Dilution
4. Salt formation

(a) 1 and 2
(b) 1 and 3
(c) 2 and 3
(d) 2 and 4

Sol : www.cbse.site/sc/bm120

21. Which one of the following can be used as an acid-base indicator by a visually impaired student?
(a) Litmus
(b) Turmeric
(c) Vanilla essence
(d) Petunia leaves

Sol : www.cbse.site/sc/bm121

22. Which of the following substances will not give carbon dioxide on treatment with dilute acid?
(a) Marble
(b) Limestone
(c) Baking soda

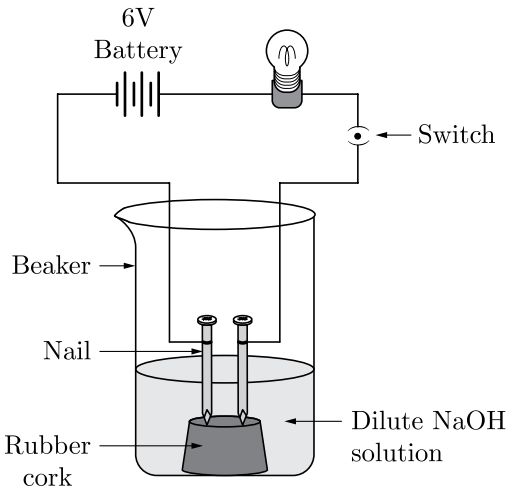
(d) Lime

Sol : www.cbse.site/sc/bm122

23. Which of the following is acidic in nature?
(a) Lime juice
(b) Human blood
(c) Lime water
(d) Antacid

Sol : www.cbse.site/sc/bm123

24. In an attempt to demonstrate electrical conductivity through an electrolyte, the following apparatus (figure) was set up.



Which among the following statement (s) is (are) correct?
1. Bulb will not glow because electrolyte is not acidic.
2. Bulb will glow because NaOH is a strong base and furnishes ions for conduction.
3. Bulb will not glow because circuit is incomplete.
4. Bulb will not glow because it depends upon the type of electrolytic solution.

(a) 1 and 3
(b) 2 and 4
(c) Only 2
(d) Only 4

Sol : www.cbse.site/sc/bm124

25. Which of the following is used for dissolution of gold?
(a) Hydrochloric acid
(b) Sulphuric acid
(c) Nitric acid
(d) Aqua regia

Sol : www.cbse.site/sc/bm125

26. Which of the following is not a mineral acid?
(a) Hydrochloric acid
(b) Citric acid
(c) Sulphuric acid
(d) Nitric acid

Sol : www.cbse.site/sc/bm126

27. Which among the following is not a base?
(a) NaOH
(b) KOH
(c) NH_4OH
(d) C_2H_5OH

Sol : www.cbse.site/sc/bm127

28. Which of the following statements is not correct?
(a) All metal carbonates react with acid to give a salt, water and carbon dioxide.
(b) All metal oxides react with water to give salt and acid.
(c) Some metals react with acids to give salt and hydrogen.
(d) Some non-metal oxides react with water to form acid.

Sol : www.cbse.site/sc/bm128

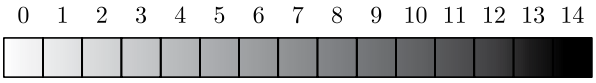
29. Match the chemical substances given in column (A) with their appropriate application given in column (B)

	Column (A)		**Column (B)**
A.	Bleaching powder	(i)	Preparation of glass
B.	Baking soda	(ii)	Production of H_2 and Cl_2
C.	Washing soda	(iii)	Decolorization
D.	Sodium chloride	(iv)	Antacid

(a) A- (ii), B- (i), C- (iv), D- (iii)
(b) A- (iii), B- (ii), C- (iv), D- (i)
(c) A- (iii), B- (iv), C- (i), D- (ii)
(d) A- (ii), B- (iv), C- (i), D- (iii)

Sol : www.cbse.site/sc/bm129

30. Equal volumes of hydrochloric acid and sodium hydroxide solutions of same concentration are mixed and the pH of the resulting solution is checked with a pH paper. What would be the colour obtained?



(a) Red
(b) Yellow
(c) Yellowish green
(d) Blue

Sol : www.cbse.site/sc/bm130

31. Which of the following is (are) true when HCl(g) is passed through water?
1. It does not ionise in the solution as it is a covalent compound.
2. It ionizes in the solution.
3. It gives both hydrogen and hydroxyl ion in the solution.
4. It forms hydronium ion in the solution due to the combination of hydrogen ion with water molecule.

(a) Only 1
(b) Only 3
(c) 2 and 4
(d) 3 and 4

Sol : www.cbse.site/sc/bm131

32. Which of the following statements is true for acids?
(a) Bitter and change red litmus to blue
(b) Sour and change red litmus to blue
(c) Sour and change blue litmus to red
(d) Bitter and change blue litmus to red

Sol : www.cbse.site/sc/bm132

33. Which of the following are present in a dilute aqueous solution of hydrochloric acid?
(a) $H_3O^+ + Cl^-$
(b) $H_3O^+ + OH^-$
(c) $Cl^- + OH^-$
(d) Unionized HCl

Sol : www.cbse.site/sc/bm133

34. Identify the correct representation of reaction occurring during chlor-alkali process.
(a) $2NaCl_{(l)} + 2H_2O_{(l)} \rightarrow 2NaOH_{(l)} + Cl_{2(g)} + H_{2(g)}$
(b) $2NaCl_{(aq)} + 2H_2O_{(aq)} \rightarrow 2NaOH_{(aq)} + Cl_{2(g)} + H_{2(g)}$
(c) $2NaCl_{(aq)} + 2H_2O_{(l)} \rightarrow 2NaOH_{(aq)} + Cl_{2(aq)} + H_{2(aq)}$
(d) $2NaCl_{(aq)} + 2H_2O_{(l)} \rightarrow 2NaOH_{(aq)} + Cl_{2(g)} + H_{2(g)}$

Sol : www.cbse.site/sc/bm134

35. Which of the following statements is/are correct for litmus?
1. Litmus solution is a purple dye.
2. It is extracted from lichen.
3. In neutral solution. it remains colourless.

(a) 1 and 2
(b) 2 and 3
(c) 1 and 3
(d) 1, 2 and 3

Sol : www.cbse.site/sc/bm135

36. Which of the following is/are correct for olfactory indicators?
1. Their colour changes with acid or base.
2. Onion, vanilla or clove are examples.

(a) Only 1
(b) Only 2
(c) Both 1 and 2
(d) Neither 1 nor 2

Sol : www.cbse.site/sc/bm136

37. Which of the following are correctly matched?

1.	Acid + salt	metal + hydrogen
2.	Acid + metal carbonate	salt + carbon dioxide + water
3.	Metal oxide + acid	salt + water

(a) 1 and 2
(b) 2 and 3
(c) 1 and 3
(d) 1, 2 and 3

Sol : www.cbse.site/sc/bm137

38. Which of the following is/are correct for diluting acid?
1. Adding acid to water by stirring.
2. Adding water to acid by stirring.

(a) Only 1
(b) Only 2
(c) Both 1 and 2
(d) Neither 1 nor 2

Sol : www.cbse.site/sc/bm138

39. Which of the following is/are correct for pH?
1. A scale for measuring hydronium ion concentration.
2. Values less than 7 on the pH scale represent an acidic solution.
3. As the pH value increases from 7 to 14, it represents an increase in hydrogen ion concentration in the solution.

(a) Only 1
(b) Only 2
(c) Only 3
(d) 1, 2 and 3

Sol : www.cbse.site/sc/bm139

40. Which of the following are correctly matched?

1.	Plants and animals	pH range is 7.0 to 7.8
2.	Rain water	pH is 7.6
3.	Tooth decay	pH less than 5.5

(a) 1 and 2
(b) 2 and 3
(c) 1 and 3
(d) 1, 2 and 3

Sol : www.cbse.site/sc/bm140

41. Which of the following are correctly

matched?

1.	Common salt	formed by sodium hydroxide and hydrochloric acid.
2.	Brine	aqueous solution of sodium chloride.
3.	Chlor-alkali process	formation of sodium chloride

(a) 1 and 2
(b) 2 and 3
(c) 1 and 3
(d) 1, 2 and 3

Sol : www.cbse.site/sc/bm141

42. Which of the following are correctly matched?

1.	Bleaching powder	oxidising agent in chemical industries.
2.	Baking powder	a mixture of sodium hydrogen carbonate and a mild edible acid.
3.	Washing soda	remove permanent hardness of water.

(a) 1 and 2
(b) 2 and 3
(c) 1 and 3
(d) 1, 2 and 3

Sol : www.cbse.site/sc/bm142

43. The chemical formula of plaster of paris is
(a) $CaSO_4 \cdot \frac{1}{2}H_2O$
(b) $CaSO_3 \cdot \frac{1}{2}H_2O$
(c) $Ca \cdot SO_4\frac{1}{2}O_2$
(d) $SO_4 \cdot \frac{1}{2}H_2O$

Sol : www.cbse.site/sc/bm143

44. Which of the following are responsible for causing acid-rain?
(a) Oxides of sulphur and carbon dioxide
(b) Oxides of nitrogen and carbon monoxide
(c) Hydrogen sulphide and carbon dioxide
(d) Oxides of sulphur and nitrogen

Sol : www.cbse.site/sc/bm144

45. On washing with soap, a turmeric stain on the cloth turns to red because
1. Soap solution is alkaline.
2. Soap solution is acidic.
3. Turmeric contains a natural indicator.
4. Turmeric contains litmus.

Select the correct alternative.
(a) 1 and 3
(b) 2 and 4
(c) 3 and 2
(d) 1 and 4

Sol : www.cbse.site/sc/bm145

46. Which of the following are used as an antacid to reduce acidity in stomach?
(a) Sodium carbonate and magnesium hydroxide
(b) Magnesium hydroxide and sodium hydroxide
(c) Sodium bicarbonate and calcium hydroxide
(d) Sodium bicarbonate and magnesium hydroxide

Sol : www.cbse.site/sc/bm146

47. A highly reactive element (X) reacts with oxygen of air even at room temperature to give an oxide (Y). The oxide (Y) is soluble in water. The aqueous solution of (Y) does not change the colour of red litmus solution but reacts with an aqueous solution of

sodium hydroxide. Here X is-
(a) sodium
(b) phosphorus
(c) carbon
(d) sulphur

Sol : www.cbse.site/sc/bm147

48. Some of the substances used in making of a modern safety match box are listed below :
1. Antimony trisulfide
2. Glass powder
3. Potassium chlorate
4. Red phosphorus

The head of modern safety match stick contains :
(a) 1 and 4
(b) 2 and 3
(c) 3 and 4
(d) 3 and 1

Sol : www.cbse.site/sc/bm148

49. Calamine is used to reduce the irritating effect of ant bite/sting because it reacts with (X) released due to the bite/sting of ants with (Y) present in calamine. Then (X) and (Y) respectively are :
(a) Sodium hydrogen carbonate and formic acid
(b) Formic acid and zinc carbonate
(c) Acetic acid and common salt
(d) Hydrochloric acid and zinc oxide

Sol : www.cbse.site/sc/bm149

50. A metal carbonate X on treatment with a mineral acid liberates a gas which when passed through an aqueous solution of a substance Y on reaction with the gas obtained at anode during electrolysis of brine gives a compound Z which can decolourise coloured fabrics. The compounds X, Y and Z respectively are
(a) $CaCO_3$, $Ca(OH)_2$, $CaOCl_2$
(b) $Ca(OH)_2$, CaO, $CaOCl_2$
(c) $CaCO_3$, $CaOCl_2$, $Ca(OH)_2$
(d) $Ca(OH)_2$, $CaCO_3$, $CaOCl_2$

Sol : www.cbse.site/sc/bm150

51. A salt can be produced by reaction between
1. a weak acid and weak base.
2. metal oxide and water.
3. metal and a mineral acid.
4. metal oxide and a mineral acid.

(a) 1, 2 and 3
(b) 2, 3 and 4
(c) 3, 4 and 1
(d) 4, 1 and 2

Sol : www.cbse.site/sc/bm151

52. Which of the following is true about the two statements?
Statement I : Reactivity of aluminium decreases when it is dipped in nitric acid
Statement II : A protective layer of aluminium nitrate is formed when aluminium is dipped in nitric acid.
(a) I is correct but II is incorrect
(b) I is incorrect but II is correct
(c) Both the statements are correct and II is also the correct explanation of I
(d) Both the statements are correct but II is not correct explanation of I

Sol : www.cbse.site/sc/bm152

53. A silvery white metal X reacts with water at room temperature to produce a water soluble compound Y and a colourless gas Z. The reaction is highly exothermic and the Z catches fire immediately during the reaction. The solution of Y in water on reacting with stoichiometric amount of

dilute solution of hydrochloric acid gives a solution of pH = 7.0. The compounds X, Y and Z respectively are-

(a) Al, $Al(OH)_3$ and H_2

(b) Ag, AgOH and H_2

(c) K, KCl and H_2

(d) Na, NaOH and H_2

Sol : www.cbse.site/sc/bm153

54. Match the items of Column I with the items of the Column II

	Column I		**Column II**
(i)	$NH_4OH + CH_3COOH \rightarrow CH_3COONH_4 + H_2O$	(A)	Thermal decomposition
(ii)	$2AgBr \rightarrow 2Ag + Br_2$	(B)	Thermite reaction
(iii)	$ZnCO_3 \rightarrow ZnO + CO_2$	(C)	Photochemical reaction
(iv)	$2Al + Fe_2O_3 \rightarrow 2Fe + Al_2O_3$	(D)	Neutralization reaction

(a) (iv)-(B), (iii)-(D), (ii)-(A), (i)-(C)

(b) (iii)-(A), (i)-(B), (iii)-(C), (iv)-(D)

(c) (ii)-(B), (iv)-(A), (i)-(C), (iii)-(D)

(d) (i)-(D), (ii)-(C), (iii)-(A), (iv)-(B)

Sol : www.cbse.site/sc/bm154

55. Which of the following represents the correct order of the acidic strength for equimolar aqueous solutions of HCl, H_2SO_4, NH_4OH and NaOH

(a) $HCl < NH_4OH < NaOH < H_2SO_4$

(b) $NH_4OH < NaOH < H_2SO_4 < HCl$

(c) $HCl < H_2SO_4 < NH_4OH < NaOH$

(d) $NaOH < NH_4OH < HCl < H_2SO_4$

Sol : www.cbse.site/sc/bm155

56. P substance a react with another substance Q to produce the product R and a gas S. If a mixture of the gas S. and ammonia is passed through an aqueous solution of R, baking soda is formed. The substances P and Q are

(a) HCl and NaOH

(b) HCl and Na_2CO_3

(c) Na and HCl

(d) Na_2CO_3 and H_2O

Sol : www.cbse.site/sc/bm156

57. The reaction that differs from the rest of the reaction given is-

(a) formation of calcium oxide from limestone

(b) formation of aluminium from aluminium oxide

(c) formation of sodium carbonate from sodium hydrogen carbonate

(d) formation of mercury from mercuric oxide

Sol : www.cbse.site/sc/bm157

58. An element X reacts with dilute H_2SO_4 as well as with NaOH to produce salt and $H_2(g)$. Hence, it may be concluded that :

1. X is an electro-positive element.
2. oxide of X is basic in nature.
3. oxide of X is acidic in nature.
4. X is an electronegative element.

(a) 1, 2, 3

(b) 4, 1, 2

(c) 3, 4, 1

(d) 2, 3, 4

Sol : www.cbse.site/sc/bm158

59. The turmeric solution will turn red by an aqueous solution of-

(a) potassium acetate

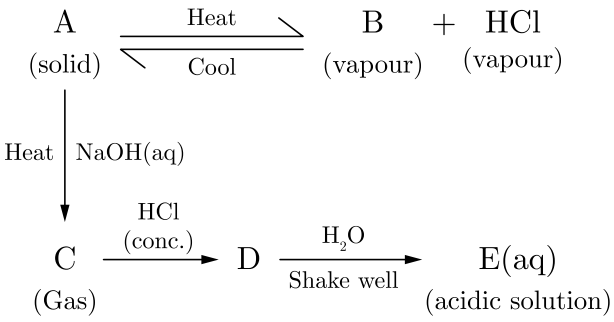
(b) copper sulphate

(c) sodium sulphate

(d) ferric chloride

Sol : www.cbse.site/sc/bm159

60. The schematic diagram is given below :



Which of the following is an incorrect statement?

(a) A and E are chemically same.

(b) A and D are chemically same.

(c) D and E are chemically same.

(d) C and E are chemically same.

Sol : www.cbse.site/sc/bm160

61. When an acid reacts with a metal than X gas is liberated. Here X is-

(a) Ammonia gas

(b) Hydrogen gas

(c) Carbon dioxide gas

(d) Methane gas

Sol : www.cbse.site/sc/bm161

62. Which of the following is not true for acids?

(a) Acid react with copper (II) oxide to produce a blue solution.

(b) Acid liberate carbon dioxide gas when reacted with sodium carbon-ale

(c) Acid liberate hydrogen gas when reacted with magnesium ribbon.

(d) Acid produces hydrogen molecules when dissolved in water.

Sol : www.cbse.site/sc/bm162

63. Which of the following statement is incorrect for acids?

(a) They give pink colour with phenolphthalein.

(b) They give H^+ ions in water.

(c) They are sow in taste.

(d) They turn blue litmus red.

Sol : www.cbse.site/sc/bm163

64. Which two substances react to give salt and water only?

(a) Copper (II) oxide and ethanoic acid

(b) Magnesium and sulphuric acid

(c) Sodium oxide and water

(d) Zinc carbonate and hydrochloric acid

Sol : www.cbse.site/sc/bm164

65. A solution in test tube 'A' turns red litmus blue, evolves hydrogen gas on reaction with zinc and does not react with sodium carbonate. Whereas, solution in test tube 'B' turns blue litmus red, liberates hydrogen gas on reaction with zinc and evolves carbon dioxide gas with sodium carbonate. Identify 'A' and 'B'.

(a) 'A' is an acid, 'B' is a base.

(b) 'A' is a base, 'B' is an acid.

(c) Both 'A' and 'B' are bases.

(d) Both 'A' and 'B' are acids.

Sol : www.cbse.site/sc/bm165

66. Which of the following will turn red litmus to blue?

(a) Vinegar

(b) Banking soda solution

(c) Soft drink

(d) Lemon juice

Sol : www.cbse.site/sc/bm166

67. Which gas is evolved when acids react with metal carbonates?

(a) H_2

(b) CO_2

(c) O_2

(d) NH_3

Sol : www.cbse.site/sc/bm167

68. The colour of the pH paper turned red when it was dipped in X solution. The X is-

(a) Dilute Hydrochloric acid.

(b) Dilute sodium hydroxide solution.

(c) Tap water

(d) Dilute sodium bicarbonate solution.

Sol : www.cbse.site/sc/bm168

69. Which of the following is not a base?

(a) NaCl

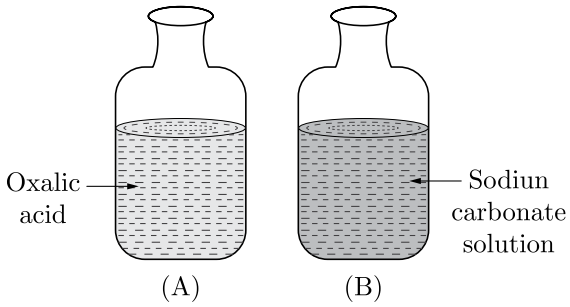
(b) KOH

(c) ZnO

(d) $Al(OH)_3$

Sol : www.cbse.site/sc/bm169

70. When pH strip is dipped in each bottle, the colour shown by bottle A and B will be respectively:



(a) orange, blue

(b) blue, orange

(c) green, blue

(d) blue, green

Sol : www.cbse.site/sc/bm170

71. $2NaOH + Zn \longrightarrow X + H_2$

Here X is

(a) Na_2ZnO_2

(b) $NaZnO_2$

(c) Na_2ZnO

(d) Na_3ZnO_2

Sol : www.cbse.site/sc/bm171

72. Which of the following solutions has the lowers pH value?

(a) 0.1 molar NaCl solution

(b) 0.01 molar $NaHCO_3$ solution

(c) 0.001 molar Na2CO_3 solution

(d) 0.01 molar NaOH solution

Sol : www.cbse.site/sc/bm172

73. On putting a few drops of X liquid on the pH paper the colour of pH paper changes to violet. The liquid X is

(a) Dilute sodium hydroxide

(b) Dilute hydrochloric acid
(c) Dilute acetic acid
(d) Water

Sol : www.cbse.site/sc/bm173

74. The term pH stands for:
(a) potential of hydrogen
(b) peak of hydrogen
(c) push of hydrogen
(d) pointed to hydrogen

Sol : www.cbse.site/sc/bm174

75. pH of different solution are given in the table below.

Solution	**pH**
A	2.4
B	14.0
C	7.5
D	9.0

Arrange the above solution in the increasing order of OH^- ion concentration.
(a) D < C < B < A
(b) A < C < D < B
(c) C < D < B < A
(d) B < D < C < A

Sol : www.cbse.site/sc/bm175

76. Which of the following is more acidic in nature?
(a) Baking soda
(b) Lime water
(c) Lemon
(d) Apple

Sol : www.cbse.site/sc/bm176

77. Which one of following property of base is incorrect?
(a) Bases are bitter to taste.
(b) Bases are soapy and slippery to touch.
(c) Bases are not a good conductor of electricity.
(d) None of these.

Sol : www.cbse.site/sc/bm177

78. On diluting a solution of pH = 4.5 it pH will
(a) increases
(b) decreases
(c) remain same
(d) firstly increases than decreases

Sol : www.cbse.site/sc/bm178

79. In an experiment of pH paper four students takes the following observation?

Student	Sample	pH paper colour
A	Water	Blue
B	Dilute HCl	Red
C	Dilute NaOH	Blue
D	Dilute Ethanoic acid	Orange

Which student takes the incorrect observation?
(a) B
(b) C
(c) D
(d) A

Sol : www.cbse.site/sc/bm179

80. Which of the following acid is present in the vinegar?
(a) Acetic acid
(b) Tartaric acid

(c) Lactic acid
(d) Citric acid

Sol : www.cbse.site/sc/bm180

81. Which of the following is not a acid?
(a) KOH
(b) HNO_3
(c) HCl
(d) H_2SO_4

Sol : www.cbse.site/sc/bm181

82. Which of the following is the synthetic indicator?
(a) Methyl orange
(b) Phenolphthalein
(c) China rose
(d) Both (a) and (b)

Sol : www.cbse.site/sc/bm182

83. ..... indicator odour changes in acidic or basic media.
(a) Methyl orange
(b) Phenolphthalein
(c) Olfactory
(d) Ozonal

Sol : www.cbse.site/sc/bm183

84. Which of the following substance have maximum value of pH?
(a) Lemon
(b) Rain water
(c) Sea water
(d) Apple

Sol : www.cbse.site/sc/bm184

85. Consider the following table :

Substance	**pH**
Lemon	2.3
Battery acid	x
Sea water	8.5
Apple	3.1

The value of x in above table is:
(a) 0
(b) 1.3
(c) 2.5
(d) 1.9

Sol : www.cbse.site/sc/bm185

86. Which of the following pair is incorrect?

	Substance	**pH**
(a)	Hydrochloric acid	1.0
(b)	Vinegar	2.8
(c)	Lime water	11
(d)	Stomach acid	1

Sol : www.cbse.site/sc/bm186

87. Which compound is formed due to the reaction of acid on metal oxides?
(a) Oxygen
(b) Nitrogen
(c) Salt
(d) Ammonia

Sol : www.cbse.site/sc/bm187

88. $2NaCl + (dil)\,H_2SO_4 \longrightarrow Na_2SO_4 + Y$
Here Y is.
(a) Cl_2
(b) H_2
(c) 2HCl
(d) SO_2

Sol : www.cbse.site/sc/bm188

89. The chemical name of bleaching powder is:
(a) Calcium oxychloride
(b) Calcium chloride
(c) Calcium carbonate
(d) Calcium sulfate

Sol : www.cbse.site/sc/bm189

90. ..... is obtained by heating of gypsum.
(a) Bleaching powder
(b) Plaster of paris
(c) Banking soda
(d) Sodium hydroxide

Sol : www.cbse.site/sc/bm190

91. ..... is obtained by passing Cl_2 over dry slaked lime.
(a) Plaster of paris
(b) Bleaching powder
(c) Banking soda
(d) Washing soda

Sol : www.cbse.site/sc/bm191

92. Washing soda is obtained from ..... carbonate.
(a) Calcium
(b) Sodium
(c) Magnesium
(d) Zinc

Sol : www.cbse.site/sc/bm192

93. Read the following statements:
I. When a red litmus paper is dipped into the reaction mixture of a saponification reaction, it turns blue and the reaction is exothermic.
II. When a blue litmus paper is dipped into the reaction mixture of a saponification reaction, its colour does not change and the reaction is exothermic.
III. When a red litmus paper is dipped into the reaction mixture of a saponification reaction, its colour does not change and the reaction is endothermic.
IV. When a blue litmus paper is dipped into the reaction mixture of a saponification reaction, its colour does not change and the reaction is endothermic.
Which of the above statements are correct?
(a) I and II
(b) II and III
(c) III and IV
(d) I and IV

Sol : www.cbse.site/sc/bm193

94. A student prepared 20% sodium hydroxide solution in a beaker containing water. The observations noted by him are given below.
I. Sodium hydroxide is in the form of pellets.
II. It dissolves in water readily.
III. The beaker appears cold when touched from outside.
IV. Red litmus paper turns blue when dipped into the solution.
The correct observations are:
(a) I, II and III
(b) II, III and IV
(c) III, IV and I
(d) I, II and IV

Sol : www.cbse.site/sc/bm194

95. Hard water required for an experiment is not available in a school laboratory. However, following salts are available in the laboratory. Select the salts which may be dissolved in water to make it hard for

the experiment.
1. Calcium Sulphate
2. Sodium Sulphate
3. Calcium Chloride
4. Potassium Sulphate
5. Sodium Hydrogen Carbonate
6. Magnesium Chloride

(a) 1, 2 and 4
(b) 1, 3 and 6
(c) 3, 5 and 6
(d) 2, 4 and 5

Sol : www.cbse.site/sc/bm195

96. In an experiment to study the properties of acetic acid, a student takes about 2 ml of acetic acid in a dry test tube. He adds about 2 ml of water to it and shakes the test tube well. What will he observe ?
(a) The acetic acid dissolves readily in water.
(b) The solution becomes light orange.
(c) Water floats over the surface of acetic acid.
(d) Acetic acid floats over the surface of water.

Sol : www.cbse.site/sc/bm196

97. A student takes 2 ml acetic acid in a dry test tube and adds a pinch of sodium hydrogen carbonate to it. He makes the following observations:
I. A colourless and odourless gas evolves with a brisk effervescence.
II. The gas turns lime water milky when passed through it.
III. The gas burns with an explosion when a burning splinter is brought near it.
IV. The gas extinguishes the burning splinter which is brough near it.
The correct observations are:
(a) I, II and III
(b) II, III and IV
(c) III, IV and I
(d) IV, I and II

Sol : www.cbse.site/sc/bm197

98. We need 20% aqueous solution of sodium hydroxide for the study of saponification reaction. When we open the lid of the bottle containing solid sodium hydroxide we observe it in which form?
(a) Colourless transparent beads
(b) Small white beads
(c) White pellets/flakes
(d) Fine white powder

Sol : www.cbse.site/sc/bm198

99. In a locality, hard water, required for an experiment, is not available. However, the following salts are available in the school laboratory:
1. Sodium sulphate
2. Calcium sulphate
3. Magnesium chloride
4. Sodium chloride
5. Calcium chloride
6. Potassium sulphate

Which of the above may be dissolved in water to obtain hard water for the experiment?
(a) 2, 3 and 5
(b) 1, 2 and 5
(c) 1, 2, 4 and 6
(d) 3 and 5 only

Sol : www.cbse.site/sc/bm199

100. What do we observe on pouring acetic acid on red and blue litmuts papers?
(a) Red litmus remains red and blue litmus turns red.
(b) Red litmus turns blue and blue litmus remains blue.

(c) Red litmus turns blue and blue litmus turns red.
(d) Red litmus becomes colourless and blue litmus remains blue.

Sol : www.cbse.site/sc/bm200

101. A student takes about 6 ml of distilled water in each of the four test tubes A, B, C and D, then dissolves in equal amount four different salts name sodium chloride in A Potassium Chloride in B, Calcium Chloride in C and magnesium chloride in D. He then adds 10 drop of soap solution to each test tube and shakes its contents. The test tube(s) in which he would observe a good amount of lather is:
(a) A and B
(b) Only A
(c) C and D
(d) Only B

Sol : www.cbse.site/sc/bm201

102. Hard water is not available for an experiment in the school and its vicinity. However, some salts as given below are available in the school laboratory.
1. Sodium Chloride
2. Sodium Sulphate
3. Calcium Chloride
4. Calcium Sulphate
5. Potassium Chloride
6. Magnesium Sulphate

Select form the following a group of these salts, each member of which may be dissolved in water to make it hard.
(a) 1, 2, 5
(b) 1, 3, 5
(c) 3, 4, 6
(d) 2, 4, 6

Sol : www.cbse.site/sc/bm202

103. The pH of soft drink is ..... and they are ..... .
(a) less than 7, acidic
(b) more than 7, basic
(c) equal to 7, neutral
(d) less than 7, basic

Sol : www.cbse.site/sc/bm203

104. When acidified potassium dichromate solution is added to a jar containing sulphur dioxide gas, the solution becomes:
(a) colourless
(b) brown
(c) dark orange
(d) green

Sol : www.cbse.site/sc/bm204

105. When you add a few drops of acetic acid to a test-tube containing sodium bicarbonate powder, which one of the following is your observation?
(a) No reaction takes place.
(b) A colourless gas with pungent smell is released with brisk effervescence.
(c) A brown coloured gas is released with brisk effervescence.
(d) Formation of bubbles of a colourless and odourless gas.

Sol : www.cbse.site/sc/bm205

106. A student require hard water for an experiment in his laboratory which is not available in the neighbouring area. In the laboratory there are some salts, which when dissolved in distilled water can convert it into hard water. Select from the following groups of salts, a group, each salt of which when dissolved in distilled water will make it hard.
(a) Sodium chloride, Potassium chloride

(b) Sodium sulphate, Potassium sulphate
(c) Sodium sulphate, Calcium sulphate
(d) Calcium sulphate, Calcium chloride

Sol : www.cbse.site/sc/bm206

107. To a sample of turmeric adulterated with metanil yellow, concentrated hydrochloric acid was added. The colour of the reaction mixture
(a) became green
(b) became blue
(c) remained the same
(d) disappeared

Sol : www.cbse.site/sc/bm207

108. Which one of the following is used in manufacturing of ammonia?
(a) Washing soda
(b) Bleaching powder
(c) Plaster of paris
(d) Hydrogen gas

Sol : www.cbse.site/sc/bm208

109. Which of the following acid present in curd?
(a) Acetic acid
(b) Citric acid
(c) Oxalic acid
(d) Lactic acid

Sol : www.cbse.site/sc/bm209

110. Metal carbonate + acid → salt + Y + water
Here Y is:
(a) carbon dioxide
(b) carbon monoxide
(c) carbon chloride
(d) metal oxide

Sol : www.cbse.site/sc/bm210

111. When acid and base is mixed together than which of the following is formed?
(a) Salt
(b) Base
(c) Acid
(d) Hydrogen

Sol : www.cbse.site/sc/bm211

112. Mixing of an acid or base with water is known as ..... .
(a) dilution
(b) neutralisation
(c) indicators
(d) offertory inductors

Sol : www.cbse.site/sc/bm212

113. Which one of the following is used for bleaching cotton and linen in textile industry?
(a) Caustic soda
(b) Bleaching powder
(c) Baking soda
(d) Washing soda

Sol : www.cbse.site/sc/bm213

114. When electricity is passed through an aqueous solution of sodium chloride than ..... is formed.
(a) Sodium hydroxide
(b) Sodium sulphate
(c) Sodium chloride
(d) Sodium bicarbonate

Sol : www.cbse.site/sc/bm214

115. When a few drops of liquid X were added to distilled water. It was observed that the pH of water decreased. The liquid sample

X is:
(a) acid
(b) base
(c) salt
(d) mixture of salt and acid

Sol : www.cbse.site/sc/bm215

116. Which of following solution have a higher concentration of H^+ ions?
(a) 1 M HCl solution
(b) 1 M CH_3COOH solution
(c) 0.5 M CH_3COOH solution
(d) None of these

Sol : www.cbse.site/sc/bm216

117. Arrange the following in the increasing order of pH values.
A. NaOH solution
B. Blood
C. Lemon juice
D. Milk of magnesia
(a) C < B < D < A
(b) A < B < C < D
(c) D < C < B < A
(d) A < B < D < C

Sol : www.cbse.site/sc/bm217

118. Which of following tablets are used by a person suffering from acidity?
(a) Antacid
(b) Antabuse
(c) Antasalt
(d) None of these

Sol : www.cbse.site/sc/bm218

119. When 2 mL of sodium hydioxide solution is added to a few pieces of granulated zinc metal taken in test tube. When the contents are warmed, a gas evolves which is bubbled through a soap solution before testing.
The name of the gas is:
(a) Hydrogen
(b) Oxygen
(c) Nitrogen
(d) Helium

Sol : www.cbse.site/sc/bm219

120. A student take a small amount of copper oxide in a beaker and dilute hydrochloric acid slowly while stirring.
Which of the following product is formed in above process?
(a) $CuCl_2$
(b) CuCa
(c) $CuMg_2$
(d) CuCOH

Sol : www.cbse.site/sc/bm220

121. Which of the following property is incorrect for acid?
(a) Acid have sour taste.
(b) Acid are corrosive to metals.
(c) Acid change red litmus paper to blue.
(d) Acid become less acidic on mixing with bases.

Sol : www.cbse.site/sc/bm221

122. Which of the following pair is incorrect?

	Acid	**Source**
(a)	Ascorbic acid	All citrus fruits
(b)	Malic acid	Pears
(c)	Formic acid	Ant stings
(d)	Acetic acid	Milk

Sol : www.cbse.site/sc/bm222

123. Which of the following is the organic acids?
(a) HCl
(b) HNO_3
(c) H_2SO_4
(d) CH_3COOH

Sol : www.cbse.site/sc/bm223

124. Arrange the following acids on their basicity in the table:
A = HCl, B = HNO_3, C = H_3PO_4

	Type of acid	Acid
1.	Monobasic	
2.	Dibasic	
3.	Tribasic	

(a) 1-A, 2-B, 3-C
(b) 1-C, 2-B, 3-A
(c) 1-A, 2-C, 3-B
(d) 1-B, 2-C, 3-A

Sol : www.cbse.site/sc/bm224

125. ..... is used in bathing soaps.
(a) Sodium hydroxide
(b) Potassium hydroxide
(c) Magnesium hydroxide
(d) Ammonium hydroxide

Sol : www.cbse.site/sc/bm225

126. Which of following in not a natural indicator?
(a) Red cabbage
(b) China rose
(c) Turmeric
(d) Onion

Sol : www.cbse.site/sc/bm226

127. An acid produces ..... ions in water.
(a) Hydrogen
(b) Helium
(c) OH^-
(d) None of these

Sol : www.cbse.site/sc/bm227

128. Which of the following is the strong acid?
(a) CH_3COOH
(b) HCN
(c) HBr
(d) HF

Sol : www.cbse.site/sc/bm228

129. Which of the following pair is not correct?

	Acid	**Example**
(a)	Monobasic acid	HNO_3
(b)	Dibasic acid	H_3PO_3
(c)	Tribasic acid	H_3PO_4
(d)	Monobasic acid	H_2SO_4

Sol : www.cbse.site/sc/bm229

130. ..... acid is used in car battery.
(a) Nitric
(b) Sulpharic
(c) Carbonic
(d) Tartaric

Sol : www.cbse.site/sc/bm230

131. A body wanted to remove the grease strain from our shirt. So he used a X solution. Here X solution is:
(a) Ammonium hydroxide
(b) Magnesium hydroxide
(c) Calcium hydroxide
(d) Sodium hydroxide

Sol : www.cbse.site/sc/bm231

132. Which of the following is the correct for dilution of acid and base?
(a) Acid or base added to water.
(b) Water is added to acid or base.
(c) Water is added drop by drop to acid or base.
(d) Water cannot be added in acid or base.

Sol : www.cbse.site/sc/bm232

133. The acidic solution is the one in which the concentration of ..... is grater than that of ..... ions.
(a) H^+, OH^-
(b) DH^-, H^+
(c) H_3O^+, H^+
(d) H^+, H_3O^+

Sol : www.cbse.site/sc/bm233

134. The hydrogen ion concentration of solution is 0.001 M. The pH of solution is?
(a) 3
(b) 2
(c) 1
(d) 1.5

Sol : www.cbse.site/sc/bm234

135. The hydrogen ion concentration of a solution is 1.0×10^{-9} M. The pH of the solution is:
(a) 10
(b) 9
(c) 11
(d) 8

Sol : www.cbse.site/sc/bm235

136. The hydroxyl ion concentration of a solution is 0.001 M. The pH of the solution is:
(a) 11
(b) 12
(c) 13
(d) 14

Sol : www.cbse.site/sc/bm236

137. The hydroxyl ion concentration of a solution is 1.0×10^{-9} M. The pH of the solution is:
(a) 4
(b) 5
(c) 6
(d) 7

Sol : www.cbse.site/sc/bm237

138. Which of the following statement is incorrect about acids?
(a) they change the colour of red litmus to blue
(b) they have sour taste
(c) they may change the colour of indicator
(d) they changes the colour or blue litmus to red

Sol : www.cbse.site/sc/bm238

139. When $Ca(OH)_2$ reacts with $CO_2(g)$, it will give $CaCO_3(s)$ and $H_2O(l)$. The nature of $CaCO_3$ is
(a) acidic
(b) basic
(c) neutral
(d) All are possible

Sol : www.cbse.site/sc/bm239

140. The correct statement regarding universal

indicator is
(a) it gives orange colour at pH = 3
(b) it becomes colourless at pH = 7
(c) it is an indicator having pH = 7
(d) it gives blue colour at pH = 3

Sol : www.cbse.site/sc/bm240

141. When NaOH and HCl are mixed in equal molar quantities, the result is
(a) the formation of salt $+H_2O$
(b) the formation of salt $+H_2(g)$
(c) the formation of salt $+O_2(g)$
(d) All above are correct

Sol : www.cbse.site/sc/bm241

142. Aqueous solution of copper sulphate reacts with aqueous ammonium hydroxide solution to give.
(a) green precipitate
(b) brown precipitate
(c) pale blue precipitate
(d) white precipitate

Sol : www.cbse.site/sc/bm242

143. The organic acid present in tomato is
(a) oxalic acid
(b) lactic acid
(c) malic acid
(d) tartaric acid

Sol : www.cbse.site/sc/bm243

144. You are having five solutions P, Q, R, S and T with pH values as follows:
$P = 1.8$, $Q = 7$, $R = 8.5$, $S = 8$ and $T = 5$
Which solution would be most likely to liberate hydrogen with magnesium powder?
(a) Solution P and Q
(b) Solution P
(c) Solution R
(d) All of the above

Sol : www.cbse.site/sc/bm244

145. The reagent used to distinguish iron (II) chloride and iron (III) chloride is
(a) Warm water
(b) distilled water
(c) NaOH
(d) dil. HCl

Sol : www.cbse.site/sc/bm245

146. An acid (P) with sodium hydrogen carbonate is used in making the cakes fluffy and spongy. It is due to the release of (Q) gas in the reaction. Here, P and Q are
(a) P : Tartaric acid : Q : CO_2
(b) P : Succinic acid : Q : H_2
(c) P : Tartaric acid : Q : O_2
(d) P : Oxalic acid : Q : CO_2

Sol : www.cbse.site/sc/bm246

147. The pH of a solution is 4.5. What should be the change in the hydrogen ion concentration of the solution, if its pH is to increased to 6.
(a) increases by 10 times
(b) doubled
(c) halved
(d) decreases to 1/10 of its original concentration

Sol : www.cbse.site/sc/bm247

148. The pH of a solution is 6. Its hydrogen ion concentration is decreased by 100 times, the solution will be :
(a) more acidic

(b) basic
(c) neutral
(d) unaffected

Sol : www.cbse.site/sc/bm248

149. Bleaching powder is soluble in cold water giving a milky solution due to-
(a) The absorption of carbon dioxide from atmosphere
(b) available chlorine
(c) lime present in it
(d) calcium carbonate formation

Sol : www.cbse.site/sc/bm249

150. A blue litmus paper was first dipped in dil. HCl and then in dil. NaOH solution. It was observed that the colour of the litmus paper-
(a) remains blue in both the solutions
(b) changed to red
(c) changed first to red and then to blue
(d) changed blue to colourless

Sol : www.cbse.site/sc/bm250

151. Bleaching powder gives smell of chlorine because it-
(a) contains excess of chlorine
(b) is a mixture of chlorine and slaked lime
(c) is unstable
(d) gives chlorine on exposure to atmosphere

Sol : www.cbse.site/sc/bm251

152. A solution reacts with crushed egg-shells to give a gas that turns lime-water milky. The solution contains
(a) KCl
(b) NaCl
(c) HCl
(d) LiCl

Sol : www.cbse.site/sc/bm252

153. **Assertion :** Olfactory indicators are those whose colour changes in acidic and basic medium.
Reason : They react with acidic and basic solutions.
(a) Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.
(c) Assertion is true but the Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/bm253

154. **Assertion :** Active metals react with acids to liberate Hydrogen gas.
Reason : It is an example of displacement reaction.
(a) Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.
(c) Assertion is true but the Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/bm254

155. **Assertion :** Acids contain H^+ ions.
Reason : H^+ ions neutralise acids.
(a) Both Assertion and Reason are true and Reason is the correct explanation

of the Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.

(c) Assertion is true but the Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/bm255

156. **Assertion :** The process of dissolving an acid or a base in water is a highly exothermic one.
Reason : A large amount of heat is produced.

(a) Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.

(c) Assertion is true but the Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/bm256

157. **Assertion :** On heating, colour of hydrated copper sulphate changes from blue to white.
Reason : Copper sulphate is a crystalline salt.

(a) Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.

(c) Assertion is true but the Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/bm257

158. **Assertion :** Plaster of Paris is obtained on heating gypsum at 373K.
Reason : On heating gypsum at 373K, it loses water molecules.

(a) Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.

(c) Assertion is true but the Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/bm258

159. **Assertion :** Salts of strong acids and weak bases are basic in nature.
Reason : pH value of such salt are mare than 7.

(a) Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.

(c) Assertion is true but the Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/bm259

160. **Assertion :** When acid rain flows into the river, it lowers the pH of the river water.
Reason : The survival of aquatic life in such river becomes difficult.

(a) Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.

(c) Assertion is true but the Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/bm260

161. **Assertion :** Limestone, chalk and marble react with acids to form salt, carbon dioxide and water.
Reason : Limestone, chalk and marble are different forms of calcium carbonate.
(a) Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.
(c) Assertion is true but the Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/bm261

162. **Assertion :** In a neutralisation reaction, metal and non-metal react to form salt.
Reason : Metal contains H^+ ions and non-metal OH^- ions.
(a) Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.
(c) Assertion is true but the Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/bm262

163. **Assertion :** Non-metallic oxides are acidic is nature.
Reason : Non-metallic oxides react with base to form salt and water just like an acid reacts with a base.
(a) Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion.
(c) Assertion is true but the Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/bm263

164. **Assertion :** HCl produces hydronium ions (H_3O^+) and chloride ions (Cl^-) in aqueous solution.
Reason : In presence of water, base give H^+ ions.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/bm264

165. **Assertion :** If the pH inside the mouth decreases below 5.5, the decay of tooth enamel begins.
Reason : The bacteria present in mouth degrades the sugar and left over food particles and produce acids that remains in the mouth after eating.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/bm265

166. **Assertion :** H_2CO_3 is a strong acid.
Reason : A strong acid dissociates completely or almost completely in water.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/bm266

167. **Assertion :** Salts are the products of an acid-base reaction.
Reason : Salt may be acidic or basic.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/bm267

168. **Assertion :** On adding H_2SO_4 to water the resulting aqueous solution get corrosive.
Reason : Hydronium ions are responsible for corrosive action.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/bm268

169. **Assertion :** pH of ammonium chloride solution is in acidic range.
Reason : Solution of a salt of weak base and strong acid is acidic.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/bm269

170. **Assertion :** Baking soda does not creates acidity in the stomach.
Reason : Baking soda is not alkaline.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is true but Reason is false

Sol : www.cbse.site/sc/bm270

171. **Assertion :** Plaster of Paris is used by doctors by setting fractured bones.
Reason : When Plaster of Paris is mixed with water and applied around the fractured limbs, it sets into a hard mass.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

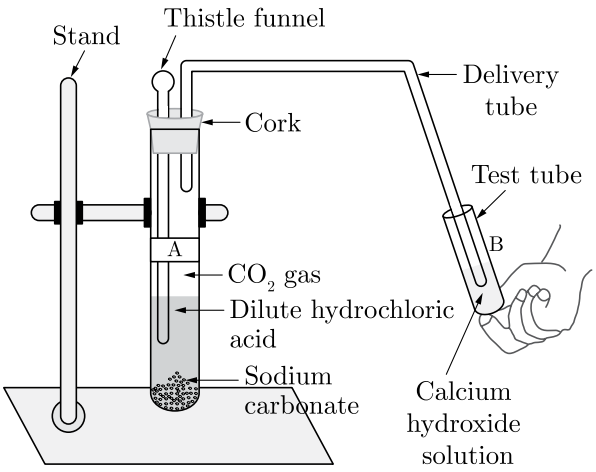
Sol : www.cbse.site/sc/bm271

172. **Assertion :** Sodium hydroxide reacts with zinc to produce hydrogen gas.
Reason : Acids reacts with active metals to produce hydrogen gas.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/bm272

COMPETENCY BASED QUESTIONS

173. A student takes two test tube *A* and *B* and arrange the test tubes according to the figure:



Student takes about 0.5 g of sodium carbonate (Na_2CO_3) in test tube *A* and about 0.5 g of sodium hydrogen carbonate ($NaHCO_3$) in test tube *B*. After this student add about 2 ml of dilute HCl to both the test tubes.
Which of following gas is evolved in the about experiment?
(a) Carbon dioxide
(b) Carbon monoxide
(c) Oxygen
(d) Carbon chloride

Sol : www.cbse.site/sc/bm273

Direction For Questions (175-176)

Take about 2 ml of dilute NaOH solution in a test tube and add two drops of phenolphthalein solution.

174. The colour of solution is:
(a) Pink
(b) Blue
(c) Red
(d) Green

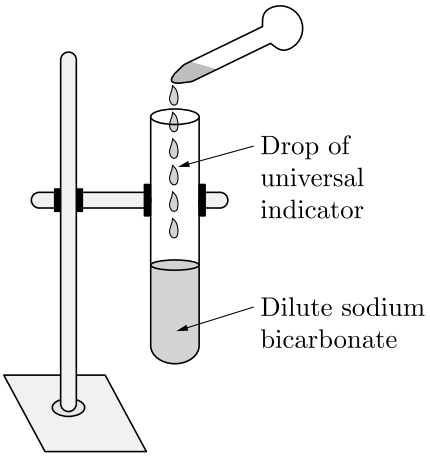
Sol : www.cbse.site/sc/bm274

175. In the previous question, hydrochloric acid is mixed drop by drop. The colour of this solution is:
(a) Pink
(b) Blue
(c) Red
(d) Green

Sol : www.cbse.site/sc/bm274

176. A student adds a few drops of the universal indicator to a dilute solution of sodium

bicarbonate taken in a test tube.



The colour of mixture of universal indicator and dilute sodium bicarbonate is:

(a) Green
(b) Yellow
(c) Violet
(d) Blue

Sol : www.cbse.site/sc/bm275

177. A student placed a few drops of a liquid over a portion of the blue litmus paper as shown in figure. He observed that the blue litmus paper turned red. The liquid could be:

(a) water
(b) dilute sodium bicarbonate solution
(c) dilute hydrochloric acid
(d) dilute sodium hydroxide

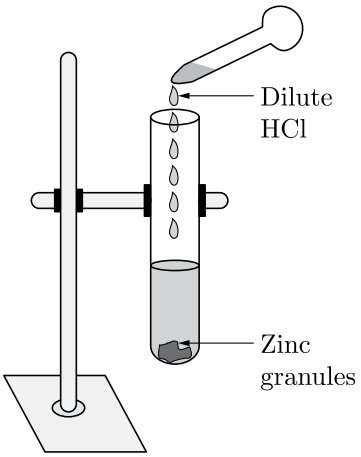
Sol : www.cbse.site/sc/bm276

178. A student was provided with a pH chart by the teacher and asked to observe the colours corresponding to pH 1 and 14 respectively. The correct answer would be

(a) yellow, green
(b) violet, orange
(c) red, blue
(d) blue, mustard

Sol : www.cbse.site/sc/bm277

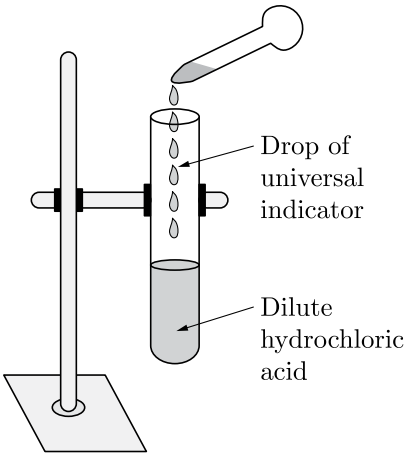
179. A student added dilute HCl to Zn granules taken in a test tube as shown in figure. The correct observation would be:



(a) no change
(b) evolution of gas
(c) Zn granules turned green
(d) formation of a precipitate

Sol : www.cbse.site/sc/bm278

180. A student adds a few drops of the universal indicator to a solution of dilute hydrochloric acid in the way shown in the figure.
He would observe that the colour of the solution changes from colourless to:



(a) red
(b) yellow
(c) violet
(d) green

Sol : www.cbse.site/sc/bm279

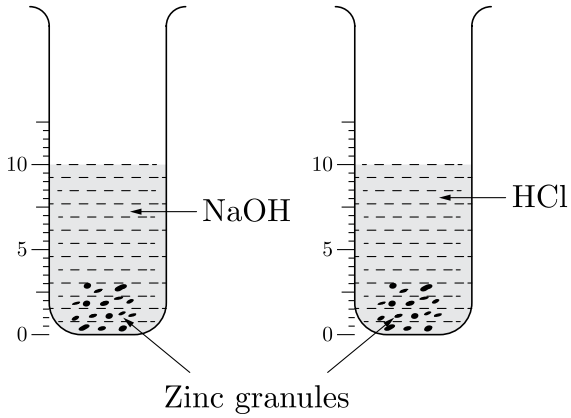
181. A student takes some zinc granules in a test tube and adds dilute hydrochloric acid to it. He would observe that the colour of the zinc granules changes to
(a) Red
(b) Black
(c) Green
(d) Yellow

Sol : www.cbse.site/sc/bm280

182. On putting few drops of an unknown liquid on pH strip, the colour of pH strip changed to green. The liquid taken is likely to be:
(a) dilute sodium hydroxide solution
(b) lemon juice
(c) dilute hydrochloric acid
(d) water

Sol : www.cbse.site/sc/bm281

183. 10 mL of HCl and 10 mL of NaOH solutions are contacted in two separate beakers, labelled I and II respectively. On adding zinc granules to both as shown in figure, it is observed that at room temperature.



(a) no gas is evolved in either of the two beakers.
(b) gas is evolved in beaker II but not in beaker I.
(c) gas is evolved vigorously in both.
(d) gas is evolved vigorously in beaker I but not in beaker II.

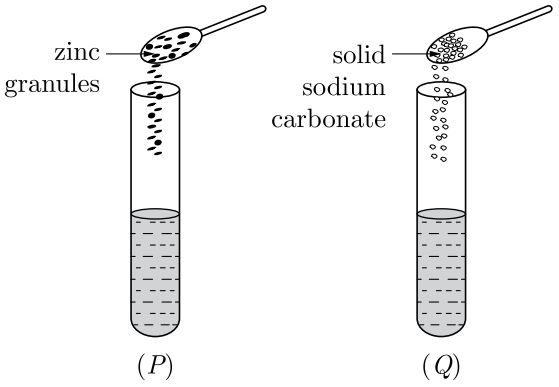
Sol : www.cbse.site/sc/bm282

184. You have four test tubes, P, Q, R, and S containing sodium carbonate, sodium chloride, lime water and blue litmus solutions respective. Out of these the material of which test tube/test tubes would be suitable for the correct test of acetic/ethanoic acid.
(a) Only P
(b) P and Q
(c) R and S
(d) P and S

Sol : www.cbse.site/sc/bm283

185. A student took two test tubes containing 2 mL of dilute hydrochloric acid and added zinc granules to test tube (P) and solid sodium carbonate to test tube (Q) as

shown below.

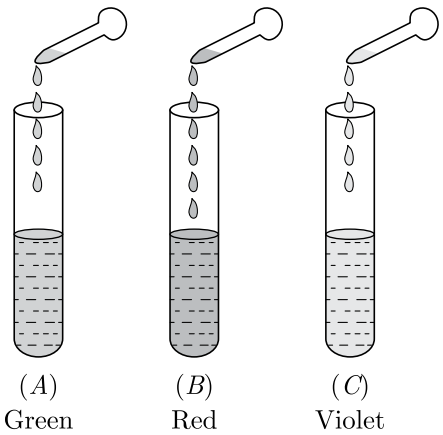


The correct observation would be

(a) no reaction in any of the test tube
(b) rapid reaction in both the test tubes
(c) slow reaction in (P) and rapid reaction in (Q)
(d) rapid reaction in (P) but a slow reaction in (Q)

Sol : www.cbse.site/sc/bm284

186. On adding a few drops of universal indicator to three unknown colourless solutions (A), (B) and (C), taken separately in three test tubes shown in the following diagrams, a student observed the changes in colour as green in (A), red in (B) and violet in (C).



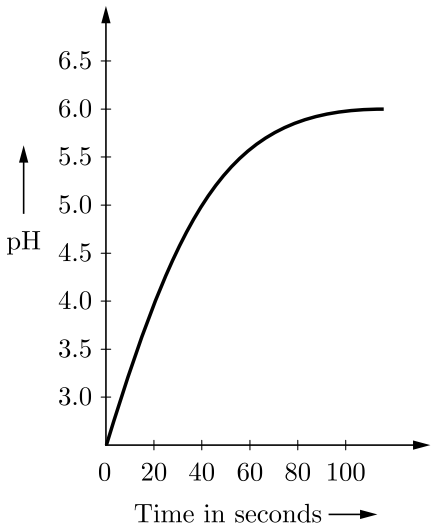
The decreasing order of pH of the solutions taken is

(a) $A > B > C$
(b) $C > A > B$
(c) $B > A > C$
(d) $C > B > A$

Sol : www.cbse.site/sc/bm285

Direction For Questions (188-192)

Mr. Ashok assumed that the time taken for 10 cm^3 of CO_2 to be formed from a reaction between equal volume of acid solutions and 1.0 g of calcium carbonate is affected by the pH of acid solution. Mr. Rajesh tested his hypothesis and represented his results is shown in the graph.



187. What will happen at pH 6.5?

(a) No reaction
(b) Reaction occur very fast
(c) Slow reaction
(d) CO_2 will evolve

Sol : www.cbse.site/sc/bm286

188. What is the nature of $CaCO_3$?

(a) Acidic salt
(b) Basic salt

(c) Amphoteric
(d) Can't predict

Sol : www.cbse.site/sc/bm286

189. According to graph, a more acidic solution will produce the gas:
(a) can't predict
(b) more quickly
(c) less quickly
(d) at the same rate

Sol : www.cbse.site/sc/bm286

190. What will be time taken to collect 10 cm^3 of CO_2at pH = 5.0?
(a) 20 seconds
(b) 40 seconds
(c) 50 seconds
(d) 50 seconds

Sol : www.cbse.site/sc/bm286

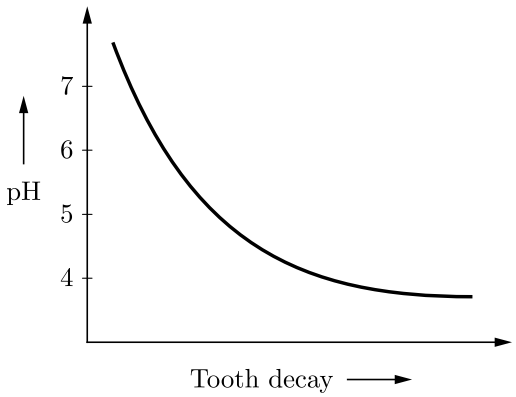
191. Which of the following statements is correct about an aqueous solution of an acid and of a base?
1. Lower the pH, weaker the base
2. Lower the pH, stronger the base
3. Higher the pH, weaker the acid
4. Higher the pH, stronger the acid

(a) 1 and 3
(b) 2 and 3
(c) 1 and 4
(d) 2 and 4

Sol : www.cbse.site/sc/bm286

Direction For Questions (193-197)

Tooth decay starts when the pH of the mouth is lower than 5.5. Tooth enamel, made up of calcium phosphate is the hardest substance in the body. It does not dissolve in water, but is corroded when the pH in the mouth is below 5.5. Bacteria present in the mouth produce acids by degradation of sugar and food particles remaining in the mouth after eating. The best way to prevent this is to clean the mouth after eating food. Using toothpastes, which are generally basic, for cleaning the teeth can neutralise the excess acid and prevent tooth decay.



192. The tooth decay be prevented:
(a) By rinsing mouth with excess of water after eating.
(b) By using basic toothpaste.
(c) Both (a) and (b)
(d) Preventing use of acidic substances like lemon etc.

Sol : www.cbse.site/sc/bm287

193. Teeth enamel is made of a substance called:
(a) Aluminium
(b) Calcium phosphate
(c) Iron
(d) Diamond

Sol : www.cbse.site/sc/bm287

194. Tooth decay in the mouth starts when:
(a) pH of mouth is below 5.5
(b) pH of mouth is 7.6

(c) pH of mouth is 7.5
(d) pH of mouth is 7

Sol : www.cbse.site/sc/bm287

195. The acidity in the mouth is due to:
(a) Undigestion of food.
(b) Degradation of sugar and food particles remaining in mouth by bacteria.
(c) Drinkin8g of Mosambi juice.
(d) Eating of acidic substances like tomatoes, orange etc.

Sol : www.cbse.site/sc/bm287

196. The hardest substance in the body is:
(a) Tooth enamel
(b) Lungs
(c) Mouth
(d) Trachea

Sol : www.cbse.site/sc/bm287

Direction For Questions (198-202)

Acidic solutions have excess of hydrogen ions. Even the acidic solutions contain hydroxide ions which come form the ionisation of water but the concentration of hydroxide ions in acidic solutions is much less than that of hydrogen ions.
The basic solution have excess of hydroxide ions. Even the basic solutions have hydrogen ions in them which come form the ionisation of water but the concentration of hydrogen ions in basic solutions is much less than that of hydroxide ions.
In 1909 Sorenson devised a scale (known as pH scale) on which the strength of acid solutions as well as basic solutions could be represented by making use of the hydrogen ion concentrations in them. Sorensen linked the hydrogen ion concentrations of acid and base solutions to the simple numbers 0 to 14 on his pH scale. The pH of a solution is inversely proportional to the concentration of hydrogen ions in it.
In everyday life, pH plays an important role on daily basis like in gardening and farming, the best crops are usually obtained with neutral or slightly acidic soil (pH 6.5 to 7.0), tooth decay starts when the pH of mouth is lower than 5.5. Bee-sting leaves an acid which causes pain and irritation etc.

197. Which of the following substance(s) is added by farmers if the soil is acidic?
(a) Common salt
(b) Slaked lime
(c) Vinegar
(d) Limestone

Sol : www.cbse.site/sc/bm288

198. Rain is called an acid rain when the pH is
(a) above 8.5
(b) below 6.5
(c) below 5.6
(d) between 7-8

Sol : www.cbse.site/sc/bm288

199. During indigestion, which acid is produced by the stomach that causes irritation and pain?
(a) Hydrochloric acid
(b) Sulphuric acid
(c) Nitric acid
(d) Phosphoric acid

Sol : www.cbse.site/sc/bm288

200. The basic salt that gives relief on the stung area is
(a) washing soda

(b) caustic soda
(c) baking soda
(d) bleaching powder

Sol : www.cbse.site/sc/bm288

201. Which of the following type of medicines is used for the treatment of hyperacidity in the stomach?
(a) Antiseptic
(b) Antibiotic
(c) Analgesic
(d) Antacid

Sol : www.cbse.site/sc/bm288

Direction For Questions (203-207)

The acids are sour in taste while bases are bitter in taste. Tasting a substance is not a good way of finding out if it is an acid or a base. Acids and bases can be better distinguished with the help of indicators. Indicators are substances that undergo a change of colour with a change of acidic, neutral or basic medium. Many of these indicators are derived from natural substances such as extracts from flower petals and barrier. Some indicators are prepared artificially. For example, methyl orange and phenolphthalein.

202. When a few drops of phenolphthalein is added to a solution having pH 8.5, then the colour
(a) changes to blue
(b) changes to red
(c) changes to pink
(d) does not change

Sol : www.cbse.site/sc/bm289

203. The colour observed when methyl orange is added to an acid is
(a) pinkish red
(b) blue
(c) orange
(d) yellow

Sol : www.cbse.site/sc/bm289

204. Which of the following statement(s) is incorrect about the litmus paper?
(a) It is a most commonly used indicator.
(b) In acidic solution, blue litmus paper turns red.
(c) In neutral solution, no colour change is observed.
(d) Litmus solution is a yellow dye, which is extracted from the lichen plant.

Sol : www.cbse.site/sc/bm289

205. Which solution will change blue litmus to red?
(a) $NaOH(aq)$
(b) $NH_4OH(aq)$
(c) $KCl(aq)$
(d) $H_2SO_4(aq)$

Sol : www.cbse.site/sc/bm289

206. Which of the following solutions will turn phenolphthalein pink?
(a) $HCl(aq)$
(b) $CO_2(aq)$
(c) $KOH(aq)$
(d) $H_2SO_4(aq)$

Sol : www.cbse.site/sc/bm289

Direction For Questions (208-212)

Baking soda is also called sodium bicarbonate. This is the major constituent

of baking powder.
Sodium chloride is used as one of the raw materials in the production of baking soda. Baking soda is commonly used to make crispy pakoras, etc., in the kitchen. It is also added for faster cooking. It is also used in the preparation of effervescent drinks and fruit salts and it is used as an antacid, it neutralises excess acid in the stomach.

207. The chemical name of baking soda is
(a) sodium hydrogen carbonate
(b) sodium hydroxide
(c) sodium carbonate decahydrate
(d) calcium oxychloride

Sol : www.cbse.site/sc/bm290

208. Which of the following statements is correct regarding properties of baking soda?
(a) It is a yellow crystalline substance.
(b) It is non-corrosive in nature.
(c) It reacts with acids evolving hydrogen gas.
(d) All are correct

Sol : www.cbse.site/sc/bm290

209. The temperature above which sodium bicarbonate decomposes to give sodium carbonate is
(a) 283 K
(b) 309 K
(c) 373 K
(d) 575 K

Sol : www.cbse.site/sc/bm290

210. Baking powder is a mixture of
(a) sodium carbonate and ethanoic acid
(b) sodium hydrogen carbonate and ethanoic acid
(c) sodium carbonate and tartaric acid
(d) sodium hydrogen carbonate and tartaric acid

Sol : www.cbse.site/sc/bm290

211. The chemical formula of baking soda is
(a) $NaHCO_3$
(b) NaOH
(c) $Na_2CO_3 \cdot 10H_2O$
(d) $CaOCl_2$

Sol : www.cbse.site/sc/bm290

Direction For Questions (213-217)

The pH of a solution is a measure of its hydrogen ion (H^+) concentration. It is measured generally using pH scale. The values on pH scale ranges from 0 to 14.
A pH of 1 is very acidic and corresponds to a high concentration of H^+ ions. A pH of 14 is very basic and corresponds to a low concentration of H^+ ions. The pH of a neutral solution is 7. The table given below shows the pH and H^+ ion concentration of some common aqueous solutions. The leftmost column shows the number of moles of H^+ ions in 1 mole of liquid.

The pH and Hydrogen ion (H^+) Concentration of Some Solutions

H^+ Concentration (Moles)	**pH**	**Solution**
10^{-1}	1	
10^{-2}	2	Gastric (stomach) juice, cola, lemon juice
10^{-3}	3	Vinegar
10^{-4}	4	Tomato juice
10^{-5}	5	Black coffee, rain water

The pH and Hydrogen ion (H^+) Concentration of Some Solutions

H^+ Concentration (Moles)	**pH**	**Solution**
10^{-6}	6	Urine
10^{-7}	7	Pure water
10^{-8}	8	Sea water
10^{-9}	9	Baking soda
10^{-10}	10	
10^{-11}	11	Milk of magnesia
10^{-12}	12	Household bleach
10^{-13}	13	Oven cleaner
10^{-14}	14	

212. How is the hydrogen ion concentration and pH related to each other?
(a) They are inversely proportional
(b) They are directly proportional
(c) They are equal
(d) They have no relation

Sol : www.cbse.site/sc/bm291

213. Among the given solutions in the above table, the most basic in nature is
(a) pure water
(b) oven cleaner
(c) household bleach
(d) gastric juice

Sol : www.cbse.site/sc/bm291

214. The acid having highest hydrogen ion concentration is one with
(a) pH = 2.5
(b) pH = 1.8
(c) pH = 7
(d) pH = 10

Sol : www.cbse.site/sc/bm291

215. Which of the following acids is used in making of vinegar?
(a) Nitric acid
(b) Sulphuric acid
(c) Formic acid
(d) Acetic acid

Sol : www.cbse.site/sc/bm291

216. A basic solution could have a pH of
(a) 11
(b) 7
(c) 1
(d) 2

Sol : www.cbse.site/sc/bm291

Direction For Questions (218-222)

A student takes the there solutions P, Q and R and make the reaction of all these solution with phenolphthalein indicator and methyl orange indicator. He get the following result:

Solutions	**Colour change with phenolphthalein indicator**	**Colour change with methyl orange indicator**
P	Pink	Yellow
Q	Colourless	Orange
R	Colourless	Red

217. The acidic solution is
(a) P
(b) Q
(c) R
(d) None of these

Sol : www.cbse.site/sc/bm292

218. The increasing of pH of solution P, Q and R is
(a) $P < Q < R$
(b) $R < P < Q$
(c) $R < Q < P$
(d) $Q < R < P$

Sol : www.cbse.site/sc/bm292

219. Solutions P and Q could be
(a) HCl and NaOH
(b) NaOH and NaCl
(c) CH_3COOH and CH_3COONa
(d) HCl and Na_2CO_3

Sol : www.cbse.site/sc/bm292

220. When solution P added to the China rose indicator, the colour of the solution P changes to
(a) Green
(b) Dark red
(c) Pink
(d) Colourless

Sol : www.cbse.site/sc/bm292

221. The solution which give pink colour after reaction with phenolphthalein indicator is
(a) P
(b) Q
(c) R
(d) None of these

Sol : www.cbse.site/sc/bm292

Direction For Questions (223-227)

In pure water, the concentrations of hydrogen ions and hydroxide ions are equal. Due to this, pure water is neither acidic nor basic, it is neutral.
Acidic solutions have excess of hydrogen ions. Even the acidic solutions contain hydroxide ions which come form the ionisation of water but the concentration of hydroxide ions in acidic solutions is much less than than that of hydrogen ions.
The basic solution have excess of hydroxide ions. Even the basic solutions have hydrogen ions in them which come form the ionisation of water but the concentration of hydrogen ions in basic solutions is much less than that of hydroxide ions.
In 1909 Sorenson devised a scale (known as pH scale) on which the strength of acid solutions as well as basic solutions could be represented by making use of the hydrogen ion concentrations in them. Sorensen linked the hydrogen ion concentrations of acid and base solutions to the simple numbers 0 to 14 on his pH scale. The pH of a solution is inversely proportional to the concentration of hydrogen ions in it.
pH may be defined as a number by which negative power of 10 has to be raised in order to express the concentration of hydrogen ion of the solution i.e., $[H^+] = 10^{-pH}$ where the concentration of H^+ ions is expressed as moles/litre and is written as $[H^+]$.

S. No.	Solution	pH limit
1.	Saliva	6.5-7.5
2.	Lemon juice	2.2-2.4
3.	Tomato juice	4.0-4.4
4.	Coffee	4.5-5.5

222. When drops of tomato juice are dropped on litmus paper than litmus paper will turn
(a) red
(b) yellow
(c) green
(d) black

Sol : www.cbse.site/sc/bm293

223. The nature of saliva in given table is
(a) acidic
(b) basic
(c) Neither acidic nor basic
(d) cannot be define

Sol : www.cbse.site/sc/bm293

224. The effect of acid on litmus paper is
(a) blue to red in colour
(b) red to blue in colour
(c) red to green in colour
(d) green to red on colour

Sol : www.cbse.site/sc/bm293

225. The effect of base on litmus paper is
(a) Turns red litmus to blue in colour
(b) Turns blue litmus to blue in colour
(c) Turns red litmus to orange
(d) None of these

Sol : www.cbse.site/sc/bm293

226. The pH limit of coffee is
(a) 4.5-5.5
(b) 6.5-7.5
(c) 1.4-2.5
(d) 2.9-3.9

Sol : www.cbse.site/sc/bm293

Direction For Questions (228-232)

For making baking powder, which is a mixture of baking soda (sodium hydrogen carbonate) and a mild edible acid such as tartaric acid. When baking powder is heated or mixed in water, the following reaction takes place:

$$\underset{\text{(From any acid)}}{NaHCO_3 + H^+} \longrightarrow CO_2 + H_2O +$$

Sodium salt of acid

Carbon dioxide produced during the reaction causes bread or cake to rise making them soft and spongy.

Sodium hydrogen carbonate is also an ingredient in antacids. Being alkaline, it neutralises excess acid in the stomach and provides relief.

It is also used in soda-acid fire extinguishers.

227. Which of the following compound is used in soda-acid fire extinguishers?
(a) Plaster of Paris
(b) Baking soda
(c) Washing soda
(d) Bleaching powder

Sol : www.cbse.site/sc/bm294

228. ..... is the chemical name of baking soda.
(a) Calcium hydrogen carbonate
(b) Sodium hydrogen carbonate
(c) Calcium carbonate
(d) Sodium carbonate

Sol : www.cbse.site/sc/bm294

229. Baking powder is a mixture of the following compounds:
(a) Bleaching powder and citric acid
(b) Baking soda and oxalic acid
(c) Washing soda and citric acid
(d) Baking soda and tartaric acid

Sol : www.cbse.site/sc/bm294

230. Which ingredient is used in anti-acids which gives relief in stomach by neutralising excess acid?
(a) Magnesium hydroxide

(b) Sodium carbonate
(c) Aluminium hydroxide
(d) Sodium hydrogen carbonate

Sol : www.cbse.site/sc/bm294

231. What is the nature of baking soda?
(a) It is amphoteric
(b) It is acidic
(c) It is alkaline
(d) It is neutral

Sol : www.cbse.site/sc/bm294

□□□□□□□

CHAPTER

Metal and Non - Metals

4.1 ELEMENTS

Till now, out of 118 elements known, only the first 98 elements occur naturally on the earth. Elements are divided into metals, i.e., Fe, Cu, Hg, Pb, etc., and nonmetals, i.e., C, O, H, N, etc.

Elements showing properties of both metals and nonmetals like boron, silicon, germanium, arsenic, antimony and tellurium are called metalloids.

4.1.1 Metals

Three-quarters of elements are metals. Coinage metals Au, Ag and Pt are used to make coins, etc.

1. Strategic metals titanium, chromium, manganese, zirconium, etc., are used for country's economy and defence. Co, Cu, Fe, Mg, K, Na and Zn are essential to human, plant and animal health.
2. Metals are solid at room temp. except mercury, i.e., liquid at room temp. They have metallic lustre. They are hard and cannot be easily cut with a sharp knife but metals Na and K are so soft that they can be easily cut with a knife. Chromium is the hardest and caesium the softest metal.
3. Metals like Au, Ag, Cu, Sn, Al, etc., are malleable, i.e., can be beaten with a hammer into thin sheets. They are ductile, i.e., drawn into fine wires. Gold is the most ductile and malleable metal.
4. Metals are good conductors of heat and electricity. Silver is the best conductor of heat and electricity. Lead is a poor conductor of heat and electricity.
5. Metals are crystalline in nature and densely packed, i.e., have high density. However, lithium (Li), sodium (Na) and potassium (K) have densities lesser than water.
6. Metals have high MP and BP because their constituent atoms are closely packed and strong forces of attraction exist between them. Gallium and caesium will melt if kept on the palm of our hand due to having low MP. Metals are sonorous, i.e., give a ringing sound when struck.

4.1.2 Nonmetals

All living organisms are composed of nonmetals, i.e., carbon, hydrogen, oxygen and nitrogen. Oxygen, the survival of living organisms, is the most abundant non-metal in the earth's crust.

1. Out of 22 nonmetals, 10 are solids, 11 are gases and 1 (Br) is a liquid. Solid nonmetals are brittle, i.e., when hammered, e.g., S and P. Nonmetals are non-malleable and non-ductile.
2. Nonmetals are bad conductors of heat and electricity except graphite. They have low density, and low MP and BP except diamond (3873 K) and graphite (3773 K) which have high MP.

4.1.3 Chemical Properties of Metals

The metals when listed according to their electron-releasing tendency, the list is called activity series or reactivity series. It is shown in decreasing order as follows:

$K > Na > Ca > Mg > Al > Zn > Fe > CO > Ni > Su > Pb > [H]^* > Cu > Hg > Ag > Au$

1. Metals combine with O_2 to give their oxides, e.g., metals like Na quickly burns with bright golden yellow flame, Mg burns with dazzling

white light to give magnesium oxide (MgO) and Al burns in O_2 to form aluminium oxide (Al_2O_3).

$$2Mg + O_2 \longrightarrow 2MgO$$

$$4Al + 3O_2 \longrightarrow 2Al_2O_3$$

2. Iron slowly rusts in moist air to form a reddish-brown powder called rust[$Fe_2O_3 \cdot xH_2O$].

$$4Fe + 3O_2 \longrightarrow 2Fe_2O_3$$

$$Fe_2O_3 + xH_2O \longrightarrow Fe_2O_3 \cdot xH_2O$$

3. Silver and gold do not react with oxygen even at high temperature.
4. Metals form basic oxides which react with H_2O to form basic solution, e.g.,

$$Na_2O\,(s) + H_2O\,(l) \longrightarrow 2NaOH\,(aq)$$

5. Oxides of metals, insoluble in water, react with acids to form salt and water.

$$CaO\,(s) + 2HCl\,(aq) \longrightarrow CaCl_2(aq) + H_2O\,(l)$$

6. Amphoteric oxides ZnO, Al_2O_3 and PbO_2 react with acid and base to form salt and water, e.g.,

$$ZnO\,(s) + 2HCl\,(aq) \rightarrow ZnCl_2(aq) + H_2O\,(l)$$

or

$$ZnO\,(s) + 2NaOH\,(aq) \rightarrow Na_2ZnO_2(aq) + H_2O\,(l)$$

A metal placed above hydrogen is more reactive than a metal placed below hydrogen. Sodium violently reacts with water, i.e.,

$$2Na\,(s) + 2H_2O\,(l) \longrightarrow 2NaOH\,(aq) + H_2(g)$$

Lithium, potassium and calcium react with cold water.

1. Ca reacts with H_2O violently. The heat evolved is insufficient for hydrogen to catch fire.

   Ca, heavier than H_2O, however, floats on water because bobbles of H_2 gas evolved during the reaction stick to the surface of Ca and make it float. Less reactive metals like Mg displace H_2 from boiling water.

$$Ca\,(s) + 2H_2O\,(l) \longrightarrow Ca\,(OH)_2(aq) + H_2(g)$$

$$Mg\,(s) + H_2O\,(l) \longrightarrow MgO\,(s) + H_2(g)$$

Fe, Al and Zn react on passing steam over hot metal. Pb, Cu, Ag and Au do not react with H_2O.

4.1.4 Reaction of Metals with Acids

Active metals react with dil. acids to evolve H_2 and form salt.

1. Metals placed above hydrogen in the activity series displace hydrogen from dil. hydrochloric acid or dil. sulphuric acid to evolve hydrogen gas and form the corresponding salt. Metals like Cu, Ag, Au placed below hydrogen in activity series do not evolve H_2 from dil. acids.
2. H_2 gas is not evolved when a metal reacts with HNO_3. Mg and Mn react with dil. HNO_3 to evolve H_2 gas, e.g.,

$$Mn + 2HNO_3 \longrightarrow Mn\,(NO_3)_2 + H_2\uparrow$$

$$Mg + 2HNO_3 \longrightarrow Mg\,(NO_3)_2 + H_2$$

3. The combining atom of metal loses one or more of its valence electrons to change into positive ion (cation) and atom of the nonmetal gains these electrons to convert into negative ion (anion). Due to transfer of electrons between atoms of compounds, they are ionic compounds.

4.1.5 Physical Properties of Ionic Compounds

Ionic compounds (solids) have high MP and BP. They are soluble in the water but are insoluble in solvents kerosene, benzene, etc. They do not conduct electricity in solid state due to the presence of ions.

4.1.6 Chemical Properties of Nonmetals

Nonmetals containing 4 or more than 4 electrons in their valence shell gain electrons to acquire its octet to form negative ions, thus, called electronegative elements.

1. Nonmetals, on heating in air, form their respective oxides, e.g.,

$$C\,(s) + O_2(g) \xrightarrow{\text{Heat}} CO_2(g)$$

2. Oxides of nonmetals, being acidic in character,

dissolve in water to form acids, i.e.,

$$CO_2(g) + H_2O(l) \longrightarrow H_2CO_3(aq)$$

3. Nonmetals act as oxidising agents because they gain electrons and get reduced, e.g., fluorine (strongest oxidising agent). They also form covalent compounds.

□□□□□□□

MULITIPLE CHOICE QUESTIONS

1. Which of the following property is generally not shown by metals?
(a) Electrical conduction
(b) Sonorous in nature
(c) Dullness
(d) Ductility

Sol : www.cbse.site/sc/cm101

2. The ability of metals to be drawn into thin wire is known as
(a) Ductility
(b) Malleability
(c) Sonority
(d) Conductivity

Sol : www.cbse.site/sc/cm102

Don't Take Printout of This File because this is not useful. You can purchase hard book from Amazon. Hard book includes explanation of all MCQs in print form.

3. Aluminium is used for making cooking utensils. Which of the following properties of aluminium are responsible for the same?
1. Good thermal conductivity
2. Good electrical conductivity
3. Ductility
4. High melting point

(a) 1 and 2
(b) 1 and 3
(c) 2 and 3
(d) 1 and 4

Sol : www.cbse.site/sc/cm103

4. Which one of the following metals do not react with cold as well as hot water?
(a) Na
(b) Ca
(c) Mg
(d) Fe

Sol : www.cbse.site/sc/cm104

5. Which of the following oxide(s) of iron would be obtained on prolonged reaction of iron with steam?
(a) FeO
(b) Fe_2O_3
(c) Fe_3O_4
(d) Fe_2O_3 and Fe_3O_4

Sol : www.cbse.site/sc/cm105

6. What happens when calcium is treated with water?
1. It does not react with water.
2. It reach violently with water.
3. It reacts less violently with water.
4. Bubbles of hydrogen gas formed stick to the surface of calcium.

(a) 1 and 4
(b) 2 and 3
(c) 1 and 2
(d) 3 and 4

Sol : www.cbse.site/sc/cm106

7. Generally metals react with acids to give salt and hydrogen gas.
Which of the following acids does not give hydrogen gas on reacting with metals (except Mn and Mg)?
(a) H_2SO_4
(b) HCl
(c) HNO_3
(d) All of these

Sol : www.cbse.site/sc/cm107

8. The composition of aqua regia is

(a)	Dil.HCl	:	Conc.HNO_3
	3	:	1
(b)	Conc.HCl	:	Dil.HNO_3
	3	:	1
(c)	Conc.HCl	:	Conc.HNO_3
	3	:	1
(d)	Dil.HCl	:	Dil.HNO_3
	3	:	1

Sol : www.cbse.site/sc/cm108

9. Which of the following are not ionic compounds?
1. KCl
2. HCl
3. CCl_4
4. NaCl

(a) 1 and 2
(b) 2 and 3
(c) 3 and 4
(d) 1 and 3

Sol : www.cbse.site/sc/cm109

10. Which one of the following properties is not general exhibited by ionic compounds?
(a) Solubility in water
(b) Electrical conductivity in solid state
(c) High melting and boiling points
(d) Electrical conductivity in molten state

Sol : www.cbse.site/sc/cm110

11. Which of the following metals exist in their native state in nature?
1. Cu

2. Au
3. Zn
4. Ag

(a) 1 and 2
(b) 2 and 3
(c) 2 and 4
(d) 3 and 4

Sol : www.cbse.site/sc/cm111

12. Silver articles become black on prolonged exposure to air. This is due to the formation of

(a) Ag_3N
(b) Ag_2O
(c) Ag_2S
(d) Ag_2S and Ag_3N

Sol : www.cbse.site/sc/cm112

13. Stainless steel is very useful material for out life. In stainless steel, iron is mixed with

(a) Ni and Cr
(b) Cu and Cr
(c) Ni and Cu
(d) Cu and Au

Sol : www.cbse.site/sc/cm113

14. If copper is kept open in air, it slowly loses its shining brown surface and gains a green coating. It is due to the formation of

(a) $CuSO_4$
(b) $CuCO_3$
(c) $Cu(NO_3)_2$
(d) CuO

Sol : www.cbse.site/sc/cm114

15. Generally, metals are solid in nature. Which one of the following metals is found in liquid state at room temperature?

(a) Na
(b) Fe
(c) Cr
(d) Hg

Sol : www.cbse.site/sc/cm115

16. Which of the following metals are obtained by electrolysis of their chlorides in molten state?

1. Na
2. Ca
3. Fe
4. Cu

(a) 1 and 4
(b) 3 and 4
(c) 1 and 3
(d) 1 and 2

Sol : www.cbse.site/sc/cm116

17. Generally, non-metals are not lustrous. Which of the following non-metals is lustrous?

(a) Sulphur
(b) Oxygen
(c) Nitrogen
(d) Iodine

Sol : www.cbse.site/sc/cm117

18. Which one of the following four metals would be displaced from the solution of its salts by other three metals?
(a) Mg
(b) Ag
(c) Zn
(d) Cu

Sol : www.cbse.site/sc/cm118

19. 2 mL each of concentrated HCl, HNO_3 and a mixture of concentrated HCl and concentrated HNO_3 in the ratio of 3 : 1 were taken in test tubes labelled as A, B and C. A small piece of metal was put in each test tube. No change occurred in test tubes A and B but the metal got dissolved in test tube C respectively. The metal could be
(a) Al
(b) Au
(c) Cu
(d) Pt

Sol : www.cbse.site/sc/cm119

20. An alloy is
(a) an element
(b) a compound
(c) a homogeneous mixture
(d) a heterogeneous mixture.

Sol : www.cbse.site/sc/cm120

21. An element A is soft and can be cut with a knife. This is very reactive to air and cannot be kept open in air. It reacts vigorously with water. Identify the element from the following :
(a) Mg
(b) Na
(c) P
(d) Ca

Sol : www.cbse.site/sc/cm121

22. Alloys are homogeneous mixtures of a metal with a metal or non-metal.
Which among the following alloys contain non-metal as one of its constituents?
(a) Brass
(b) Bronze
(c) Amalgam
(d) Steel

Sol : www.cbse.site/sc/cm122

23. Which among the following statements is incorrect for magnesium metal?
(a) It burns in oxygen with a dazzling white flame.
(b) It reacts with cold water to form magnesium oxide and evolves hydrogen gas.
(c) It reacts with hot water to form magnesium hydroxide and evolves hydrogen gas.
(d) It reacts with steam to form magnesium hydroxide and evolves hydrogen gas.

Sol : www.cbse.site/sc/cm123

24. Which among the following alloys contain mercury as one of its constituents?
(a) Stainless steel
(b) Alnico
(c) Solder
(d) Zinc amalgam

Sol : www.cbse.site/sc/cm124

25. Reaction between X and Y, forms compound Z. X loses electron and Y gains electron. Which of the following properties

is not shown by Z?
(a) Has high melting point
(b) Has low melting point
(c) Conducts electricity in molten state
(d) Occurs as solid

Sol : www.cbse.site/sc/cm125

26. The electronic configurations of three elements X, Y and Z are X- 2, 8; Y- 2, 8, 7 and Z- 2, 8, 2. which of the following is correct?
(a) X is a metal.
(b) Y is a metal.
(c) Z is a non-metal.
(d) Y is a non-metal and Z is a metal.

Sol : www.cbse.site/sc/cm126

27. Although metals form basic oxides, which of the following metals form an amphoteric oxide?
(a) Na
(b) Ca
(c) Al
(d) Cu

Sol : www.cbse.site/sc/cm127

28. Generally non-metals are not conductors of electricity. Which of the following is a good conductor of electricity?
(a) Diamond
(b) Graphite
(c) Sulphur
(d) Fullerene

Sol : www.cbse.site/sc/cm128

29. Electrical wires have a coating of an insulating material. The material, generally used is
(a) Sulphur
(b) Graphite
(c) PVC
(d) all can be used.

Sol : www.cbse.site/sc/cm129

30. Which of the following non-metals is a liquid?
(a) Carbon
(b) Bromine
(c) Phosphorus
(d) Sulphur

Sol : www.cbse.site/sc/cm130

31. Which of the following can undergo a chemical reaction?
(a) $MgSO_4 + Fe$
(b) $ZnSO_4 + Fe$
(c) $MgSO_4 + Pb$
(d) $CuSO_4 + Fe$

Sol : www.cbse.site/sc/cm131

32. Substance that can be beaten into thin are called ..... .
(a) Malleable
(b) Ductile
(c) Liquid
(d) None of these

Sol : www.cbse.site/sc/cm132

33. Sodium kept immersed in kerosene oil because-
(a) Sodium is most reactive metal.
(b) Sodium is less reactive metal.
(c) Sodium is not a reactive metal.
(d) None of these.

Sol : www.cbse.site/sc/cm133

34. $2Fe(s) + 2H_2O(l) \longrightarrow X + 4H_2(g)$. Here X is.
(a) Fe_2O_3
(b) Fe_3O_4
(c) FeO_2
(d) Fe_2O_2

Sol : www.cbse.site/sc/cm134

35. When dilute hydrochloric acid is added to a reactive metal ..... gas is evolved.
(a) Hydrogen
(b) Argon
(c) Helium
(d) Nitrogen

Sol : www.cbse.site/sc/cm135

36. When zinc is added to a sodium of iron (II) sulphate than it would displace ..... from the solution
(a) Zinc
(b) Sodium
(c) Iron
(d) None of these

Sol : www.cbse.site/sc/cm136

37. The electron dot structure for sodium is
(a) Na•
(b) Na:
(c) Na•
(d) :Na:

Sol : www.cbse.site/sc/cm137

38. Ionic compound have high melting point due to
(a) Strong force of attraction between oppositely charged ions.
(b) Less force of attraction between oppositely charged ions.
(c) Strong force of attraction between similar charged ions.
(d) None of these

Sol : www.cbse.site/sc/cm138

39. Which of the following pairs will give displacement reaction?
(a) NaCl solution and copper metal
(b) $MaCl_2$ solution and aluminium metal
(c) $FeSO_4$ solution and silver metal
(d) $AgNO_3$ solution and copper metal.

Sol : www.cbse.site/sc/cm139

40. An element reacts with oxygen to give a compound with a high melting point. This compound is also soluble in water. The element is likely to be
(a) calcium
(b) carbon
(c) silicon
(d) iron

Sol : www.cbse.site/sc/cm140

41. Food cans are coated with tin and not with zinc because
(a) Zinc is costlier than tin.
(b) Zinc has higher melting point than tin.
(c) Zinc is more reactive than tin.
(d) Zinc is less reactive than tin.

Sol : www.cbse.site/sc/cm141

42. Which of the following is amphoteric oxides?
(a) Al_2O_3
(b) SO_2
(c) ZnO_2
(d) AlO_2

Sol : www.cbse.site/sc/cm142

43. Which of the following metal displace hydrogen from dilute acid?
(a) Zinc
(b) Magnesium
(c) Copper
(d) Sodium

Sol : www.cbse.site/sc/cm143

44. A non-metal X exists in two different forms Y and Z. Y is the hardest natural substance, whereas Z is a good conductor of electricity. Here X, Y and Z are

	X	Y	Z
(a)	Carbon	Diamond	Graphite
(b)	Graphite	Diamond	Carbon
(c)	Carbon	Graphite	Diamond
(d)	Diamond	Graphite	Carbon

Sol : www.cbse.site/sc/cm144

45. An element forms an oxide, A_2O_3 which is acidic in nature. Here A is
(a) metal
(b) non-metal
(c) cannot be identified
(d) mixture of metal and non metal

Sol : www.cbse.site/sc/cm145

46. Which of the following elements makes iron hard and strong?
(a) carbon
(b) oxygen
(c) water
(d) magnesium

Sol : www.cbse.site/sc/cm146

47. The percentage of Au in 18 carat gold?
(a) 25%
(b) 75%
(c) 30%
(d) 20%

Sol : www.cbse.site/sc/cm147

48. When a metal X is treated with cold water, it gives a base Y with molecular formula XOH (Molecular mass = 40) and liberates a gas Z which easily catches fire. Here X, Y and Z are

	X	Y	Z
(a)	Na	NaOH	H_2
(b)	H_2	NaOH	Na
(c)	H_2	Na	NaOH
(d)	NaOH	Na	H_2

Sol : www.cbse.site/sc/cm148

49. Which of the following metals on reacting with sodium hydroxide solution produce hydrogen gas?
1. Cu
2. Al
3. Fe
4. Zn

(a) 2 and 3
(b) 2 and 4
(c) 1 and 4
(d) 2 only

Sol : www.cbse.site/sc/cm149

50. Match the items and select the correct alternative:

1.	Sodium	A	On burning produces an acidic gas.
2.	Phosphorus	B	Reacts neither with acids nor bases.
3.	Copper	C	It is so soft that it can be cut with a knife.
4.	Charcoal	D	Burns spontaneously on exposure to air.
		E	Acquires a dull green coating on exposure to air.

(a) 1- (C), 2- (E), 3- (B), 4- (A)
(b) 1- (D), 2- (A), 3- (C), 4- (B)
(c) 1- (D), 2- (E), 3- (C), 4- (B)
(d) 1- (C), 2- (D), 3- (E), 4- (A)

Sol : www.cbse.site/sc/cm150

51. Two elements X and Y on burning in air give corresponding oxides. Oxides of both X and Y are soluble in water. The aqueous solution of oxide of X is alkaline and reacts with aqueous solution of oxide of Y to give another compound. Identify X and Y
(a) X and Y both are metals
(b) X and Y are non-metals
(c) X is metal and Y is non-metal
(d) X is non-metal and Y is metal

Sol : www.cbse.site/sc/cm151

52. A highly reactive element X is stored under water. It readily reacts with oxygen of air to give a compound Y which dissolves in water. The aqueous solution of Y changes blue litmus solution to red. The element X
(a) Sodium
(b) Sulphur
(c) Phosphorous
(d) Potassium

Sol : www.cbse.site/sc/cm152

53. Match the items in column I with the items in column II.

	Column I		Column II
1.	Iron	A	Liquid at room temperature
2.	Copper	B	Deposition of reddish-brown layer on exposure to moist air.
3.	Potassium	C	Can be cut easily with a knife.
4.	Mercury	D	Formation of a greenish layer on exposure to moist air.

Select the correct alternative.
(a) 1- A, 2- C, 3- D, 4- B
(b) 1- B, 2- D, 3- C, 4- A
(c) 1- C, 2- A, 3- B, 4- D
(d) 1- D, 2- B, 3- A, 4- C

Sol : www.cbse.site/sc/cm153

54. An element X (atomic number 12) reacts with another element Y (atomic number 17) to form a compound Z. Which of the following statements are true regarding this compound?
1. Molecular formula of Z is XY_2.
2. It is soluble in water.
3. X and Y are joined by sharing of electrons.
4. It would conduct electricity in the molten state.

(a) 2 and 3

(b) 1 and 3
(c) 1, 3 and 4
(d) 1 and 4

Sol : www.cbse.site/sc/cm154

55. A metal occurs in nature as its ore X which on heating in air converts to Y. Y reacts with unreacted X to give the metal. The metal is :
(a) Hg
(b) Cu
(c) Zn
(d) Fe

Sol : www.cbse.site/sc/cm155

56. An element X has electronic configuration 2, 8, 1 and another element Y has electronic configuration 2, 8, 7. They form a compound Z. The property that is not exhibited by Z is
(a) It has high melting point.
(b) It is a good conductor of electricity in its pure solid state.
(c) It breaks into pieces when beaten with hammer.
(d) It is soluble in water

Sol : www.cbse.site/sc/cm156

57. The compound containing both ionic and covalent bonds is
(a) $AlBr_3$
(b) CaO
(c) $MgCl_2$
(d) NH_4Cl

Sol : www.cbse.site/sc/cm157

58. The metal used to recover copper from an aqueous solution of copper sulphate is :
(a) Na
(b) Ag
(c) Hg
(d) Fe

Sol : www.cbse.site/sc/cm158

59. A metal M of moderate reactivity is present as its sulphide X. On heating in air, X converts into is oxide Y and a gas evolves. On heating Y and X together, the metal M is produced. X and Y respectively are
(a) X cuprous sulphide, Y cuprous oxide
(b) X cuprous sulphide, Y cupric oxide
(c) X sodium sulphide, Y sodium oxide
(d) X calcium sulphide, Y calcium oxide

Sol : www.cbse.site/sc/cm159

60. Which of the following are correctly matched?

1.	Ductility	drawn into wire.
2.	Malleability	drawn into sheets.
3.	Good conductors	copper and mercury.
4.	Non-metals	solids or gases.

(a) 1, 2 and 3
(b) 1, 2 and 4
(c) 1, 3 and 4
(d) 2, 3 and 4

Sol : www.cbse.site/sc/cm160

61. Which of the following are correctly matched?

1.	Mercury	liquid at room temperature
2.	Iodine	non-lustrous
3.	Lithium	low melting point

4.	Graphite	good conductor

(a) 1, 2 and 3
(b) 1, 2 and 4
(c) 1, 3 and 4
(d) 2, 3 and 4

Sol : www.cbse.site/sc/cm162

62. Which of the following statements is/are correct for metals?
1. They react with oxygen to form metal oxides.
2. All metallic oxides are basic in nature.
3. Metals are reducing agents.

(a) 1 and 2
(b) 2 and 3
(c) 1 and 3
(d) 1, 2 and 3

Sol : www.cbse.site/sc/cm62

63. Which of the following metals do/does not react with cold water?
1. Potassium
2. Sodium
3. Magnesium
4. Aluminium

(a) 1 and 2
(b) 2 and 3
(c) 2 and 4
(d) 3 and 4

Sol : www.cbse.site/sc/cm63

64. Which of the following statements is/are correct for aqua regia?
1. It is a freshly prepared mixture of concentrated hydrochloric acid and concentrated nitric acid.
2. Hydrochloric acid and nitric acid are in ratio 2:1
3. It can dissolve gold.

(a) 1 and 2
(b) 2 and 3
(c) 1 and 3
(d) 1, 2 and 3

Sol : www.cbse.site/sc/cm64

65. What is/are true for ionic compounds?
1. They are solids.
2. They have low melting and boiling points.
3. They are soluble in water.
4. They are good conductors of electricity.

(a) 1, 2 and 3
(b) 1, 2 and 4
(c) 1, 3 and 4
(d) 2, 3 and 4

Sol : www.cbse.site/sc/cm65

66. Which one of the following is incorrect for metal?
1. In their pure state, metal have a shining surface.
2. The ability of metals to be drawn into thin wires is called malleability.
3. Metals are generally soft.
4. Some metal can be beaten into thin sheets.

(a) 1 and 2
(b) 2 and 3
(c) 3 and 4
(d) 1 and 4

Sol : www.cbse.site/sc/cm66

67. Which of the following is the most malleable metal?
(a) Sulphur
(b) Gold
(c) Phosphorus
(d) Iron

Sol : www.cbse.site/sc/cm67

68. Which of the following metal have low density?
(a) Iridium
(b) Osmium
(c) Lithium
(d) None of these

Sol : www.cbse.site/sc/cm68

69. Select the odd one out-
1. Tin
2. Sulphur
3. Hydrogen
4. Carbon
5. Iodine
6. Oxygen

(a) 2
(b) 4
(c) 5
(d) 1

Sol : www.cbse.site/sc/cm69

70. Which of the following is the best conductor of heat?
(a) Silver
(b) Iron
(c) Gold
(d) Aluminium

Sol : www.cbse.site/sc/cm70

71. Which of the following is incorrect regarding to non-metals?
(a) Non-metal are generally non lustrous and dull.
(b) Non-metal are generally brittle.
(c) Non-metals are generally soft.
(d) Non-metal have high densities.

Sol : www.cbse.site/sc/cm71

72. An element X (atomic number 12) reacts with another element Y (atomic number 17) to form a compound Z. Which of the following statements are true regarding this compound?
1. Molecular formula of Z is XY_2.
2. It is soluble in water.
3. X and Y are joined by sharing of electrons.
4. It would conduct electricity in the molten state.

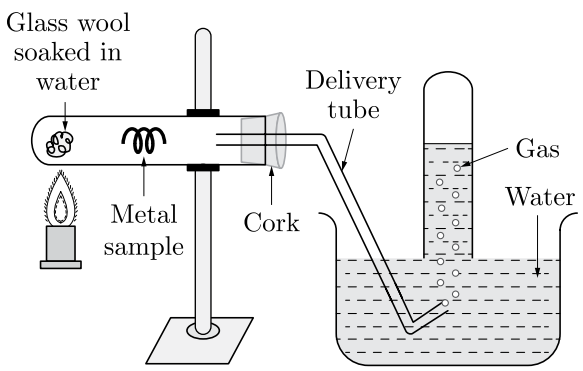
(a) 2 and 3
(b) 1 and 2
(c) 1, 3 and 4
(d) 1, 2 and 4

Sol : www.cbse.site/sc/cm72

73. Metals tend to have high melting points of the strength of ..... bond.
(a) Metallic
(b) Ionic
(c) Compound
(d) None of these

Sol : www.cbse.site/sc/cm73

74. In the following practical set which of the following gas is emitted?



(a) Hydrogen
(b) Carbon monoxide
(c) Carbon dioxide
(d) Nitrogen

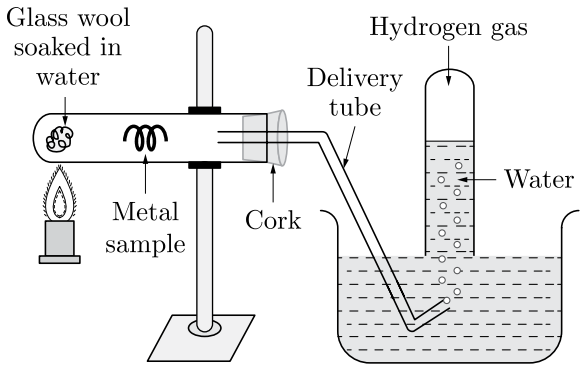
Sol : www.cbse.site/sc/cm74

75. Which of the following is the most reactive metal?
(a) Gold
(b) Copper
(c) Tin
(d) Sodium

Sol : www.cbse.site/sc/cm75

These metals are more reactive than hydrogen	Potassium	K
	Sodium	Na
	Calcium	Ca
	Magnesium	Mg
	Aluminium	Al
	Zinc	Zn
	Iron	Fe
	Tin	Sn
	Lead	Pb
	[Hydrogen]	**[H]**
These metals are less reactive than hydrogen.	Copper	Cu
	Mercury	Hg
	Silver	Ag
	Gold	Au
	Platinum	Pt

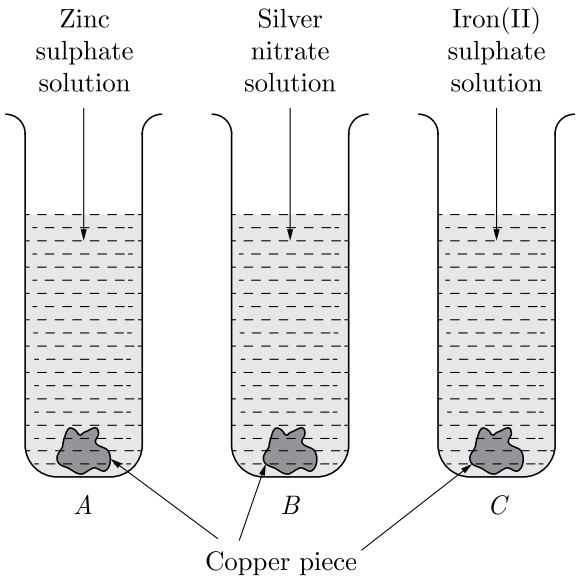
76. Action of stem on a metal is shown in the figure.



The metal sample in the above experiment is-
(a) Zinc
(b) Copper
(c) Aluminium
(d) Platinum

Sol : www.cbse.site/sc/cm76

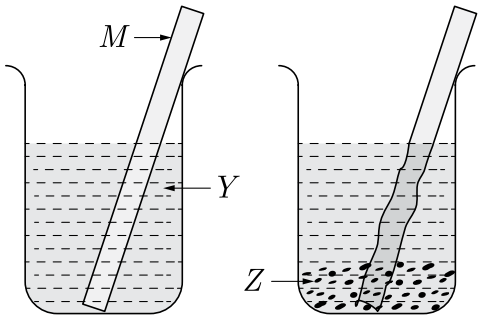
77. Test tubes A, B and C contain zinc sulphate, silver nitrate and iron (II) sulphate solutions respectively as shown in the figure. Copper pieces are added to each test tubes. Blue colour will appear in case of



(a) Test tube A
(b) Test tube B
(c) Test tube C
(d) All the test tube

Sol : www.cbse.site/sc/cm77

78. A metal rod (M) was dipped in a coloured solution (Y). After some time it was observed that the metal rod starts dissolving in the solution and the solution starts fading in colour. However, a coloured precipitate (Z) (Z) was seen at the bottom of the beaker. (M), (Y) and (Z) could be



(a) $M = \text{Zn}$ $Y = \text{FeSO}_4$ $Z = \text{Fe}$
(b) $M = \text{Cu}$ $Y = \text{Al}_2(\text{SO}_4)_3$ $Z = \text{Al}$
(c) $M = \text{Ag}$ $Y = \text{CuSO}_4$ $Z = \text{Cu}$
(d) $M = \text{Fe}$ $Y = \text{ZnSO}_4$ $Z = \text{Zn}$

Sol : www.cbse.site/sc/cm78

79. What is the chemical formula of the compound formed when ${}^{24}_{12}X$ combines with ${}^{19}_{9}Y$?
(a) XY
(b) X_2Y
(c) XY_2
(d) X_2Y_3

Sol : www.cbse.site/sc/cm79

80. The electronic structures of six elements A to F are given in the table below :

	Electronic structure		Formula of compound
1.	A : 2, 1	B : 2, 6	A_2B
2.	B : 2, 6	C : 2, 7	B_2C
3.	C : 2, 7	D : 2, 8, 3	DC_3
4.	E : 2, 8, 6	F : 2, 8, 8, 2	FE_2

Which of the compounds formed are wrong?
(a) 1 and 3
(b) 2 and 3
(c) 3 and 4
(d) 2 and 4

Sol : www.cbse.site/sc/cm80

81. Observe the given reactions and answer the question that follows :

$$\underset{(2,8,1)}{\text{Na}} \longrightarrow \underset{(2,8)}{\text{Na}^+} + \text{e}^-$$

$$\underset{(2,8,7)}{\text{Cl}} + \text{e}^- \longrightarrow \underset{(2,8,8)}{\text{Cl}^-}$$

$$\underset{(2,8,2)}{\text{Mg}} \longrightarrow \underset{(2,8)}{\text{Mg}^{2+}} + 2\text{e}^-$$

Which of the following are correct representations for the ionic compounds formed of these ions?

(a) $[\text{Na}^+]\left[\begin{array}{c}\times\times\\ \times\text{Cl}\times\\ \times\times\end{array}\right]^-$, $[\text{Mg}^{2+}]\left[\begin{array}{c}\times\times\\ \times\text{Cl}\times\\ \times\times\end{array}\right]^-_2$

(b) $[\text{Na}^+]\left[\begin{array}{c}\times\times\\ \times\text{Cl}\times\\ \times\times\end{array}\right]^-$, $[\text{Mg}^{2+}]\left[\begin{array}{c}\times\times\\ \times\text{Cl}\times\\ \times\times\end{array}\right]^-_2$

(c) $[\text{Na}^+]\left[\begin{array}{c}\times\times\\ \times\text{Cl}\times\\ \times\times\end{array}\right]^-$, $[\text{Mg}^{2+}]\left[\begin{array}{c}\times\times\\ \times\text{Cl}\times\\ \times\times\end{array}\right]^-_2$

(d) $[Na^+]\left[\begin{array}{c}\times\times\\ :\mathrm{Cl}\ \times\\ \times\times\end{array}\right]^-$, $[Mg^{2+}]\left[\begin{array}{c}\times\times\\ :\mathrm{Cl}\ \times\\ \times\times\end{array}\right]^-_2$

Sol : www.cbse.site/sc/cm81

82. ..... metal has highest melting point.
(a) Tungsten
(b) Sodium
(c) Silver
(d) Copper

Sol : www.cbse.site/sc/cm82

83. Which of the following is correct regarding to metals?
1. They have one to three valence electrons
2. They have 4 to 8 valence electrons
3. They are brittle
4. They are capable to form anions easily

(a) 1 and 2
(b) 2 and 3
(c) 1
(d) 1, 2, 3 and 4

Sol : www.cbse.site/sc/cm83

84. Which of the following only contain non-metals?
(a) Carbohydrates
(b) Proteins
(c) Alloys
(d) Both (a) and (b)

Sol : www.cbse.site/sc/cm84

85. Which of the following is incorrect regarding to non-metal?
1. They are neither malleable nor ductile
2. They are brittle
3. They are sonorous
4. They are poor conductor of heat and electricity (except graphite)

(a) 1
(b) 2 and 3
(c) 3
(d) 4 and 1

Sol : www.cbse.site/sc/cm85

86. A student mistakenly used a wet gas jar to collect sulphur dioxide. Which one of the following tests of the gas is likely to fail?
(a) Odour
(b) Effect on acidified $K_2Cr_2O_7$ solution
(c) Solubility test
(d) None of these

Sol : www.cbse.site/sc/cm86

87. **Assertion :** Nitrate ores are rarely available.
Reason : Bond dissociation energy of nitrogen is very high.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
(c) Assertion is correct and Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/cm87

88. **Assertion :** Metals possess metallic lustre.
Reason : Metals is their pure state, have a shining surface.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false

Sol : www.cbse.site/sc/cm88

89. **Assertion :** Metals are said to be sonorous.
Reason : Metals conduct heat and electricity.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/cm89

90. **Assertion :** Some metal oxides are amphoteric is nature.
Reason : Metallic oxides show acidic behaviour.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/cm90

91. **Assertion :** Sodium displaces copper from its salt solution.
Reason : Reactive metals can displace less reactive metals from their compounds in solution as molten form.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/cm91

92. **Assertion :** Ionic compounds are soft solids.
Reason : There is weak molecular forces between particles of ionic compounds.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/cm92

93. **Assertion :** An arrangement of metals in decreasing order of their reactivity is called activity series.
Reason : Metals can be differentiated from non metals.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/cm93

94. **Assertion :** Alloying is a good method of improving the properties of a metal.
Reason : We can be differentiated from non metals.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/cm94

95. **Assertion :** Solder is an alloy of lead and copper.
Reason : It has a high melting paint.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/cm95

96. **Assertion :** Sodium metal is obtained by electrolytic reduction.
Reason : Sodium is a highly reactive metal.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/cm96

97. **Assertion :** Silver articles become black after sometime when exposed to air.
Reason : Silver is very less reactive.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/cm97

98. **Assertion :** Electrical wires can be made by copper.
Reason : Copper is a good conductor of electricity.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/cm98

99. **Assertion :** When zinc is added to a solution of iron (II) sulphate, no change is observed.
Reason : Zinc is less reactive than iron.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/cm99

100. **Assertion :** Food cans are coated with zinc and not with tin.
Reason : Zinc is more reactive than tin.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are

true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/cm100

101. **Assertion :** Carbon reacts with oxygen to form carbon monoxide which is an acidic oxide.
Reason : Non-metals form acidic oxides.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/cm101

102. **Assertion :** Different metals have different reactivities with water and dilute acids.
Reason : Reactivity of a metal depends on its position in the reactivity series.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/cm102

103. **Assertion :** Zinc becomes dull in most air.
Reason : Zinc is coated by a thin film of its basic carbonate in moist air.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/cm103

104. **Assertion :** Gas bubbles are observed when sodium carbonate is added to dilute hydrochloric acid
Reason : Carbon dioxide is given off in the reaction.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

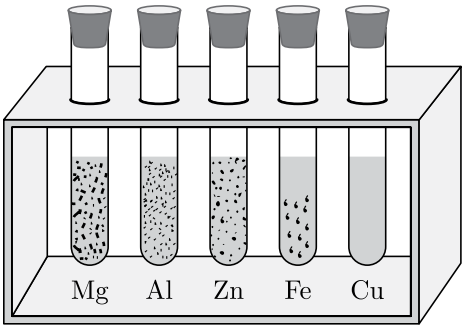
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/cm104

COMPETENCY BASED QUESTIONS

105. Clean small pieces of magnesium, zinc, aluminium, iron and copper by rubbing them with a piece of sand paper. Take them in separate test tubes. Add about 10 mL of

dilute hydrochloric acid to each of them.



Identify the correct statements (S).

1. The rate of evolution of hydrogen gas bubbles is not same in all the test tubes.
2. The rate of formation of bubbles is the fastest in the case of magnesium.
3. The reactivity decreases in the order : Mg > Zn > Al > Fe > Cu.
4. In the case of copper, no bubbles are seen and the temperature also remains unchanged. This shows that copper does not react with dilute HCl.

(a) 2 and 4
(b) 3 and 4
(c) Only 3
(d) 1, 2 and 4

Sol : www.cbse.site/sc/cm105

106. Four metals A, B, C and D are tested with water steam and dilute hydrochloric acid and its observation is listed below.

Metal	Reaction with water	Reaction with steam	Reaction with dilute
A	No reaction	reaction	reaction
B	No reaction	No reaction	reaction
C	reaction	reaction	reaction
D	No reaction	No reaction	No reaction

Between which two metals should hydrogen be placed in the series?

(a) A and B
(b) B and D
(c) A and C
(d) C and D

Sol : www.cbse.site/sc/cm106

Direction For Questions (109-110)

Samples of four metals A, B, C and D were taken and added to the following solutions one by one. The results obtained have been tabulated as follows.

Metal	Iron (II) sulphate	Copper (II) sulphate	Zinc sulphate	Silver nitrate
A	No reaction	Displac-ement		
B	Displac-ement		No reaction	
C	No reaction	No reaction	No reaction	Displac-ement
D	No reaction	No reaction	No reaction	No reaction

Use the Table above to answer the following questions about metals A, B, C and D.

107. The most reactive metal is?

(a) A
(b) C
(c) D
(d) B

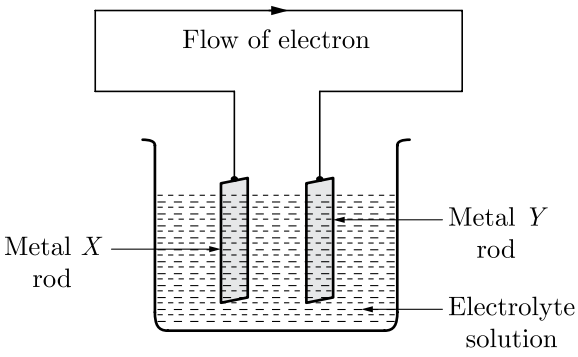
Sol : www.cbse.site/sc/cm107

108. The order of reactivity of metals is

(a) B > A > D > C
(b) B > A > C > D
(c) A > B > C > D
(d) D > A > B > C

Sol : www.cbse.site/sc/cm107

109. Mohit arranged two metal rods in electrolyte solution as shown in the figure and electron flows from metal X to metal Y.



Here, metal X and Y are-

(a) Copper, Zinc

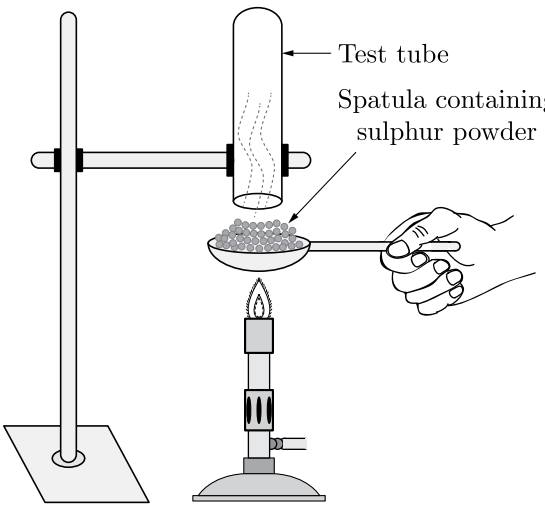
(b) Zinc, Silver

(c) Iron, Aluminium

(d) Iron, Silver

Sol : www.cbse.site/sc/cm108

110. Pratyush took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test tube over it, as shown in figure below.



The balance chemical equation for the reaction taking place will be-

(a) $S + O_2 \rightarrow SO_2$

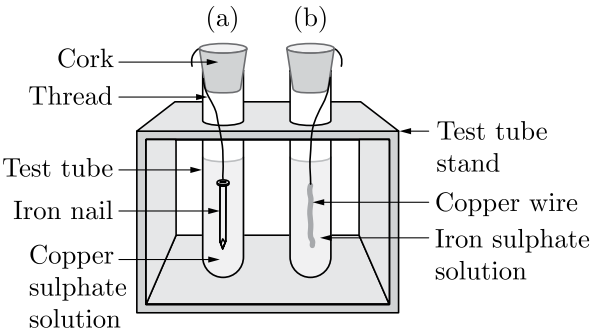
(b) $SO_2 + H_2O \rightarrow H_2SO_3$

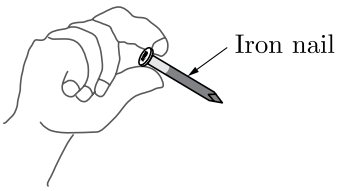
(c) $SO_2 + O_2 \rightarrow SO_4$

(d) Both (a) and (b)

Sol : www.cbse.site/sc/cm109

111. Consider the following figure.





Which of the following reaction take place in first test tube?

(a) $Fe(s) + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Cu(s)$

(b) $Fe(s) + CuSO_3(aq) \longrightarrow FeSO_4(aq) + Cu(s)$

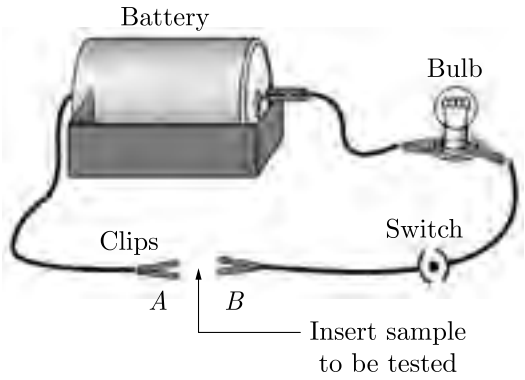
(c) $Fe(s) + CuSO_4(aq) \longrightarrow FeSO_3(aq) + Cu(s)$

(d) $Fe(s) + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Heat$

Sol : www.cbse.site/sc/cm110

112. A student arrange the battery, bulb, switch

and clips as shown in the figure:



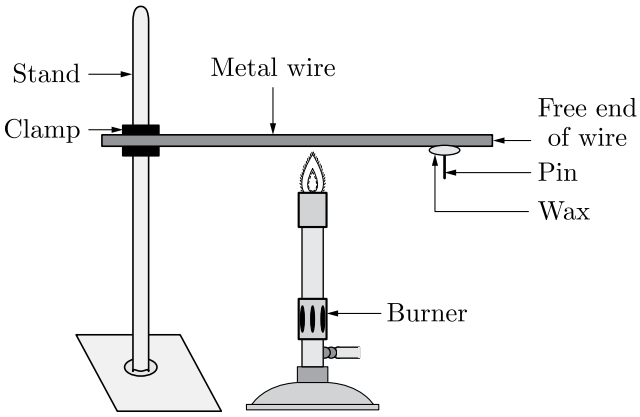
When ..... wire is placed between the terminals A and B. The bulb light up.

1. Copper
2. Aluminium
3. Iron
4. Silver

(a) 1
(b) 2
(c) 3
(d) All of these

Sol : www.cbse.site/sc/cm111

113. A student arrange the following practical setup-



Which of the following metals can be suitable for the experiment?

1. Iron
2. Gallium
3. Caesium
4. Copper

(a) 1 and 4
(b) 1 and 3
(c) 2 and 3
(d) 2 and 4

Sol : www.cbse.site/sc/cm112

114. A man went door to door posing as goldsmith. He promised to bring back the glitter of old and dull gold ornaments. An unsuspecting lady gave a set of gold bangles to him which he dipped in a particular solution. The bangles sparkled like new but their weight was reduced drastically. The lady was upset but after a futile argument the man beat a hasty retreat.
The particular solution is-

(a) Aqua regia
(b) NaCl solution
(c) HCl solution
(d) Nitric acid solution

Sol : www.cbse.site/sc/cm113

Direction For Questions (117-121)

In chemistry a metal is an element that readily forms positive ions and has metallic bonds. A metal is a material that when freshly prepared, polished or fractured, shows a lustrous appearance and conducts electricity and heat relatively well. Metals are typically malleable or ductile.
The table shows the reaction of different metals with water.

Metal	Reaction with water	Reaction with steam
P	None	Mild
Q	Mild	Vigorous
R	Very slow	Vigorous

S	Vigorous	Violent

115. The current order of increasing reactivity of metals is:
(a) $P < R < Q < S$
(b) $P < R < S < Q$
(c) $P < Q < R < S$
(d) $S < Q < R < P$

Sol : www.cbse.site/sc/cm114

116. Which metal is indicated by R?
(a) Mg
(b) Al
(c) Fe
(d) Cu

Sol : www.cbse.site/sc/cm114

117. Which metal can displace R from its salt solution?
(a) P
(b) Q
(c) S
(d) Both (b) and (c)

Sol : www.cbse.site/sc/cm114

118. Which metal is likely to be displaced by R?
(a) P
(b) Q
(c) R
(d) S

Sol : www.cbse.site/sc/cm114

119. Which one of the following metals do not react with cold as well as hot water?
(a) Fe
(b) Na
(c) Ca
(d) Mg

Sol : www.cbse.site/sc/cm114

Direction For Questions (122-126)

All existing matter in our surroundings is made up of basic unit known as elements. Elements are classified into two category i.e., metal can non-metal. All metals are electrical conductors. Many of them have a high density and they are usually ductile and malleable. All these properties influence the way the metals are used. Some metals are sonorous and so they are used for special purposes.

120. 'Sonorous' means:
(a) unique property of non-metals
(b) induce conductivity
(c) having high density
(d) causing sound

Sol : www.cbse.site/sc/cm115

121. Materials that conduct electricity are called:
(a) metal
(b) bad conductors
(c) insulators
(d) non-metal

Sol : www.cbse.site/sc/cm115

122. Which metal shows ductility?
(a) Zinc
(b) Lithium
(c) Magnesium
(d) Copper

Sol : www.cbse.site/sc/cm115

123. Property of metal by which it can be drawn into wire is:
(a) ductility
(b) density
(c) malleability
(d) elasticity

Sol : www.cbse.site/sc/cm115

124. Property of metal by virtue of which it can be beaten into sheets is:
(a) resistivity
(b) ductility
(c) malleability
(d) conductivity

Sol : www.cbse.site/sc/cm115

Direction For Questions (127-131)

Metals are elements that exhibit a variety of physical properties such as those of malleability, ductility, conductivity of heat and electricity, lustre, etc. Due to such properties, metals find usage in purpose such as cooking utensils, machinery, modes of transportation, construction, etc., in our daily life. Metals such as gold and silver have been used in making jewellery since ancient times. Non-metals have been found to exist in all the three states– solid, liquid and gaseous. They are non-malleable, non-ductile and brittle in nature. Non-metals have very low tensile strength and are easily broken up.

125. Which of the following metal(s) will have very low melting point?
(a) Gallium
(b) Caesium
(c) Copper
(d) Both (a) and (b)

Sol : www.cbse.site/sc/cm116

126. The metal which is known as strategic metal is
(a) zirconium
(b) titanium
(c) manganese
(d) all of these

Sol : www.cbse.site/sc/cm116

127. Metals can be given different shapes according to our needs because
(a) they are malleable and ductile
(b) they are sonorous
(c) they are generally hard
(d) they have a shining surface

Sol : www.cbse.site/sc/cm116

128. Which of the following non-metal is a good conductor of electricity?
(a) Oxygen
(b) Nitrogen
(c) Graphite
(d) Bromine

Sol : www.cbse.site/sc/cm116

129. Metals produce a metallic sound. This property of metal is called
(a) malleability
(b) sonority
(c) conductivity
(d) ductility

Sol : www.cbse.site/sc/cm116

Direction For Questions (132-136)

Metals react with non-metals by losing or gaining electrons. They have a give-and-take relation between them. Ionic compounds are usually solid and hard in nature. They

are generally soluble in water and insoluble in solvent like petrol, kerosene, etc. The melting and boiling points of electrovalent compounds are high. In order to change the physical state of the electrovalent compounds (from solid to liquid to gas), a high temperature is needed to overcome the attractive forces.

130. Which of the following properties is not generally exhibited ionic compounds?
(a) Electrical conductivity in molten state
(b) Electrical conductivity in solid state
(c) High melting and boiling points
(d) Solubility in water

Sol : www.cbse.site/sc/cm117

131. Electrovalent compounds are usually solid and hard in nature. This is due to
(a) strong forces of attraction between the oppositely charged ions.
(b) weak forces of attraction between the oppositely charged ions.
(c) strong forces of attraction between the same charged ions.
(d) weak forces of attraction between the similarly charged ions.

Sol : www.cbse.site/sc/cm117

132. Transfer of one or more valence electrons from a metal to non-metal takes place in case of
(a) chemical bonding
(b) molecular bonding
(c) ionic bonding
(d) covalent bonding

Sol : www.cbse.site/sc/cm117

133. Calcium oxide is formed by loosing of electrons to oxygen atoms, the calcium atom has the number of valence electrons as
(a) three
(b) one
(c) four
(d) two

Sol : www.cbse.site/sc/cm117

134. The atomic number of four elements A, B, C, D are 6, 8, 10 and 12 respectively. The two elements which can react to form ionic compounds are:
(a) A and B
(b) C and D
(c) B and D
(d) A and C

Sol : www.cbse.site/sc/cm117

Direction For Questions (137-141)

The reactivity series is a list of metals arranged in the order of their decreasing activities. The metal at the top of the reactivity series is the most reactive and metal at the bottom is the least reactive. The more reactive metal displaces less reactive metal from its salt solution.

Activity series: Relative reactivities of metals

K	Potassium	Most reactive
Na	Sodium	
Ca	Calcium	
Mg	Magnesium	
Al	Aluminium	
Zn	Zinc	Reactivity decreases
Fe	Iron	
Pb	Lead	
H	Hydrogen	
Cu	Copper	
Hg	Mercury	
Ag	Silver	
Au	Gold	Least reactive

135. The metals which react with steam but not with hot water is
(a) Al, Zn, Fe
(b) K, Na, Mg
(c) Ag and Au
(d) Pb and Cu

Sol : www.cbse.site/sc/cm118

136. Non-metals do not displace hydrogen from acids because
(a) they are electron donor
(b) they are electron acceptor
(c) they have low tensile strength
(d) they have low density

Sol : www.cbse.site/sc/cm118

137. $CO_2(g) + H_2O(l) \longrightarrow$
(a) $HCO_3(s)$
(b) $H_2CO_3(aq)$
(c) $HCO_3(aq)$
(d) $H_2CO_3(s)$

Sol : www.cbse.site/sc/cm118

138. Among the following, the correct arrangement of the given metals in ascending order of their reactivity is
Zinc, Iron, Calcium, Potassium
(a) Zinc < Iron < Calcium < Potassium
(b) Potassium < Calcium < Iron < Zinc
(c) Potassium < Zinc < Calcium < Iron
(d) Potassium < Calcium < Zinc < Iron

Sol : www.cbse.site/sc/cm118

139. Which of the following pair of reactants will give displacement reactions?
(a) $FeSO_4$ solution and lead metal
(b) $CuSO_4$ solution and silver metal
(c) NaCl solution and iron metal
(d) $AgNO_3$ solution and Copper metal

Sol : www.cbse.site/sc/cm118

Direction For Questions (142-146)

Alloying is a very good method of improving the properties of a metal. This gives the desired properties of the metal. For example, iron is the most widely used metal. But it is never used in its pure state. This is because pure iron is very soft and stretches easily when hot. But, if it is mixed with a small amount of carbon (about 0.05%), it becomes hard and strong. When iron is mixed with nickel and chromium, we get stainless steel, which is hard and does not rust. Thus, if iron is mixed with some other substance, its properties change. In fact, the properties of any metal can be changed, if it is mixed with some other substance. The substance added may be a metal or a non-metal.

140. Stainless steel which is used for making

cutlery, surgical instruments, etc., has iron mixed with

(a) Cu and Au
(b) Ni and Cu
(c) Cu and Cr
(d) Ni and Cr

Sol : www.cbse.site/sc/cm119

141. Which among the following alloys contain non-metal as one of its constituents?

(a) Brass
(b) Bronze
(c) Amalgam
(d) Steel

Sol : www.cbse.site/sc/cm119

142. Name an alloy of aluminium used in the construction of aircraft.

(a) Duralumin
(b) Solder
(c) Magnalium
(d) Amalgam

Sol : www.cbse.site/sc/cm119

143. An alloy is a/an

(a) compound
(b) element
(c) homogeneous mixture
(d) heterogeneous mixture

Sol : www.cbse.site/sc/cm119

144. Which one of the following alloy(s) contains mercury as one of its constituents?

(a) Stainless steel
(b) Alnico
(c) Zinc amalgam
(d) Solder

Sol : www.cbse.site/sc/cm119

Direction For Questions (147-150)

A metal M reacts vigorously with water to form a solution S and a gag G. The solution S turns red litmus to blue whereas gas G, which is lighter than air, burns with a pop sound. Metal M has a low melting point and is used as a coolant in nuclear reactors.

145. The metal M is:

(a) Sodium
(b) Copper
(c) Iron
(d) Steel

Sol : www.cbse.site/sc/cm120

146. The solution S is:

(a) NaCl
(b) NaOH
(c) $CaCl_2$
(d) CaOH

Sol : www.cbse.site/sc/cm120

147. Here the gas G is:

(a) Hydrogen
(b) Oxygen
(c) Carbon-dioxide
(d) Nitrogen

Sol : www.cbse.site/sc/cm120

148. Which of the following balanced reaction take place here?

(a) $Na + H_2O \longrightarrow Na_2O + H_2$
(b) $2Na + 2H_2O \longrightarrow 2NaOH + H_2$
(c) $2Na + 2H_2O \longrightarrow Na_2O_2 + O_2$
(d) $Na + H_2O \longrightarrow Na_2O_2 + H_2$

Sol : www.cbse.site/sc/cm120

Direction For Questions (151-153)

The arrangement of metals in a vertical column in the decreasing order of their reactivities is called the reactivity series or activity series of metals. The most reactive metal is at the top position of the reactivity series. The least reactive metal is at the bottom of the reactivity series.
Hydrogen, though a non-metal, has been included in the activity series of metals only for comparison. Apart from it, the hydrogen atom also has tendency to lose its valence electron and form cation like the behaviour shown by metals. Thus,

$$H \longrightarrow H^+ + e^-$$

149. Which of the following metal can be displaced by copper from its salt solution?
(a) Mg
(b) Ag
(c) Fe
(d) None of these

Sol : www.cbse.site/sc/cm121

150. An element X after reacting with acids liberate hydrogen gas and can displace lead and tin from their salt solution. Here X is:
(a) Sodium
(b) Iron
(c) Copper
(d) Nickel

Sol : www.cbse.site/sc/cm121

151. Which of the following is the most reactive metal?
(a) Sodium
(b) Iron
(c) Copper
(d) Potassium

Sol : www.cbse.site/sc/cm121

□□□□□□□

CHAPTER 5

Life Processes

Life processes are various essential processes which take place in the body of living beings for their survival. They are also called metabolic processes. These processes are nutrition, respiration, transportation, excretion and reproduction.

5.1 NUTRITION

Nutrition is the breakdown of complex food nutrients into simpler forms and their utilisation to get energy for various processes taking place in the body. It may be of following types:

1. **Autotrophic Nutrition:** Some organisms manufacture their food from simple inorganic compounds. These organism are called autotrophs. They are green plants, some bacteria and some protists.
2. **Chemosynthetic Nutrition:** Non-green autotrophs like iron and sulphur bacteria prepare organic food by using chemical energy released during oxidation of simple inorganic compounds.
3. **Heterotrophic Nutrition:** The organisms obtain ready-made food from plants or animals, dead or alive. All animals, most protists and bacteria are heterotrophs. Heterotropic nutrition may be saprotrophic (fungi), parasitic (Cuscuta, tapeworms, etc.) and holozoic (herbivores, carnivores, omnivores and scavengers).

   Nutrition in unicellular organisms such as Amoeba, takes place through cell surface.

1. In Amoeba food is captured by pseudopodia and gets enclosed in a food vacuole. Digestion occurs inside food vacuole. The digested food diffuses into the cell cytoplasm and undigested part of food is expelled at any point on the body surface.

   Nutrition in multicellular organisms such as human beings takes place through a specialised system called digestive system.

   Human alimentary canal is about 9 metres long tube, from mouth to anus. In mouth, teeth bite, tear, chew and grind the food. Food is mixed thoroughly with saliva secreted by salivary glands and is swallowed with the help of muscular tongue.

   Oesophagus is about 25 cm long muscular tube which passes food from mouth to stomach by its peristaltic movements.
2. Stomach is a muscular bag. It contains gastric glands in its wall that secrete gastric juice, hydrochloric acid (HCl) and mucus. Stomach stores food, churns it into a fine pulp called chyme and mixes gastric juice with it.
3. Small intestine is about 6 metres (20 feet) long and 2.5 cm wide coiled tube. It is the site of complete digestion of food. It receives the secretions from pancreas and liver. It has numerous finger-like projections called villi for absorption of food. The unabsorbed food is passed to large intestine.
4. Large intestine (colon) is about 1.5-1.8 metres (5-6 feet) long and about 6 cm wide tube. It opens outside through anus. Caecum is a small pouch in large intestine which ends into a blind tube called vermiform appendix. In man, it has no function and is a vestigial organ.
5. Salivary glands, liver and pancreas are main digestive glands which help in digestion.

Digestion of food in different parts of alimentary canal takes place by the secretions of digestive glands.

1. In mouth, enzyme salivary amylase present in saliva acts upon the starch of food. Gastric

glands release hydrochloric acid, pepsin and mucus. Hydrochloric acid makes food acidic. It destroys bacteria present in the food. Mucus protects the inner lining of stomach from action of HC1. Pepsin digests proteins.

2. In small intestine, bile juice secreted by liver and stored in a pouch-like organ called gall bladder, makes the medium alkaline for the action of enzymes of pancreatic and intestinal juice and emulsifies fats. Trypsin brings about protein digestion. Lipase acts on emulsified fats and breaks them into fatty acids and glycerol.

In large intestine, the water from undigested food is absorbed and rest is removed from the body through anus.

1. The end products of carbohydrate, fat and protein digestion are glucose, glycerol and fatty acids, and a acids respectively.
2. Glucose and amino acids diffuse into the blood through intestinal wall. Glycerol and fatty acids enter the lymph vessels or lacteals present in villi.

5.2 RESPIRATION

Respiration is the process of oxidation or breaking down of organic compounds (particularly glucose) to obtain energy. Respiration may be

1. Aerobic respiration, in which breakdown of glucose occurs in the presence of oxygen.
2. Anaerobic respiration, in which breakdown of glucose occurs in the absence of oxygen.

Glycolysis is the first step in the breakdown of glucose, common to both types of respiration. It occurs in cytoplasm. During glycolysis, one molecule of glucose (6-carbon molecule) is broken down into two molecules of pyruvic acid or pyruvate (3-carbon molecule) with four molecules of ATP.

1. In the presence of oxygen, pyruvic acid inside the mitochondria is broken down into CO_2, H_2O and energy is released. This process is called Krebs cycle.
2. In the absence of oxygen, pyruvic acid breaks into ethyl alcohol or ethanol (2-carbon molecule), CO_2 and releases energy. It is called anaerobic respiration.
3. In lack (deficiency) of oxygen in muscles, pyruvic acid breaks into lactic acid (3-carbon molecule) and energy, is released.

Respiration in plants occurs through stomata of leaves, through lenticels in older portions of stems and through root hair in roots.

Respiration in unicellular animals (Amoeba, Paramecium) and simple multicellular animals (sponges, coelenterates, planarian and free-living nematodes) occurs as direct respiration and in complex multicellular animals occurs as indirect respiration through skin (frog, earthworm, etc.), gills (fish, molluscs, etc.), air tubes or trachea (insects) book lungs (spider, scorpion) and lungs (vertebrates except fish).

5.2.1 Respiratory System in Man

Air is taken into through nostrils and nasal passages (Nose). They open into the pharynx by internal nares. Hair and mucous lining of nasal passages trap dust and bacteria coming with air and make inhaled air moist.

Trachea opens in pharynx. Its opening in the pharynx called glottis and is guarded by a cartilaginous flap called epiglottis. The wall of trachea is supported with C-shaped cartilaginous rings. Trachea is divided into two primary bronchi.

1. Each primary bronchus enters the lung of its side and divides into secondary and tertiary (segmental) bronchi. A bronchus with its branches is called a bronchial tree.
2. Each segmental bronchus after fine branching, ends in alveolar ducts which open into alveolar sacs.
3. Alveoli have enormous surface area for gaseous exchange and are covered with network of capillaries for rich blood supply.
4. Passage of air in human body is nostrils → Trachea → Bronchi → Alveolar sacs.

The lungs are the main respiratory organs in man. They are a pair of conical, highly spongy, air-filled sacs formed of millions of alveoli. They are enclosed by a double-layered membrane

called pleura and are located inside the air-tight thoracic cavity. The right lung is larger with three lobes while the left lung has just two lobes. Breathing is a mechanical process which is completed in following two steps:

1. **Inspiration:** It is taking in of air. In this process, ribs and sternum are pulled upward, forward and outward, diaphragm flattens increasing the volume of thoracic cavity and causing lungs to expand. Due to this, fresh air from air passages rushes in to fill in the alveoli.
2. **Expiration:** It is expelling of air out of lungs. In this process, ribs and sternum are pulled inward which decreases the volume of thoracic cavity and the air is forced out.
3. Exchange of gases occurs between alveolar air and blood in capillaries inside lung alveoli. Oxygen from the alveolar air diffuses into the blood and carbon dioxide from the blood diffuses into the alveolar air.
4. Transport of respiratory gases occurs by haemoglobin in RBCs of blood which combines with oxygen and forms an unstable compound, oxyhaemoglobin. Oxyhaemoglobin breaks down in the tissues and releases oxygen.
5. Carbon dioxide produced during cellular respiration is removed as bicarbonate dissolved in blood plasma and is carried to the lungs. In lungs, bicarbonate releases CO_2.

5.3 TRANSPORTATION

Transportation is the movement of glucose, oxygen and other organic and inorganic substances from one part of the body to other.

1. In unicellular and simple multicellular organisms, substances move from cell to cell by diffusion.
2. In complex organisms, transport systems arc developed.

5.3.1 Transportation in Plants

1. The upward movement of water and mineral salts from roots to the aerial parts (leaves, branches, flowers, etc.) of the plant against the gravitational force is called ascent of sap. It occurs through xylem tissue throughout the plant body,
2. Root pressure, cohesion-adhesion tension of water molecules and the transpiration pull help in the upward movement of sap from root to the apex of a tree.

The transport of food from leaves to different parts of plant is called as translocation. It is carried out by phloem tissue.

5.3.2 Transportation in Human Beings

In human beings, transportation is carried out by circulatory system. It is composed of blood, blood vessels, heart, lymph and lymph vessels.

5.3.3 Heart – The Pumping Machine

1. Heart is a muscular pumping organ of the size of a fist. It is enclosed in a sac called pericardium, formed of two pericardial membranes.
2. Human heart is four-chambered. It consists of two auricles or atria and two ventricles. Auricles are receiving chambers, whereas ventricles are distributing chambers.
3. Each atrium opens into the ventricle of its side by an atrio-ventricular aperture. A bicuspid valve guards the left atrio-ventricular aperture, whereas a tricuspid valve guards the right atrio-ventricular aperture.
4. Three semilunar pulmonary valves guard the opening of right ventricle into the pulmonary aorta. Three semilunar aortic valves guard opening of left ventricle into aorta.
5. Right auricle receives deoxygenated blood from the body through superior or anterior vena cava or precaval and inferior or posterior vena cava or postcaval.
6. Left auricle receives oxygenated blood from the lungs via four pulmonary veins.
7. Pulmonary trunk arises from the right ventricle and carries deoxygenated blood to the lungs.
8. Aorta or aortic arch arises from the left

ventricle and supplies oxygenated blood to the whole body.
9. In double circulation, separation of deoxygenated and oxygenated blood results in two independent circulations: Pulmonary circulation for the oxygenation of deoxygenated blood and systemic circulation for the supply of oxygenated blood to all body organs.

5.3.4 Heartbeat and Cardiac Cycle

Working of heart includes rhythmic contractions (systole) and relaxations (diastole) of Cardiac cycle is one complete heartbeat which includes one systole and one diastole.

5.3.5 Blood Pressure

The pressure exerted by the blood discharged due to contraction of left ventricle on the wall of blood vessels is called blood pressure.
1. Systolic pressure (120 mm of Hg) is exerted during ventricular contraction (ventricular systole).
2. Diastolic pressure (80 mm of Hg) is exerted during relaxation of ventricle (ventricular diastole).

5.3.6 Blood Vessels

These are of three types:
1. Arteries are distributing vessels. They carry blood from heart to various body organs.
2. Veins are collecting vessels. They collect blood from various parts of the body and carry it to the heart.
3. Capillaries are microscopic vessels which form a link between arteries and veins.

5.3.7 Blood

It is a red-coloured fluid. The fluid matrix of blood is called plasma. Blood cells or corpuscles (RBCs, WBCs and platelets) are suspended in the plasma.

5.3.8 Lymphatic System

The lymphatic system consists of lymph (the fluid), lymph vessels and lymph nodes.
1. Lymph is filtered blood. It is a link between blood and tissue fluid which facilitates exchange of substances between blood and body cells by diffusion. The tissue fluid on entering lymphatic capillaries is called lymph.
2. Lymph vessels are called lymphatics. They form a network in the body. In the intestinal wall, they are called lacteals.
3. Lymph nodes are formed of lymphatic tissue. Thymus and spleen are lymphatic organs. Tonsils and adenoids are masses of lymphatic tissue.

5.4 EXCRETION

Excretion is the removal of harmful and unwanted metabolic wastes from the body.

Osmoregulation is the regulation of osmotic pressure of body fluids by controlling the amount of water and salts in the body.

5.4.1 Excretion in Plants

Waste products in plants are tannins, resins, gums, alkaloids, essential oils, salt crystal, etc. They are deposited in old and non-functional xylem, older leaves which are soon shed off, dead cells of bark, etc. The plants living in saline habitats excrete excess of salts.

5.4.2 Excretion in Animals

In unicellular animals, ammonia and carbon dioxide diffuse out of their body by simply diffusion.

Excretion in man occurs by one pair of kidneys located in the abdominal cavity. Kidneys form urine, remove nitrogenous wastes, excess of water and salts from the blood. Blood enters Kidneys for filtration through a pair of renal arteries and a pair of renal veins collects filtered blood from kidneys.

Nephrons or uriniferous tubules are bask filtration units of kidney.
1. The cup-like hollow proximal part of each nephron is known as Bowman's capsule. It is filled with a tuft of blood capillaries called

glomerulus. The glomerulus and Bowman's capsule collectively form a Malpighian body which acts as ultrafilters. The blood while passing through glomerular capillaries is filtered under pressure and the filtrate is collected in the cavity of Bowman's capsule.

2. The remaining tubular part of nephron has Proximal Convoluted Tubule (PCT), U-shaped Henle's Loop and Distal Convoluted Tubule (DCT). The distal convoluted tubule opens into the collecting tubule which finally opens into pelvis part of ureter. All parts of renal tubule are covered with a network of peritubular capillaries.

5.4.3 Urine Formation

Urine formation involves following steps:

1. **Ultrafiltration:** Water and dissolved substances such as urea, uric acid, glucose, amino acids, some vitamins and inorganic salts are filtered from the blood flowing under pressure in glomerular capillaries and form nephric or glomerular filtrate.
2. **Selective Reabsorption:** Useful substances (glucose, all amino acids, some inorganic salts and most water) are reabsorbed from nephric filtrate into the blood.
3. **Tubular Secretion:** The excretory products such as creatinine and potassium are secreted from the blood into the nephric filtrate by diffusion.
4. This way nephric filtrate changes into urine which is a straw-coloured liquid due to presence of urochrome. It contains water and dissolved solids.

Urine is collected in the urinary bladder. It is released periodically to the exterior through urethra.

□□□□□□□

MULITIPLE CHOICE QUESTIONS

1. To differentiate a living from non-living the movement of ..... is needed.
(a) Molecular structure
(b) Non-static movement
(c) In organic structure
(d) Movement

Sol : www.cbse.site/sc/fm101

2. The maintenance functions of living organisms must go on even when they are not doing
(a) Anything particular
(b) Sleeping
(c) Moving at constant speed
(d) Hibernation

Sol : www.cbse.site/sc/fm102

3. Life process involves:
(a) Continuous process of maintaining functions of living organism.
(b) All the activities being performed during life cycle of an organism.
(c) Generation of energy for the purpose of metabolism.
(d) Differs from individual to individual.

Sol : www.cbse.site/sc/fm103

4. Various maintenance processes are needed to:
(a) Survival
(b) Prevent damage and break down
(c) Routine process
(d) Release energy

Sol : www.cbse.site/sc/fm104

5. If the body size of the organisms is to grow:
(a) Additional carbon based food or raw material is needed.
(b) Needs more energy to expand.
(c) Have to go through complex process which sometimes is not possible.
(d) Needs lots of cell formation.

Sol : www.cbse.site/sc/fm105

6. Due to the complexities of carbon sources, different organism use:
(a) Different kinds of nutritional processes
(b) Different kind of growing processes
(c) Different kind of metabolism
(d) Different kind of cell structure

Sol : www.cbse.site/sc/fm106

7. Since the environment is not under the control of the individual organism, the outside source of energy is quite:
(a) Varied
(b) Same
(c) Differ from case to case
(d) Under the control of organism

Sol : www.cbse.site/sc/fm107

8. All the sources of energy need to be broken down in the body and converted into:
(a) Uniform energy
(b) Molecular energy
(c) Chemical reactions
(d) Digestive process

Sol : www.cbse.site/sc/fm108

9. Those reactions which are most common chemical means to break-down molecules are:
(a) Oxidizing-reducing reactions
(b) Hibernation
(c) Chemical reaction
(d) Needed for well being

Sol : www.cbse.site/sc/fm109

10. The process of break-down of food sources for cellular needs is known as
(a) Respiration
(b) Molecular breakup
(c) Excretion
(d) Molecular process

Sol : www.cbse.site/sc/fm110

11. Which statement is not correct for single celled organism:
(a) no specific organs for taking in food needed.
(b) exchange of gases or removal of wastes may be needed.
(c) single cell organisms are the newest form of life.
(d) entire surface of the organism is in contact with the environment.

Sol : www.cbse.site/sc/fm111

12. The reason for single cell diffusion inefficiency in multicellular organism is
(a) Cell diffusion is a complex process
(b) Big size and complex body designs
(c) Cell diffusion requires lots of time
(d) Cell diffusion is rather a simple process to be carried out in multi cell organism

Sol : www.cbse.site/sc/fm112

13. In multi-cellular organisms, various body parts have specialized in the functions they

perform with the help of:
(a) Specialized cells
(b) Multiple organs
(c) Multiple structure
(d) Specialized tissues

Sol : www.cbse.site/sc/fm113

14. The uptake of food and of oxygen in body is done with the help of:
(a) Specialized tissues
(b) Specialized cells
(c) Multiple organs
(d) None of the above

Sol : www.cbse.site/sc/fm114

15. Various chemical reactions in body use ..... for energy generation.
(a) Nitrogen and carbon
(b) Oxygen
(c) Carbon sources and oxygen
(d) None of the above

Sol : www.cbse.site/sc/fm115

16. The process by which all the by products discarded from the body is known as:
(a) Respiration
(b) Sweating
(c) Excretion
(d) None of the above

Sol : www.cbse.site/sc/fm116

17. Choose the incorrect statement:
(a) We don't need energy while not doing any activity
(b) We release energy and feel tired while doing various activities
(c) Energy is needed to maintain the state of body
(d) Our body need to synthesize protein to develop

Sol : www.cbse.site/sc/fm117

18. Organisms which uses simple food material obtained from inorganic sources in the form of carbon dioxide and water are:
(a) Single cell organism
(b) Multi cell organism
(c) Virus
(d) Autotrophs

Sol : www.cbse.site/sc/fm118

19. Various organism breakdown the complex substances into simpler one with the help of:
(a) Multiple organs
(b) Small and large intestine
(c) Enzymes
(d) Bacteria

Sol : www.cbse.site/sc/fm119

20. Bio catalysts are also known as:
(a) Enzymes
(b) Autotrophs
(c) Heterotrophs
(d) Excretory tissue

Sol : www.cbse.site/sc/fm120

21. The heterotrophs survival depends directly

or indirectly on:
(a) Surroundings
(b) Ecology and surrounding
(c) Autotrophs
(c) Molecular structure

Sol : www.cbse.site/sc/fm121

22. Heterotrophic organisms include
(a) Animals and fungi
(b) Plants
(c) Bacteria and fungus
(d) Fungus only

Sol : www.cbse.site/sc/fm122

23. Autotrophic organism requires ..... for their survival.
(a) only carbon dioxide
(b) water and sunlight
(c) both (a) and (b)
(d) None of the Above

Sol : www.cbse.site/sc/fm123

24. The process by which autotrophic organism fulfill their energy requirement is known as
(a) Respiration
(b) Transpiration
(c) Photosynthesis
(d) Excretion

Sol : www.cbse.site/sc/fm124

25. The process by which autotrophs take in substances from the outside and convert them into stored forms of energy is known as
(a) Photosynthesis
(b) Respiration
(c) Molecular breakup
(d) Cell diffusion

Sol : www.cbse.site/sc/fm125

26. Autotrophic organism converts of carbon dioxide and water into carbohydrates in the presence of
(a) Sunlight and carbon dioxide
(b) Sunlight and chlorophyll
(c) Carbon dioxide and Nitrogen
(d) Chlorophyll and carbon dioxide

Sol : www.cbse.site/sc/fm126

27. ..... are utilised for providing energy to the plants.
(a) Carbohydrates
(b) Enzymes
(c) Protein
(d) Carbon dioxide

Sol : www.cbse.site/sc/fm127

28. Following form of energy acts as internal energy reserve for plants
(a) Protein
(b) Carbohydrates
(c) Starch
(d) Fructose

Sol : www.cbse.site/sc/fm128

29. Human body stores energy in form of:
(a) Glucose
(b) Insulin
(c) glycogen
(d) Fructose

Sol : www.cbse.site/sc/fm129

30. During the process of photosynthesis,

absorption of light energy is done by
(a) Leaf
(b) Midrib
(c) Vein
(d) Chlorophyll

Sol : www.cbse.site/sc/fm130

31. Process of conversion of light energy to chemical energy and splitting of water molecules into hydrogen and oxygen in plants is known as
(a) Photosynthesis
(b) Photoperiodism
(c) Plant nutrition
(d) Plant hormone functions

Sol : www.cbse.site/sc/fm131

32. Which plants take up carbon dioxide at night and prepare an intermediate?
(a) Desert plants
(b) Bamboo
(c) Coattails
(d) Palm tree

Sol : www.cbse.site/sc/fm132

33. The green organelle on surface of leaves containing chlorophyll are known as
(a) Xylem
(b) Epidermis
(c) Chloroplasts
(d) Vascular bundle

Sol : www.cbse.site/sc/fm133

34. Tiny pores present on the surface of the leaves are known as
(a) Chloroplasts
(b) Xylem
(c) Guard cell
(d) Stomata

Sol : www.cbse.site/sc/fm134

35. Massive amounts of gaseous exchange takes place in the leaves through stomata for the purpose of
(a) Photosynthesis
(b) Carrying carbon dioxide
(c) Reduction of carbon dioxide
(d) Generation of carbohydrates

Sol : www.cbse.site/sc/fm135

36. The exchange of gases in plants can be done through
(a) Surface of plant
(b) Roots
(c) Leaves
(d) All of the above

Sol : www.cbse.site/sc/fm136

37. The purpose of closing the pores by the plants when it doesn't need photosynthesis is
(a) To save the water
(b) To save energy
(c) To save food
(d) None of the above

Sol : www.cbse.site/sc/fm137

38. The opening and closing of the leaf pores is a function of the
(a) Guard cells
(b) Stomata
(c) Chloroplast
(d) Vascular bundle

Sol : www.cbse.site/sc/fm138

39. The reason for swelling of guard cell is due to the presence of
(a) Sunlight
(b) Food
(c) Water
(d) Carbon dioxide

Sol : www.cbse.site/sc/fm139

40. ..... is an essential element used in the synthesis of proteins and other compounds in plants.
(a) Oxygen
(b) Water
(c) Nitrogen
(d) Carbon dioxide

Sol : www.cbse.site/sc/fm140

41. Most of the plant's nitrogen, phosphorus, iron and magnesium are taken up from the
(a) Aquatic sources
(b) Soil
(c) Mountains
(d) Sea water

Sol : www.cbse.site/sc/fm141

42. Inorganic nitrates or nitrites helps the plants for the synthesis of:
(a) Carbohydrates
(b) Nitrogen
(c) Carbon dioxide
(d) Protein

Sol : www.cbse.site/sc/fm142

43. Atmospheric nitrogen is converted into organic matter by with plant with the help of
(a) Bacteria
(b) Organic compounds
(c) Air born viruses
(d) Fertilizers

Sol : www.cbse.site/sc/fm143

44. Each organism is adapted to its environment, the type of nutrition taken by them depends on
(a) Environment
(b) Availability of food
(c) How it is obtained by the organism
(d) All of the above

Sol : www.cbse.site/sc/fm144

45. Organism who break down the food outside their body are
(a) Fungi
(b) Virus
(c) Tape worm
(d) None of the above

Sol : www.cbse.site/sc/fm145

46. Organisms which derive nutrition from plants or animals without killing them are
(a) Ticks
(b) Yeast
(c) Mushroom
(d) Fungi

Sol : www.cbse.site/sc/fm146

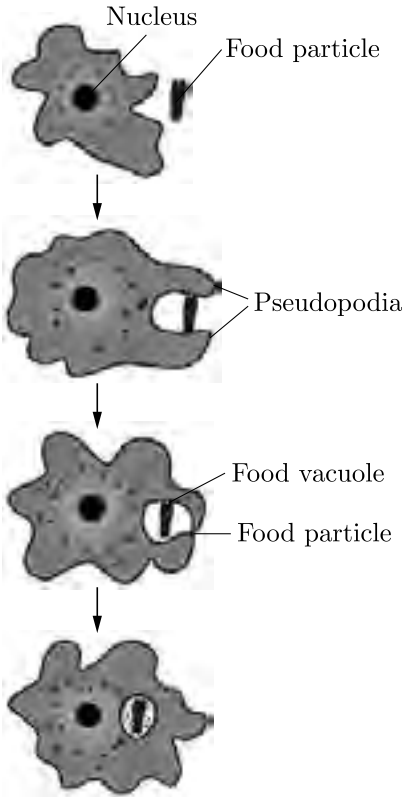
47. Single cell organism take food by their
(a) Entire surface
(b) Food vacuole
(c) Nucleus
(d) Pseudopodia

Sol : www.cbse.site/sc/fm148

48. The broken down food into simpler form in amoeba is diffused into
(a) Cytoplasm
(b) Ribosome
(c) DNA
(d) Mesosome

Sol : www.cbse.site/sc/fm149

49. Identify the micro-organism whose nutrition type is shown below :



(a) Food bacteria
(b) Yeast
(c) Fungus
(d) Amoeba

Sol : www.cbse.site/sc/fm147

50. The undigested material is ..... in some micro-organism.
(a) Absorbed in the surface
(b) Thrown out
(c) Helps for further growth
(d) None of the above

Sol : www.cbse.site/sc/fm150

51. Some unicellular organism like paramoecium take food at a
(a) Specific spot
(b) Entire surface
(c) Nucleus
(d) Food vacuole

Sol : www.cbse.site/sc/fm151

52. The alimentary canal in human beings is extended from:
(a) Small intestine to large intestine
(b) Entire large intestine
(c) Small intestine to anus
(d) Mouth to anus

Sol : www.cbse.site/sc/fm152

53. "Water" like fluid in our mouth is secreted by
(a) Pancreas
(b) Thyroid
(c) Pituitary
(d) Salivary gland

Sol : www.cbse.site/sc/fm153

54. The enzyme that break down starch into simpler form is known as
(a) Salivary amylase
(b) Lipase
(c) Maltase
(d) Trypsin

Sol : www.cbse.site/sc/fm154

55. The digestion in stomach is taken care by the ..... which is present in the wall of the stomach.
(a) Gastric glands
(b) Digestive juices
(c) Salivary amylase
(d) Lipase

Sol : www.cbse.site/sc/fm155

56. From the mouth the food is taken to the stomach through ..... .
(a) Bile duct
(b) Pancreas
(c) Diaphragm
(d) Oesophagus

Sol : www.cbse.site/sc/fm156

57. Hydrochloric acid facilitates the action of ..... .
(a) keratin
(b) collagen
(c) elastin
(d) pepsin

Sol : www.cbse.site/sc/fm157

58. Identify the secretion inside the stomach which helps to protect the inner lining of stomach from the action of acid
(a) Mucus
(b) Hydrochloric acid
(c) Digestive juices
(d) Enzymes

Sol : www.cbse.site/sc/fm158

59. The function of sphincter muscle is to
(a) Regulate digestive process
(b) Improves digestion
(c) Release digestive juices
(d) Regulate exit of food

Sol : www.cbse.site/sc/fm159

60. The ..... delivers the digestive juice to the small intestine through small tubes called ducts.
(a) Stomach
(b) Pancreas
(c) Large intestine
(d) Anus

Sol : www.cbse.site/sc/fm160

61. The longest part of alimentary canal in human body is
(a) Small intestine
(b) Large intestine
(c) Food pipe
(d) None of the above

Sol : www.cbse.site/sc/fm161

62. Which body organ is responsible for the complete digestion of carbohydrates, fats and protein?
(a) Stomach
(b) Large intestine
(c) Liver
(d) Small intestine

Sol : www.cbse.site/sc/fm162

63. The food coming from the stomach is ..... .
(a) Alkaline
(b) Acidic
(c) Neutral
(d) None of these

Sol : www.cbse.site/sc/fm163

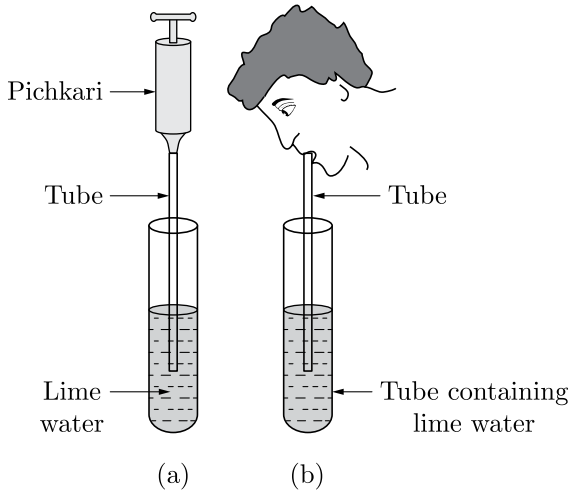
64. The inner lining of the ..... has numerous finger-like projections called villi which increase the surface area for absorption.
(a) small intestine
(b) large intestine
(c) stomach
(d) pancreas

Sol : www.cbse.site/sc/fm164

65. Tooth decay will NOT be prevented by ..... .
(a) regular brushing
(b) regular flossing
(c) regular visits to the dentist
(d) increasing the consumption of sucrose

Sol : www.cbse.site/sc/fm165

66. In the given activity, the lime water of which test tube will get milky faster?



(a) Test tube (a)
(b) Test tube (b)
(c) Both test tube will take same time
(d) Can't say

Sol : www.cbse.site/sc/fm166

67. Which gas turns lime water milky?
(a) Oxygen
(b) Hydrogen
(c) Carbon dioxide
(d) Nitrogen

Sol : www.cbse.site/sc/fm167

68. This process of break-down of glucose, a six-carbon molecule, into a three-carbon molecule pyruvate, takes place in
(a) Cytoplasm
(b) Mitochondria
(c) Golgi bodies
(d) Endoplasmic reticulum

Sol : www.cbse.site/sc/fm168

69. What is "Fermentation"?
(a) The process of break-down of glucose, a six-carbon molecule, into a three-carbon molecule pyruvate.
(b) The breakdown of organic substances by organisms to release energy in the absence of oxygen.
(c) The breakdown of organic substances by organisms to release energy in the presence of oxygen.
(d) None of the above

Sol : www.cbse.site/sc/fm169

70. Breakdown of pyruvate using oxygen takes place in the
(a) Cytoplasm
(b) Mitochondria
(c) Golgi bodies
(d) Endoplasmic reticulum

Sol : www.cbse.site/sc/fm170

71. What causes cramps in our muscles during

sudden activity?

(a) The pyruvate gets converted into lactic acid to release of energy.

(b) The pyruvate gets converted into carbon dioxide to release of energy.

(c) The pyruvate gets converted into ethanol to release of energy.

(d) The pyruvate gets converted into glucose to release of energy.

Sol : www.cbse.site/sc/fm171

72. Pyruvate is a-

(a) three-carbon molecule

(b) four-carbon molecule

(c) five-carbon molecule

(d) six-carbon molecule

Sol : www.cbse.site/sc/fm172

73. During the process of respiration in plants, the direction of diffusion of oxygen and carbon dioxide depends upon

(a) the environmental conditions

(b) the requirements of the plant

(c) both (a) and (b)

(d) none of these

Sol : www.cbse.site/sc/fm173

74. The rate of breathing in aquatic organisms is much faster than that seen in terrestrial organisms, because-

(a) the amount of dissolved oxygen in water is fairly high as compared to the amount of oxygen in the air.

(b) the amount of dissolved oxygen in water is fairly low as compared to the amount of oxygen in the air.

(c) aquatic organisms need more oxygen to breath.

(d) aquatic organisms do not have proper organs for breathing.

Sol : www.cbse.site/sc/fm174

75. ..... helps in preventing the collapse of the air passage during breathing.

(a) Nostrils

(b) Mucus

(c) Lungs

(d) Rings of cartilage

Sol : www.cbse.site/sc/fm175

76. The respiratory route of air in the respiratory tract of human is:

(a) nostrils → pharynx → larynx → trachea → alveoli.

(b) alveoli → pharynx → larynx → trachea → nostrils.

(c) alveoli → larynx → trachea → pharynx → nostrils.

(d) nostrils → trachea → pharynx → larynx → alveoli.

Sol : www.cbse.site/sc/fm176

77. Normal range of haemoglobin content in human beings is-

(a) For men, 12.0 to 15.5 grams per decilitre. For women, 13.5 to 17.5 grams per decilitre.

(b) For men, 13.5 to 17.5 grams per decilitre. For women, 12.0 to 15.5 grams per decilitre.

(c) For men, 10.5 to 17.5 grams per decilitre. For women, 10.0 to 15.5 grams per decilitre.

(d) For men, 15.5 to 20.5 grams per decilitre. For women, 12.0 to 15.5 grams per decilitre.

Sol : www.cbse.site/sc/fm177

78. What type of tissue is blood?
(a) muscle tissue
(b) nervous tissue
(c) fluid connective tissue
(d) epithelial tissue

Sol : www.cbse.site/sc/fm178

79. Blood consists of a fluid medium called ..... in which the cells are suspended.
(a) Plasma
(b) RBCs
(c) Platelets
(d) WBCs

Sol : www.cbse.site/sc/fm179

80. Oxygen is carried by the ..... cells.
(a) white blood cells
(b) red blood cells
(c) muscle cells
(d) nerve cells

Sol : www.cbse.site/sc/fm180

81. The function of valves present in auricles and ventricles is-
(a) It ensures that the blood flows only in one direction.
(b) Helps in coagulation of blood
(c) Destroy the worn out blood cells
(d) Measure pressure of body fluids

Sol : www.cbse.site/sc/fm181

82. The vein which brings clean blood from the lungs into the heart is known as:
(a) Pulmonary vein
(b) Hepatic vein
(c) Superior vena cava
(d) Pulmonary artery

Sol : www.cbse.site/sc/fm182

83. In higher vertebrates, systemic circulation takes place between ..... .
(a) body parts and lungs
(b) body parts and heart
(c) heart and body parts
(d) lungs and heart

Sol : www.cbse.site/sc/fm183

84. The upper two chambers of the heart are called ..... .
(a) aorta
(b) auricles
(c) septa
(d) ventricles

Sol : www.cbse.site/sc/fm184

85. Contraction of auricles of the heart is called ..... .
(a) Systole
(b) Diastole
(c) Heart beat
(d) Hypertension

Sol : www.cbse.site/sc/fm185

86. Which instrument is used to measure blood pressure?
(a) Thermometer
(b) Electrocardiograph

(c) Pulse recorder
(d) Sphygmomanometer

Sol : www.cbse.site/sc/fm186

87. Amphibians or many reptiles have ..... hearts.
(a) two-chambered
(b) three-chambered
(c) four-chambered
(d) five-chambered

Sol : www.cbse.site/sc/fm187

88. Cells formed in the bone marrow are .....
(a) Erythrocytes only
(b) Leucocyte only
(c) Both erythrocytes and leucocyte
(d) Platelets and blood cells

Sol : www.cbse.site/sc/fm188

89. The normal rate of heart beat in an adult is ..... per minute.
(a) 67 times
(b) 72 times
(c) 90 times
(d) 100 times

Sol : www.cbse.site/sc/fm189

90. Arteries are the vessels which carry blood away from the
(a) Various body parts to the heart
(b) Heart to various organs of the body
(c) Heart to lungs
(d) Lungs to heart

Sol : www.cbse.site/sc/fm190

91. Which part of blood helps in clotting?
(a) WBCs
(b) RBCs
(c) Platelets
(d) Plasma

Sol : www.cbse.site/sc/fm191

92. Arteries and veins are connected by a network of extremely narrow tubes called:
(a) Sieve tubes
(b) Capillaries
(c) Vena cava
(d) Valves

Sol : www.cbse.site/sc/fm192

93. The pulmonary artery arises from the ..... .
(a) right auricle
(b) left auricle
(c) left ventricle
(d) right ventricle

Sol : www.cbse.site/sc/fm193

94. Heart is surrounded and protected by ..... .
(a) Retro peritoneum
(b) Muscles
(c) Pericardium
(d) Lungs

Sol : www.cbse.site/sc/fm194

95. The valve that prevents backward flow of blood from the left auricle to the right auricle is the ..... .
(a) mitral valve
(b) auriculoventricular valve
(c) tricuspid valve

(d) semilunar valve

Sol : www.cbse.site/sc/fm195

96. The chief function of lymph in a mammalian body is to ..... .
(a) destroy the worn out blood cells
(b) produce leucocyte
(c) destroy pathogens
(d) produce a hormone

Sol : www.cbse.site/sc/fm196

97. The number of chambers in a human heart is ..... .
(a) 3
(b) 2
(c) 4
(d) 5

Sol : www.cbse.site/sc/fm197

98. The colour of blood plasma is:
(a) Red
(b) Pale yellow
(c) Yellowish green
(d) Pink

Sol : www.cbse.site/sc/fm198

99. The only reptile having 4 chambered heart is:
(a) Snake
(b) Turtle
(c) Lizard
(d) Crocodile

Sol : www.cbse.site/sc/fm199

100. What is normal blood pressure in humans?
(a) 120/80 mm of Hg
(b) 130/60 mm of Hg
(c) 140/70 mm of Hg
(d) 140/ 90 mm of Hg

Sol : www.cbse.site/sc/fm200

101. Thrombocytes is another name for
(a) Red corpuscles
(b) Platelets
(c) Plasma
(d) White blood corpuscles

Sol : www.cbse.site/sc/fm201

102. Vitamin ..... helps in blood clotting.
(a) Vitamin A2
(b) Vitamin B
(c) Vitamin E4
(d) Vitamin K

Sol : www.cbse.site/sc/fm202

103. The richest natural source of minerals for plants is ..... .
(a) chemical fertilizers
(b) soil
(c) air
(d) water

Sol : www.cbse.site/sc/fm203

104. Chlorophyll-containing organs of plant are-
(a) Stem
(b) Roots
(c) Leaves
(d) Flowers

Sol : www.cbse.site/sc/fm204

105. The ..... moves water and minerals

obtained from the soil.

(a) phloem
(b) xylem
(c) parenchyma
(d) collenchyma

Sol : www.cbse.site/sc/fm205

106. The water which is lost through the stomata is replaced by

(a) water from the xylem vessels in the leaf
(b) water from the phloem vessels in the leaf
(c) water from the veins in the leaf
(d) none of the above

Sol : www.cbse.site/sc/fm206

107. The effect of root pressure in transport of water is more important at

(a) day time
(b) night time
(c) both (a) and (b)
(d) none of these

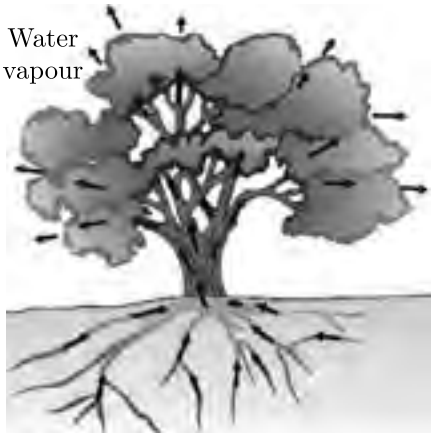
Sol : www.cbse.site/sc/fm207

108. Transpiration helps :

(a) in the absorption
(b) in the upward movement of water minerals dissolved in it from roots to the leaves
(c) in temperature regulation
(d) All of the above

Sol : www.cbse.site/sc/fm208

109. Which process is shown by the following picture?



(a) Movement of food during photosynthesis in a tree
(b) Movement of water during transpiration in a tree
(c) Movement of minerals during in a tree
(d) Movement of carbon dioxide during in a tree

Sol : www.cbse.site/sc/fm209

110. Trans location is the process in which plants deliver:

(a) minerals from leaves to other parts of the plant
(b) plant growth hormones from leaves to other parts of the plant
(c) water and organic substance from leaves to other parts of the plant
(d) all of the above

Sol : www.cbse.site/sc/fm210

111. The trans location of food and other substances takes place in the sieve tubes with the help of adjacent companion cells in :

(a) upward directions
(b) downward directions
(c) both upward and downward directions

(d) none of these

Sol : www.cbse.site/sc/fm211

112. Which of the following substance is obtained from the soil by the plants:
(a) oxygen
(b) carbon dioxide
(c) nitrogen
(d) all of the above

Sol : www.cbse.site/sc/fm212

113. When the materials like sucrose are transferred to phloem tissue, the osmotic pressure of the tissue ..... leading to ..... of water into/from it.
(a) Increases, entry
(b) Decreases, entry
(c) Increases, exit
(d) Decreases, exit

Sol : www.cbse.site/sc/fm213

114. Plants use the energy stored in ATP to accomplish the process of transportation of
(a) Water and minerals
(b) Carbon dioxide
(c) Oxygen
(d) Food

Sol : www.cbse.site/sc/fm214

115. ..... helps in trans location of food in plants.
(a) Xylem
(b) Phloem
(c) Palisade cells
(d) Root hairs

Sol : www.cbse.site/sc/fm215

116. The process of movement of solvent particles from region of less solute concentration to region of high solute concentration through semi permeable membrane is called .....
(a) Diffusion
(b) Osmosis
(c) Transpiration
(d) Translocation

Sol : www.cbse.site/sc/fm216

117. The biological process involved in the removal of these harmful metabolic wastes from the body is called
(a) Photosynthesis
(b) Respiration
(c) Excretion
(d) Translocation

Sol : www.cbse.site/sc/fm217

118. The excretory system of human beings includes a pair of kidneys, a pair of ureters, a urinary bladder and a urethra
(a) a pair of kidneys, a pair of ureters
(b) a urinary bladder and a urethra
(c) a pair of kidneys, a urinary bladder and a urethra
(d) a pair of kidneys, a pair of ureters, a urinary bladder and a urethra

Sol : www.cbse.site/sc/fm218

119. The purpose of making urine is to:
(a) filter out waste products from the blood
(b) filter out minerals from the blood
(c) filter out water from the blood
(d) none of these

Sol : www.cbse.site/sc/fm219

120. Choose the correct pathway of urine in our body-
(a) Kidney → ureter → urethra → urinary bladder
(b) Kidney → Ureter → urinary bladder → urethra
(c) Kidney → urinary bladder → urethra → Ureter
(d) Kidney → urethra → Ureter → urinary bladder

Sol : www.cbse.site/sc/fm222

121. Which of the main toxic waste that kidney filters from blood?
(a) Ammonia
(b) Uric acid
(c) Urea
(d) Water

Sol : www.cbse.site/sc/fm223

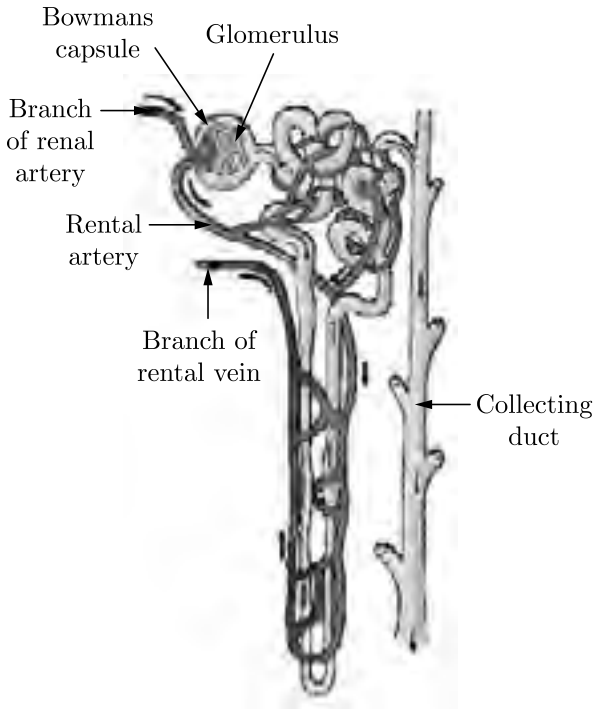
122. The functional unit of kidney is:
(a) Nephron
(b) Neuron
(c) Glomerulus
(d) Bowman's Capsule

Sol : www.cbse.site/sc/fm224

123. Just as CO_2 is removed from the blood in the lungs, nitrogenous waste such as urea or uric acid are removed from blood in the -
(a) Kidney
(b) Urinary bladder
(c) Urethra
(d) Ureters

Sol : www.cbse.site/sc/fm220

124. The given diagram is the structure of a/an-



(a) Alimentary canal
(b) Respiratory tract
(c) Nephron
(d) Small intestine

Sol : www.cbse.site/sc/fm221

125. An artificial kidney is a device to remove nitrogenous waste products from the blood through-
(a) Diaphragm
(b) Dialysis
(c) ECG
(d) Electrolysis

Sol : www.cbse.site/sc/fm225

126. Normally, in a healthy adult, the initial filtrate in the kidneys is about :
(a) 100 L/day
(b) 150 L/day
(c) 180 L/day
(d) 200 L/day

Sol : www.cbse.site/sc/fm226

127. Sweating is meant for:
(a) Regulation of body temperature
(b) Removal of excess salt
(c) Removal of excess water
(d) All of the above

Sol : www.cbse.site/sc/fm227

128. Oxygen is a waste product generated during ..... in plants.
(a) Respiration
(b) Photosynthesis
(c) Both respiration and photosynthesis
(d) None of the above

Sol : www.cbse.site/sc/fm228

129. Many-plant waste products are stored in:
(a) Chloroplast
(b) Mitochondria
(c) Cellular vacuoles
(d) Cytoplasm

Sol : www.cbse.site/sc/fm229

130. Which one of the following is the final product of photosynthesis?
(a) Mineral salt
(b) Starch
(c) Fat
(d) Protein

Sol : www.cbse.site/sc/fm230

131. What is the mode of nutrition in fungi?
(a) Parasitic
(b) Autotrophic
(c) Heterotrophic
(d) Saprophytic

Sol : www.cbse.site/sc/fm231

132. How many pairs of salivary glands are found in humans?
(a) Four
(b) Two
(c) Three
(d) Six

Sol : www.cbse.site/sc/fm232

133. Proteins $\xrightarrow{A}$ Peptones
Identify the enzyme A involved in the above reaction.
(a) Lipase
(b) Pepsin
(c) Bile juice
(d) Salivary amylase

Sol : www.cbse.site/sc/fm233

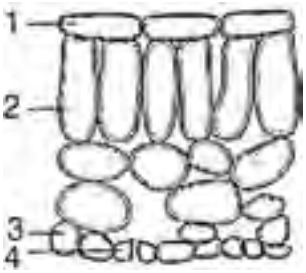
134. In photosynthesis, which substances are used up, which are produced and which are necessary, but remain unchanged after the reaction?

	Used up	**Produced**	**Remain Unchanged**
(a)	Water	Oxygen	Chlorophyll
(b)	Oxygen	Starch	Cellulose
(c)	Carbon dioxide	Water	Oxygen
(d)	Chlorophyll	Carbon dioxide	Water

Sol : www.cbse.site/sc/fm234

135. The diagram shows the arrangement of cells inside the leaf of a green plant. (No

cell contents are shown).
Which of the following cells normally contain chloroplasts?



(a) 2 and 4
(b) 2 and 3
(c) 1 and 2
(d) 1 and 4

Sol : www.cbse.site/sc/fm235

136. Choose the forms in which most plants absorb nitrogen:
1. Atmospheric nitrogen
2. Proteins
3. Nitrates and nitrites
4. Urea

Choose the correct option.
(a) 1 and 4
(b) 3 and 4
(c) 1 and 2
(d) 2 and 3

Sol : www.cbse.site/sc/fm236

137. When a person eats some egg white, proteins and water enter the stomach. Which substances are found leaving the stomach and leaving the small intestine?

	Leaving the Stomach	**Leaving the Small Intestine**
(a)	Protein, amino acids and water	Water
(b)	Amino acids and water	Amino acids and water
(c)	Fatty acids, glycerol and water	Fatty acids, glycerol and water
(d)	Protein and water	Fatty acids and glycerol

Sol : www.cbse.site/sc/fm237

138. Only two of the following Statements accurately describe what happens in the mouth.
1. Amylase breaks down large starch molecules into smaller maltose molecules.
2. Chewing increases the surface area of food for digestion.
3. Saliva emulsifies fats into smaller droplets.
4. Teeth breakup large insoluble molecules into smaller soluble molecules.

Which statements are correct?
(a) 1 and 2
(b) 2 and 3
(c) 3 and 4
(d) 1 and 4

Sol : www.cbse.site/sc/fm238

139. The process of conversion of glucose into pyruvic acid occurs in
(a) chloroplast
(b) mitochondria
(c) outside the cell
(d) cytoplasm

Sol : www.cbse.site/sc/fm239

140. During vigorous physical exercise, lactic acid is formed from glucose inside the muscle cells because

(a) there is excess of carbon dioxide

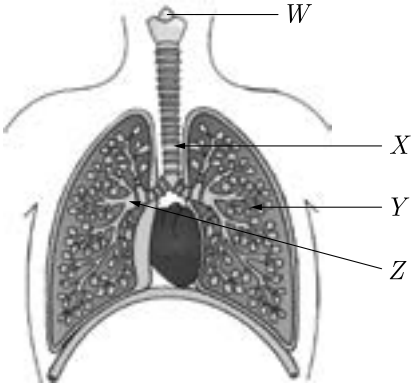
(b) there is lack of water

(c) there is lack of oxygen

(d) none of the above

Sol : www.cbse.site/sc/fm240

141. The diagram shows part of the human gas exchange system.

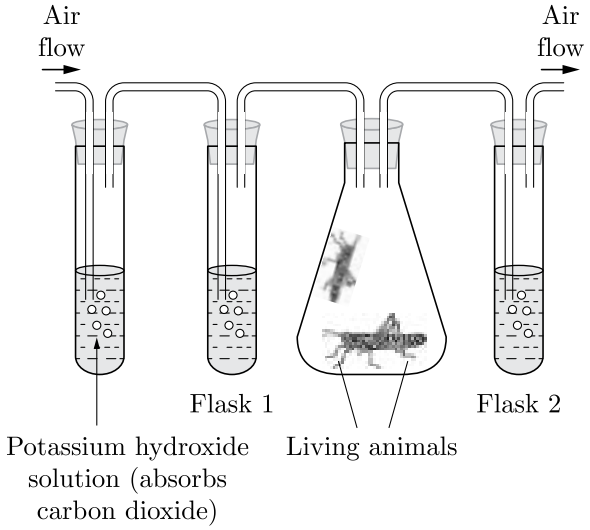


Here, W, X, Y and Z are?

	Bronchus	**Bronchiole**	**Larynx**	**Trachea**
(a)	W	X	Z	Y
(b)	X	Z	Y	W
(c)	Y	W	X	Z
(d)	Z	Y	W	X

Sol : www.cbse.site/sc/fm241

142. An experiment is set up as shown. Flasks 1 and 2 contain lime water. Air is pumped through the flasks.



What is the appearance of lime water in flasks 1 and 2 after a period of ten minutes?

	Flask 1	**Flask 2**
(a)	Clear	Clear
(b)	Clear	White/Cloudy
(c)	White/Cloudy	Clear
(d)	White/Cloudy	White/Cloudy

Sol : www.cbse.site/sc/fm242

143. Which of the following is the correct route for blood flow in a human?

(a) Right atrium → Right ventricle → Lungs → Left atrium → Left ventricle

(b) Right atrium → Right ventricle → Left ventricle → Left atrium → Lungs

(c) Left atrium → Left ventricle → Right ventricle → Right atrium → Lungs

(d) Left atrium → Left ventricle → Lungs → Right ventricle → Right atrium

Sol : www.cbse.site/sc/fm243

144. The table shows the characteristics of blood in one blood vessel of the body.

Oxygen concentration	**Carbon dioxide concentration**	**Pressure**
High	Low	High

Which blood vessel contains blood with these characteristics?

(a) Vena cava
(b) Pulmonary vein
(c) Aorta
(d) Pulmonary artery

Sol : www.cbse.site/sc/fm244

145. The waste product from skin is known as?

(a) Salts
(b) Urine
(c) Sweat
(d) Urea

Sol : www.cbse.site/sc/fm245

146. What happens if a person has one kidney removed?

(a) They will accumulate excess urea
(b) They will die
(c) They will continue as normal
(d) They will stop making urine

Sol : www.cbse.site/sc/fm246

147. A terrestrial animal must be able to .....?

(a) Excrete large amount of water
(b) Actively pump salts through skin
(c) Excrete large amount of salts in urine
(d) Conserve water

Sol : www.cbse.site/sc/fm247

148. Conversion of excess of amino acids into urea is done in?

(a) Lungs
(b) Large intestine
(c) Liver
(d) Cloaca

Sol : www.cbse.site/sc/fm248

149. The best long term solution for kidney failure is?

(a) Dialysis
(b) Kidney transplant
(c) Surgery
(d) Both (a) and (b)

Sol : www.cbse.site/sc/fm249

150. Flame cells are the excretory structures in

(a) Arthropods
(b) Platyhelminthes
(c) Annelids
(d) Crustaceans

Sol : www.cbse.site/sc/fm250

151. Main excretory organ of humans is?

(a) Lungs
(b) Skin
(c) Kidney
(d) Liver

Sol : www.cbse.site/sc/fm251

152. The excretory system of human beings includes?

(a) A pair of kidneys
(b) A pair of ureters
(c) A urinary bladder and a urethra
(d) All of the above

Sol : www.cbse.site/sc/fm252

153. Which of the following harmful products is not produced in the biochemical reactions of the cell of living organisms?
(a) Urea
(b) Uric acid
(c) Ammonia
(d) Lymph

Sol : www.cbse.site/sc/fm253

154. The blood vessel that begins and ends in capillaries?
(a) Renal vein
(b) Renal artery
(c) Hepatic artery
(d) Hepatic portal vein

Sol : www.cbse.site/sc/fm254

155. In our body which organ is responsible for conversion of ammonia into urea?
(a) Kidney
(b) Lungs
(c) Heart
(d) Liver

Sol : www.cbse.site/sc/fm255

156. What is the name of the blood vessels that provide nutrition of the heart wall?
(a) Pulmonary arteries
(b) Pulmonary veins
(c) Coronary arteries
(d) Descending aorta

Sol : www.cbse.site/sc/fm256

157. Which of the following is the correct features of 'lymph'?
(a) It is similar to the plasma of blood, colourless and contain less protein.
(b) Similar to the WBC of blood, colourless and contain more protein.
(c) Similar to the RBC of blood and red in colour.
(d) It contains more fat

Sol : www.cbse.site/sc/fm257

158. By which cell the process of opening and closing of stomata is controlled?
(a) Epidermal Cell
(b) Guard Cell
(c) Accessory Cell
(d) Leaf Cell

Sol : www.cbse.site/sc/fm258

159. Which organ is known as "Blood bank" ?
(a) Heart
(b) Liver
(c) Spleen
(d) Kidney

Sol : www.cbse.site/sc/fm259

160. Which of the following is carried by lymph which is digested and absorbed from intestine?
(a) Fat
(b) Protein
(c) Minerals
(d) Carbohydrates

Sol : www.cbse.site/sc/fm260

161. Tricuspid valve is present in ?
(a) Right atrium and right ventricle
(b) Left atria and left ventricle
(c) Wall of atrium
(d) Wall of ventricle

Sol : www.cbse.site/sc/fm261

162. Which of the following helps in maximum transport of oxygen?
(a) Red blood corpuscles
(b) Platelets
(c) Plasma
(d) White blood corpuscles

Sol : www.cbse.site/sc/fm262

163. Four chambered heart is characteristics feature of?
(a) Fishes
(b) Amphibians
(c) Reptiles
(d) Mammals

Sol : www.cbse.site/sc/fm263

164. Where does the maximum exchange of material between blood and surrounding cells occur?
(a) Heart
(b) Capillaries
(c) Arteries
(d) Veins

Sol : www.cbse.site/sc/fm264

165. Dead cells of phloem are
(a) Companion cells
(b) Phloem fibres
(c) Phloem parenchyma
(d) Sieve tubes

Sol : www.cbse.site/sc/fm265

166. Largest heart is found in
(a) Elephant
(b) Giraffe
(c) Crocodile
(d) Lion

Sol : www.cbse.site/sc/fm266

167. Choose the correct statement that describe the arteries?
(a) They have thick elastic walls, blood flows under high pressure, collect blood from different organs and bring it back to the heart.
(b) They have thin walls with valves inside, blood flows under low pressure and carry blood away from the heart to various organs of the body.
(c) They have thick elastic walls, blood flows under low pressure, carry blood from the heart to various organs of the body.
(d) They have thick elastic walls without valves inside, blood flows under high pressure and carry blood away from the heart to different parts of the body.

Sol : www.cbse.site/sc/fm267

168. For the start of respiration, a living cell requires?
(a) Glucose
(b) Glucose + O_2
(c) O_2
(d) Glucose + ATP

Sol : www.cbse.site/sc/fm268

169. Name the term which means 'taking in of air rich in oxygen into the body'.
(a) Exhalation
(b) Inhalation
(c) Breathing
(d) Respiration

Sol : www.cbse.site/sc/fm269

170. Which of the following statements is true about Trachea in a respiratory system?
(a) It functions as passages of air to each alveolus
(b) It functions for sound production
(c) It Acts as passage of air to bronchi
(d) It Lowers the surface tension

Sol : www.cbse.site/sc/fm270

171. Which of the following structures is involved in gaseous exchange in woody stem of a plant?
(a) Stomata
(b) Guard cell
(c) Lenticel
(d) Epidermis

Sol : www.cbse.site/sc/fm271

172. The cycle in which pyruvic acid is broken down in presence of oxygen is known as?
(a) Glycolysis
(b) Krebs cycle
(c) Anaerobic respiration
(d) None of the above

Sol : www.cbse.site/sc/fm272

173. Which of the following statements are true about respiration?
A. Haemoglobin has greater affinity for CO_2 than O_2.
B. The gaseous exchange takes place in the alveoli.
C. During inhalation ribs move inward and diaphragm is raised.
D. Haemoglobin has greater affinity for O_2 than CO_2.
(a) B and D
(b) A and C
(c) B and C
(d) A and B

Sol : www.cbse.site/sc/fm273

174. Breaking down of glucose in the presence of oxygen produces ?
(a) Carbon dioxide
(b) Energy
(c) Water
(d) All of the above

Sol : www.cbse.site/sc/fm274

175. During respiration exchange of gases takes place in?
(a) Trachea and larynx
(b) Throat and larynx
(c) Alveoli and throat
(d) Alveoli of lungs

Sol : www.cbse.site/sc/fm275

176. Opening of oesophagus is:
(a) Gullet
(b) Glottis
(c) Larynx
(d) Pharynx

Sol : www.cbse.site/sc/fm276

177. Cud chewing animals are known as:
(a) Ruminants
(b) Cannibals
(c) Frugivore
(d) Sanguivores

Sol : www.cbse.site/sc/fm277

178. Conversion of large fat droplets into smaller droplets are
(a) Neutralisation

(b) Assimilation
(c) Emulsification
(d) Anabolism

Sol : www.cbse.site/sc/fm278

179. Example of some organisms which derive nutrition from plants or animals without killing them
(a) Cuscuta
(b) Ticks
(c) Leeches
(d) All of the above

Sol : www.cbse.site/sc/fm279

180. Choose the form in which most of the plants absorb nitrogen from the atmosphere?
(a) Proteins
(b) Amino acids
(c) Atmospheric nitrogen
(d) Nitrates and nitrites

Sol : www.cbse.site/sc/fm280

181. **Assertion :** All the plants possess autotrophic mode of nutrition.
Reason : Due to the presence of green coloured pigment chlorophyll in them.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/fm281

182. **Assertion :** Egestion in amoeba takes place through a permanent membrane present in them.
Reason : Cilia is absent in amoeba.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/fm282

183. **Assertion :** Ethanol is obtained during the anaerobic process of respiration.
Reason : This is due to presence of oxygen and it takes place in the mitochondria.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/fm283

184. **Assertion :** During the night the effect of root pressure in transport of water is more important.
Reason : Stomata is open during day, transpiration takes place which help in transport of water.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/fm284

185. monoxide is injurious to the health of the individual.
Reason : Carbon monoxide has very strong affinity for the blood.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/fm285

186. **Assertion :** In plants, water is transported through phloem.
Reason : It is because sieve tubes are absent in phloem.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/fm286

187. **Assertion :** The thickest muscles are present in left atrium.
Reason : Left atrium receives deoxygenated blood from the lungs.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/fm287

188. **Assertion :** Failure of the kidneys leads to death of the person and there is no way he can survive.
Reason : Transplant of kidneys in humans is not possible.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/fm288

189. **Assertion :** Aerobic animals are not truly aerobic.
Reason : Anaerobically they produce lactic acid.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/fm289

190. **Assertion :** Dark phase reactions take place at night.
Reason : Dark phase is independent of light, hence, called light independent phase.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/fm290

191. **Assertion :** in the daytime, CO_2 generated during respiration is used up for photosynthesis.
Reason : There is no CO_2 release during day.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/fm291

192. **Assertion :** Amoeba is not an omnivore organism.
Reason : Lion is a carnivore organism.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/fm292

193. **Assertion :** Liver is known as the largest gland of the body.
Reason : It secretes salivary amylase.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/fm293

194. **Assertion :** Respiration is not a biochemical process opposite to photosynthesis.
Reason : Energy is released during respiration.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/fm294

195. **Assertion :** In woody plants, gaseous exchange occurs through lenticels.
Reason : Lenticels are specialised cells found along with stomata on the stem of woody plants.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/fm295

196. **Assertion :** Haemoglobin is not the respiratory pigment in human beings.
Reason : It transports oxygen in the human body.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are

true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/fm296

197. **Assertion :** Interauricular septum separates left from right atrium.
Reason : Interventricular septum separates left from right ventricle.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/fm297

198. **Assertion :** Excretion is the biological process by which harmful wastes are removed from an organism's body.
Reason : The mode of excretion is completely same in both unicellular and multicellular organisms.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/fm298

199. **Assertion :** The main organ of human excretory system is kidney.
Reason : Kidneys perform the function of adding water and nitrogenous wastes from the body.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/fm299

200. **Assertion :** Artificial kidney is a device used to remove nitrogenous waste products from the blood through dialysis.
Reason : Reabsorption does not occur in artificial kidney.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/fm300

201. **Assertion :** Plants excrete various waste products during their life processes.
Reason : They produce urea just like humans.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

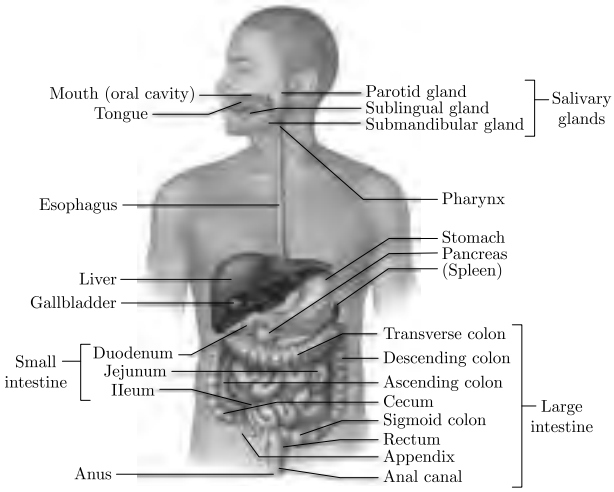
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/fm301

COMPETENCY BASED QUESTIONS

Direction For Questions (202-206)

Digestion is a catabolic process in which complex and large components of food are broken down into their respective simpler and smaller forms with the help of various hydrolytic enzymes. In human beings, the process of intake of essential nutrients in the form of food takes place through an entire system in human includes alimentary canal and its associated digestive glands.
The alimentary canal is a muscular coiled tubular structure about 9 m in length that begins from mouth and ends whit anus. The various organs of the human digestive system in sequence are: Mouth, Oesophagus (or Food pipe), Stomach, Small intestine and Large intestine. The glands which are associated with the human digestive system and form a part of the human digestive system are: Salivary glands, Liver and Pancreas. The ducts of various glands open into the alimentary canal and pour the secretions of the digestive juices into the alimentary canal.



202. In which of the following organ is digested?
(a) mouth
(b) stomach only
(c) large intestine
(d) stomach and small intestine

Sol : www.cbse.site/sc/fm302

203. Which of the following is the final product of digestion of protein?
(a) Glycerol
(b) Amino acids
(c) Glucose
(d) Nitric acid

Sol : www.cbse.site/sc/fm302

204. What are peristaltic movements?
(a) Rhythmic contraction of canal
(b) Movement of heart
(c) Movement of ribs
(d) Movement of body parts

Sol : www.cbse.site/sc/fm302

205. Which of the following enzyme is present in Saliva?
(a) Amylase
(b) Pepsinogen
(c) Trypsin
(d) Lipase

Sol : www.cbse.site/sc/fm302

206. Which chemical substance is responsible for acidic medium of stomach?
(a) Bile juice
(b) HCl
(c) CH_3COOH
(d) Lactic acid

Sol : www.cbse.site/sc/fm302

Direction For Questions (207-211)

They create by-products that art not only useless for the cells of the body, but could even be harmful. These waste by-products are therefore needed to be removed from the body and discarded outside by a process called excretion. Again, if the basic rules for body design in multi-cellular organisms are followed, a specialised tissue for excretion will be developed, which means that the transportation system will need to transport waste away from cells to this excretory tissue.

207. The excretory materials are temporarily stored in:
(a) Urethra
(b) Kidneys
(c) Ureters
(d) Urinary bladder

Sol : www.cbse.site/sc/fm303

208. The main excretory by-product in human beings is
(a) Creatine
(b) Urea
(c) Uric acid
(d) None of the above

Sol : www.cbse.site/sc/fm303

209. The process of removal of nitrogenous waste materials from the body is called ..... .
(a) Nutrition
(b) Respiration
(c) Excretion
(d) Transportation

Sol : www.cbse.site/sc/fm303

210. Which is the main excretory organ in human beings?
(a) Intestine
(b) Kidneys
(c) Lungs
(d) Heart

Sol : www.cbse.site/sc/fm303

211. Which is known as basic filtration unit in the kidneys?
(a) Alveoli
(b) Nephron
(c) Stomata
(d) Guard cells

Sol : www.cbse.site/sc/fm303

Direction For Questions (212-216)

Arteries are the vessels which carry blood away from the heart to various organs of the body. Since the blood emerges from the heart under high pressure, the arteries have thick, elastic walls. Veins collect the blood from different organs and bring it back to the heart. They do not need thick walls because the blood is no longer under pressure, instead they have valves that ensure that the blood flows only in one direction.
On reaching an organ or tissue, the artery divides into smaller and smaller vessels to bring the blood in contact with all the individual cells. The smallest vessels have walls which are one-cell thick and are called capillaries. Exchange of material between the blood and surrounding cells takes place across this thin wall. The capillaries then join together to form veins that convey the blood away from the organ or tissue.

212. What is importance of thin walls of blood capillaries?
(a) Thin walls of blood capillaries provide

them protection.

(b) Exchange of materials between the blood and surrounding cells take place across the thin walls of blood capillaries.

(c) Thin walls of blood capillaries help on smooth flow of blood.

(d) All of the above.

Sol : www.cbse.site/sc/fm304

213. Write two differences between arteries and veins.

(a) Arteries are blood vessels while veins are not.

(b) Arteries have thick walls while veins have thin walls.

(c) Arteries have valves while do not have valves.

(d) All of the above.

Sol : www.cbse.site/sc/fm304

214. What is the function of valves in veins?

(a) Valves ensure the unidirectional flow of blood.

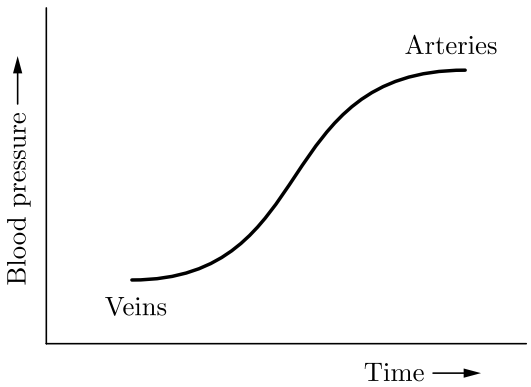
(b) Valves increase the oxygen carrying capacity of the blood.

(c) Valves protect the veins from outer shocks.

(d) Valves withstand the high pressure of blood in veins.

Sol : www.cbse.site/sc/fm304

215. Which blood vessels have high blood pressure and what they have to withstand this high pressure?



(a) Both arteries and veins have same pressure of blood and they are thich walled vessels.

(b) Arteries have high blood pressure and they have elastic and thick walls to withstand this high pressure.

(c) Veins have high blood pressure and they have to valves to withstand this high pressure.

(d) None of the above.

Sol : www.cbse.site/sc/fm304

216. What is the function of arteries?

(a) Arteries have high blood pressure.

(b) Arteries are present in the body of human beings.

(c) Arteries are thicker than veins.

(d) Arteries are the blood vessels which carry blood away from the heart to various organs of the body.

Sol : www.cbse.site/sc/fm304

Direction For Questions (217-221)

This transport of soluble products of photosynthesis is called translocation and it occurs in the part of the vascular tissue known as phloem. Besides the products of photo-synthesis, the phloem transports amino acids and other substances. These

substances are especially delivered to the storage organs of roots, fruits and seeds and to growing organs. The translocation of food and other substances takes place in the sieve tubes with the help of adjacent companion cells both in upward and downward directions. Unlike transport in xylem which can be largely explained by simple physical forces, the translocation in phloem is achieved by utilising energy, Material like sucrose is transferred into phloem tissue using energy from ATP. This increases the osmotic pressure of the tissue causing water to move into it. This pressure moves the material in the phloem to tissues which have less pressure. This allows the phloem to move material according to the plant's needs. For example, in the spring, sugar stored in root or stem tissue would be transported to the buds which need energy to grow.

217. The transportation of materials into phloem requires:
(a) Amino acids
(b) Food
(c) Water
(d) Energy

Sol : www.cbse.site/sc/fm305

218. The translocation of food in plants takes place in:
(a) Upward direction only
(b) Downwards direction only
(c) Leaves only
(d) Both in upward and downward directions

Sol : www.cbse.site/sc/fm305

219. The components which help in the translocation process in plants are:
(a) Amino acid
(b) Sieve tubes and companion cells
(c) Fruit
(d) Seeds

Sol : www.cbse.site/sc/fm305

220. The phenomenon of transportation of food in plants in its dissolved form is called:
(a) Translocation
(b) Excretion
(c) Transpiration
(d) Nutrition

Sol : www.cbse.site/sc/fm305

221. Which of the following vascular tissue is responsible for the transportation of soluble products of photosynthesis?
(a) Xylem
(b) Phloem
(c) Both Phloem and Xylem
(d) None of the above

Sol : www.cbse.site/sc/fm305

Direction For Questions (222-226)

The small intestine is the site of the complete digestion of carbohydrates, proteins and fats. It receives the secretions of the liver and pancreas for this purpose. The food coming from the stomach is acidic and has to be made alkaline for the pancreatic enzymes to act. Bile juice from the liver accomplishes this in addition to acting on fats. Fats are present in the intestine in the form of large globules which makes it difficult for enzymes to act on them. Bile salts break them down into smaller globules increasing the efficiency of enzyme action. The pancreas secretes pancreatic juice which contains enzymes like trypsin for digesting proteins and lipase for breaking down emulsified fats. The walls of the small

intestine contain glands which secrete intestinal juice. The enzymes present in it finally convert the proteins to amino acids, complex carbohydrates into glucose and fats into fatty acids and glycerol.

222. The food coming from the stomach is made alkaline by:
(a) Bile juice
(b) Pancreatic juice
(c) Gastric juice
(d) Intestinal juice

Sol : www.cbse.site/sc/fm306

223. In small intestine proteins are decomposed into:
(a) fatty acids only
(b) glucose
(c) amino acids
(d) fatty acids and glycerol

Sol : www.cbse.site/sc/fm306

224. Which enzymes are present in the pancreatic juice for digestion of proteins and fats?
(a) Amylase and pepsin
(b) Amylase and lipase
(c) Pepsin and trypsin
(d) Lipase and trypsin

Sol : www.cbse.site/sc/fm306

225. Which two organs release their secretions into small intestine for digestion of food?
(a) Liver and stomach
(b) Oesophagus and stomach
(c) Pancreas and stomach
(d) Liver and pancreas

Sol : www.cbse.site/sc/fm306

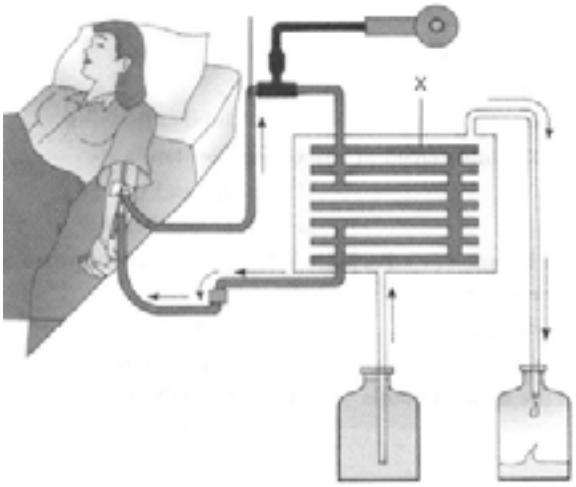
226. The complete digestion of food takes place in:
(a) small intestine
(b) stomach
(c) mouth
(d) large intestine

Sol : www.cbse.site/sc/fm306

Direction For Questions (227-231)

Nitrogenous materials formed due to metabolic activities are need to be removed. The biological process involved in the removal of these harmful metabolic wastes from the body is called excretion. Different organisms use varied strategies to do this. Many unicellular organisms remove these wastes by simple diffusion from the body surface into the surrounding water while complex multi-cellular organisms use specialised organs to perform the same function.

227.



Study the picture given above and choose the correct combination of plots provided in the following table.

	X	**Process used**	**Function**
(a)	Dialysing pump	Filtration	To draw blood from the body and send it to dialyser
(b)	Dialysate	Osmosis	To add fluid to the blood
(c)	Blood thinner	Clotting	To remove the clots from the blood
(d)	Dialyser	Diffusion	To remove the excess wastes and fluid from the blood

Sol : www.cbse.site/sc/fm307

228. Which of the following statement(s) is (are) true about excretion in human beings?

I. Urine is stored in the urethra until the urge of passing it out.

II. Each kidney has large numbers of filtration units called nephrons.

III. The bladder is muscular, so it is under nervous control.

IV. Kidneys are the primary excretory organs.

(a) I and II only

(b) I and III only

(c) II, III and IV only

(d) I and IV only

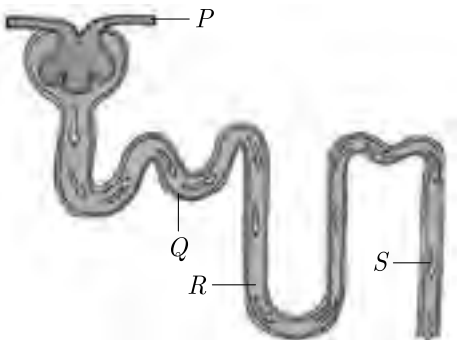
Sol : www.cbse.site/sc/fm307

229. Study the table below and select the row that has the incorrect information.

	Excretory Organ	**Substances Excreted**
(a)	Oil glands	Sebum
(b)	Skin	Sweat
(c)	Lungs	Urea
(d)	Kidneys	Nitrogenous wastes

Sol : www.cbse.site/sc/fm307

230. The given figure represents the structure of a nephron.



Which section of the nephron is responsible for concentrating the solute in the filtrate?

(a) *P*

(b) *Q*

(c) *R*

(d) *S*

Sol : www.cbse.site/sc/fm307

231. The excretory system of human beings include

(a) a kidney, a ureter, a urinary bladder and a urethra

(b) a pair of kidneys, a pair of ureters, a pair of urinary bladders and a urethra

(c) a pair of kidneys, a pair of urinary bladders, a ureter, and a urethra

(d) a pair of kidneys, a pair of ureters, a urinary bladder and a urethra

Sol : www.cbse.site/sc/fm307

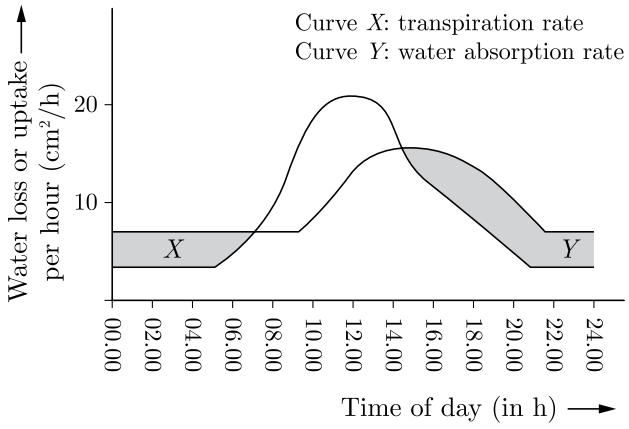
Direction For Questions (232-236)

Plants have low energy needs and can use relatively slow transport systems. The distances over which transport systems have to operate, however, can be very large in plants such as very tall trees. Plant transport systems move energy stores from leaves and raw materials from roots. These two pathways are constructed as independently organised conducting tubes.

232. Force of cohesion develops due to
(a) attraction between similar molecules
(b) attraction between different molecules
(c) attraction between xylem and phloem
(d) attraction between xylem and water

Sol : www.cbse.site/sc/fm308

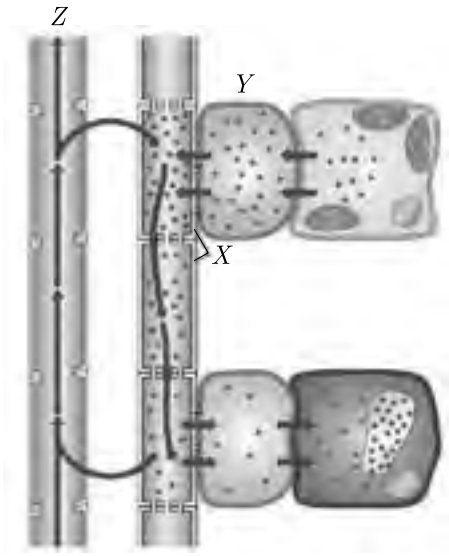
233. Given graph shows the rates of water absorption and transpiration of a plant during a 24-hour period.



The difference between the rates of transpiration and water absorption between 00:00 and 06:00 hours is due to:
(a) The rate of absorption fell behind the rate of transpiration during the day, but exceeded it at night.
(b) Rate of absorption is always higher than rate of transpiration.
(c) Rate of absorption is always equal to rate of transpiration.
(d) The rate of absorption is higher than the rate of transpiration during the day, but decreases at night.

Sol : www.cbse.site/sc/fm308

234. The given figure represents the movement of water and minerals in xylem and movement of food in phloem.



Choose the correct combination of plots provided in the following table:

	X	Y	Z
(a)	Major conducting cells in xylem	Denucleated	Flow is bidirectional
(b)	Major conducting cells in phloem	Nucleated	Flow is unidirectional
(c)	Major conducting cells in xylem and phloem	Denucleated	Flow is unidirectional
(d)	Cells of xylem but function is not defined	Nucleated	Flow is bidirectional

Sol : www.cbse.site/sc/fm308

235. Which of the following statement(s) is (are) true about transport in plants?

I. Beside water, xylem also transports amino acids and other substances.
II. The translocation in phloem is achieved by utilising energy.
III. Transpiration helps in the absorption.
IV. This transport of soluble products of photosynthesis occurs in phloem.

(a) I and II only
(b) II, III and IV only
(c) I, II and III only
(d) I, III and IV only

Sol : www.cbse.site/sc/fm308

236. Study the table below and select the row that has the incorrect information.

	Cell	**Tissue**
(a)	Vessels and tracheid	Xylem
(b)	Sieve tubes cells	Phloem
(c)	Sieve tube cells and tracheid	Xylem
(d)	Companion cell	Phloem

Sol : www.cbse.site/sc/fm308

Direction For Questions (237-241)

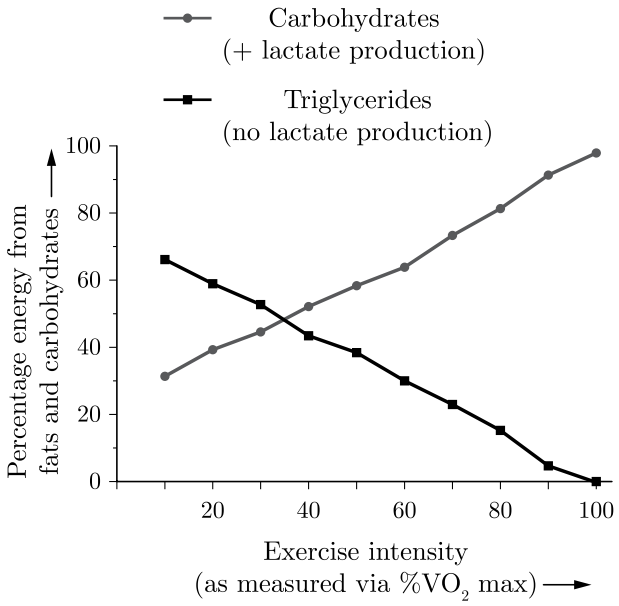
The food material taken in during the process of nutrition is used in cells to provide energy for various life processes. Diverse organisms do this in different ways - some use oxygen to break-down the food material completely, some use other pathways that do not involve oxygen. In all cases, the first step is the break-down of food material and it takes place in the cytoplasm. Further, the product of breakdown food may be converted into ethanol and carbon dioxide. Breakdown of food product using oxygen takes place in the mitochondria. Sometime food product is converted into lactic acid which is also a three-carbon molecule.

237. Athletes suffers from muscle cramps due to

(a) conversion of pyruvate to ethanol
(b) conversion of pyruvate to glucose
(c) non-conversion of glucose to pyruvate
(d) conversion of pyruvate to lactic acid

Sol : www.cbse.site/sc/fm309

238. The given graph indicates the effect of exercise intensity on carbohydrate consumption.



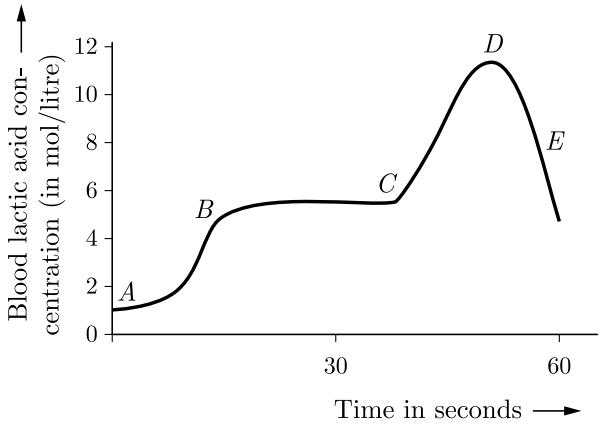
At high intensity of exercise

(a) the anaerobic consumption of sugars increases
(b) the aerobic consumption of sugars increases
(c) the anaerobic consumption of sugars decreases
(d) no consumption of sugars takes place

Sol : www.cbse.site/sc/fm309

239. Study the graph below that represents the blood test reports of an athlete just before

and after a race.



Choose the correct combination of plots provided in the following table.

	Section of race	Concentration of lactic acid	Type of respiration
(a)	A-B (sprint start)	Changing high to low	Changing from anaerobic to aerobic
(b)	B-C (maintaining speed)	High to low	Anaerobic
(c)	C-D (sprint finish)	High	Aerobic
(d)	D-E (just after sprint finishing)	Low	Aerobic

Sol : www.cbse.site/sc/fm309

240. Which of the following statement(s) is (are) true about energy released during cellular respiration?

I. It is used immediately to synthesise ADP.

II. It is used to fuel all other activities in the cell.

III. ADP is the energy currency for most cellular processes.

IV. An ADP molecule is formed from ATP and inorganic phosphate.

(a) I and II only

(b) II only

(c) I, II and III only

(d) I, III and IV only

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241. Study the table below and select the row that has the correct information.

	Break down of pyruvate in	**Take place in**	**End products**
(a)	Absence of oxygen	Yeast	Lactic acid + Energy
(b)	Lack of oxygen	Muscle cells	Ethanol + CO_2 + Energy
(c)	Presence of oxygen	Mitochondria	$CO_2 + H_2O$ + Energy
(d)	Presence of oxygen	Mitochondria	Ethanol + CO_2 + Energy

Sol : www.cbse.site/sc/fm309

Direction For Questions (242-246)

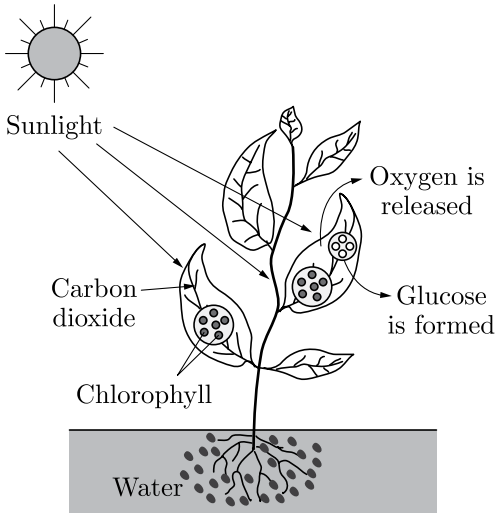
Carbon and energy requirements of the autotrophic organism are fulfilled by photosynthesis. It is the process by which autotrophs take in substances from the outside and convert them into stored forms of energy. This material is taken in the form of carbon dioxide and water which is converted into carbohydrates in the presence of sunlight and chlorophyll. Carbohydrates are utilised for providing energy to the plant. The carbohydrates which are not used immediately are stored in the form of starch, which serves as the internal energy reserve to be used as and when required by the plant. A somewhat similar situation is seen in us where some of the energy derived from the food we eat is

stored in our body in the form of glycogen. That means the complex substances have to be broken down into simpler ones before they can be used for the upkeep and growth of the body. To achieve this, organisms use biocatalysis.

242. Heterotrophs depend for energy on
(a) autotrophs
(b) producers
(c) herbivores
(d) both (a) and (b)

Sol : www.cbse.site/sc/fm310

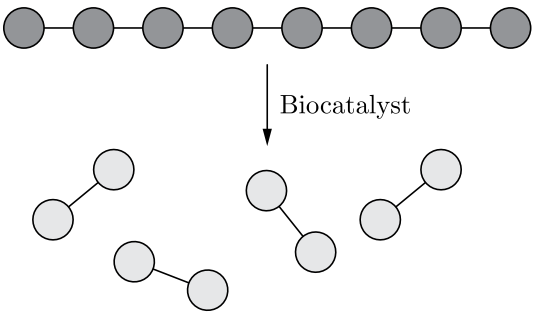
243. The picture given below represents how autotrophs take in substances from the outside and convert them into stored forms of energy.



The correct equation for the given process is
(a) $6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$
(b) $6O2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6CO_2$
(c) $C_6H_{12}O_6 + 6H_2O \longrightarrow 6CO_2 + 6O_2$
(d) $6CO_2 + 6O_2 \longrightarrow C_6H_{12}O_6 + 6H_2O$

Sol : www.cbse.site/sc/fm310

244. Study the picture below that represents the mode of action of a biocatalyst.



Choose the correct combination of plots provided in the following table.

	Biocatalyst also termed as	**Biocatalyst found in human saliva**	**Biocatalyst produced in human stomach**
(a)	Enzymes	Amylase	Pepsin
(b)	Hormones	Amylase	Trypsin
(c)	Enzymes	Trypsin	Pepsin
(d)	Energy	Pepsin	Amylase

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245. Which of the following statement (s) is (are) true?
I. Carbon and energy requirements of the autotrophic organism are fulfilled by photosynthesis.
II. Carbohydrates are utilised for providing energy to the plant.
III. Chlorophyll is essential for photosynthesis.
IV. Autotrophs survival depends directly or indirectly on heterotrophs.
(a) I and II only
(b) II and III only
(c) I, II and III only
(d) I, III and IV only

Sol : www.cbse.site/sc/fm310

246. Study the table below and select the row

that has the correct information.

	Internal energy reserve in autotrophs	**Internal energy reserve in humans**
(a)	Glycogen	Starch
(b)	Starch	Maltose
(c)	Glycogen	Maltose
(d)	Starch	Glycogen

Sol : www.cbse.site/sc/fm310

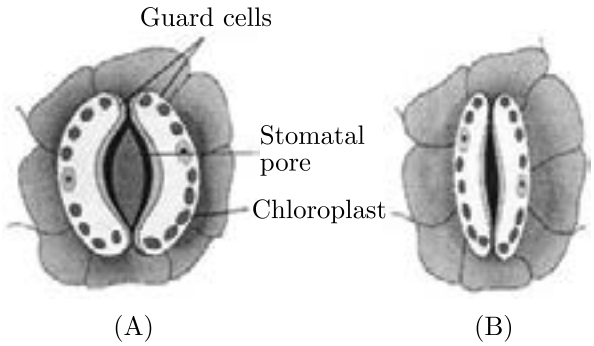
Direction For Questions (247-251)

Some tiny pores are present on the surface of the leaves. Massive amounts of gaseous exchange take place in the leaves through these pores for the purpose of photosynthesis. But it is important to note here that exchange of gases occurs across the surface of stems, roots and leaves as well. Since, large amounts of water can also be lost through these, the plant closes these pores when it does not need carbon dioxide for photosynthesis. The opening and closing of the pores is a function of some specialized cells. These cells swell when water flows into them, causing the pore to open. Similarly, the pore closes if these cells get shrink.

247. The exchange of oxygen and carbon dioxide in the leaf occurs through
(a) phloem
(b) stomata
(c) xylem
(d) alveoli

Sol : www.cbse.site/sc/fm311

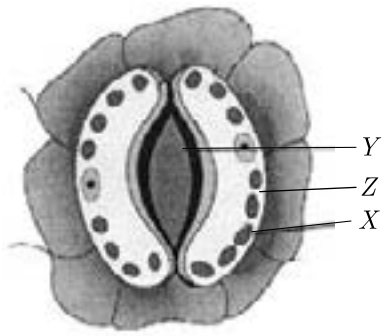
248. The given figure shows two states of a pore, opening and closing of these pores is a function of



(a) epidermis
(b) chlorophyll
(c) guard cells
(d) phloem cells

Sol : www.cbse.site/sc/fm311

249. The labelling for the slide of leaf peel showing stomata by the four students who made the diagram and tabulated the labels, is as follows:



Choose the correct combination of plots provided in the following table.

	X	***Y***	***Z***
(a)	Chloro-plast	Guard cell	Stoma
(b)	Chloro-plast	Stoma	Guard cell
(c)	Guard cell	Stoma	Chloroplast
(d)	Stoma	Chloroplast	Guard cell

Sol : www.cbse.site/sc/fm311

250. Which of the following statement(s) is (are) true about stomata?

I. These are typically found in leaves only.
II. Guard cells are responsible for regulating the size of the stomatal opening.
III. These control the exchange of gases not water vapours.
IV. These get closed at night to prevent water loss in plants.

(a) I and II only
(b) II and IV only
(c) I, II and III only
(d) I, III and IV only

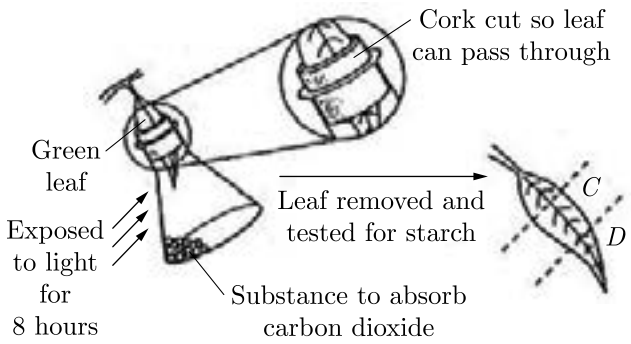
Sol : www.cbse.site/sc/fm311

251. Study the table below and select the row that has the correct information.

	Epidermal cells	**Guard cell**
(a)	Bean-shaped in surface view	Irregular in shape
(b)	Can manufacture food by photosynthesis	Can't manufacture food by photosynthesis
(c)	Contain chloroplast	Doesn't contain chloroplast
(d)	Protects all parts of the plant	Control stomatal opening

Sol : www.cbse.site/sc/fm311

252. A plant is kept in the dark for two days. A leaf is used in an experiment to investigate the effect of two factors on photosynthesis as shown in the diagram.



What are the colours of C and D, when the leaf is tested for starch, using iodine solution?

	C	D
(a)	Brown	Blue/black
(b)	Blue/black	Blue/black
(c)	Brown	Brown
(d)	Blue/black	Brown

Sol : www.cbse.site/sc/fm312

□□□□□□□

SELF ASSESSMENT TEST

1. Various maintenance processes are needed to:
(a) Survival
(b) Prevent damage and break down
(c) Routine process
(d) Release energy

2. All the sources of energy need to be broken down in the body and converted into:
(a) Uniform energy
(b) Molecular energy
(c) Chemical reactions
(d) Digestive process

3. The reason for single cell diffusion inefficiency in multicellular organism is
(a) Cell diffusion is a complex process
(b) Big size and complex body designs
(c) Cell diffusion requires lots of time
(d) Cell diffusion is rather a simple process to be carried out in multi cell organism

4. In multi-cellular organisms, various body parts have specialized in the functions they perform with the help of:
(a) Specialized cells
(b) Multiple organs
(c) Multiple structure
(d) Specialized tissues

5. Choose the incorrect statement:
(a) We don't need energy while not doing any activity
(b) We release energy and feel tired while doing various activities
(c) Energy is needed to maintain the state of body
(d) Our body need to synthesize protein to develop

6. The heterotrophs survival depends directly or indirectly on:
(a) Surroundings
(b) Ecology and surrounding
(c) Autotrophs
(c) Molecular structure

7. The process by which autotrophs take in substances from the outside and convert them into stored forms of energy is known as
(a) Photosynthesis
(b) Respiration
(c) Molecular breakup
(d) Cell diffusion

8. Human body stores energy in form of:
(a) Glucose
(b) Insulin
(c) glycogen
(d) Fructose

9. The green organelle on surface of leaves containing chlorophyll are knows as
(a) Xylem
(b) Epidermis
(c) Chloroplasts
(d) Vascular bundle

10. The purpose of closing the pores by the plants when it doesn't need photosynthesis is
(a) To save the water
(b) To save energy
(c) To save food

(d) None of the above

11. Most of the plant's nitrogen, phosphorus, iron and magnesium are taken up from the
(a) Aquatic sources
(b) Soil
(c) Mountains
(d) Sea water

12. Organism who break down the food outside their body are
(a) Fungi
(b) Virus
(c) Tape worm
(d) None of the above

13. The broken down food into simpler form in amoeba is diffused into
(a) Cytoplasm
(b) Ribosome
(c) DNA
(d) Mesosome

14. "Water" like fluid in our mouth is secreted by
(a) Pancreas
(b) Thyroid
(c) Pituitary
(d) Salivary gland

15. Hydrochloric acid facilitates the action of ..... .
(a) keratin
(b) collagen
(c) elastin
(d) pepsin

16. The ..... delivers the digestive juice to the small intestine through small tubes called ducts.
(a) Stomach
(b) Pancreas
(c) Large intestine
(d) Anus

17. The inner lining of the ..... has numerous finger-like projections called villi which increase the surface area for absorption.
(a) small intestine
(b) large intestine
(c) stomach
(d) pancreas

18. This process of break-down of glucose, a six-carbon molecule, into a three-carbon molecule pyruvate, takes place in
(a) Cytoplasm
(b) Mitochondria
(c) Golgi bodies
(d) Endoplasmic reticulum

19. Pyruvate is a-
(a) three-carbon molecule
(b) four-carbon molecule
(c) five-carbon molecule
(d) six-carbon molecule

20. The respiratory route of air in the respiratory tract of human is:
(a) nostrils → pharynx → larynx → trachea → alveoli.
(b) alveoli → pharynx → larynx → trachea → nostrils.
(c) alveoli → larynx → trachea → pharynx → nostrils.
(d) nostrils → trachea → pharynx → larynx → alveoli.

21. Blood consists of a fluid medium called ..... in which the cells are suspended.
(a) Plasma
(b) RBCs
(c) Platelets

(d) WBCs

22. In higher vertebrates, systemic circulation takes place between ..... .
(a) body parts and lungs
(b) body parts and heart
(c) heart and body parts
(d) lungs and heart

23. Which instrument is used to measure blood pressure?
(a) Thermometer
(b) Electrocardiograph
(c) Pulse recorder
(d) Sphygmomanometer

24. Arteries are the vessels which carry blood away from the
(a) Various body parts to the heart
(b) Heart to various organs of the body
(c) Heart to lungs
(d) Lungs to heart

25. Heart is surrounded and protected by ..... .
(a) Retro peritoneum
(b) Muscles
(c) Pericardium
(d) Lungs

26. The colour of blood plasma is:
(a) Red
(b) Pale yellow
(c) Yellowish green
(d) Pink

27. Vitamin ..... helps in blood clotting.
(a) Vitamin A2
(b) Vitamin B
(c) Vitamin E4
(d) Vitamin K

28. The water which is lost through the stomata is replaced by
(a) water from the xylem vessels in the leaf
(b) water from the phloem vessels in the leaf
(c) water from the veins in the leaf
(d) none of the above

29. Trans location is the process in which plants deliver:
(a) minerals from leaves to other parts of the plant
(b) plant growth hormones from leaves to other parts of the plant
(c) water and organic substance from leaves to other parts of the plant
(d) all of the above

30. When the materials like sucrose are transferred to phloem tissue, the osmotic pressure of the tissue ..... leading to ..... of water into/from it.
(a) Increases, entry
(b) Decreases, entry
(c) Increases, exit
(d) Decreases, exit

31. The biological process involved in the removal of these harmful metabolic wastes from the body is called
(a) Photosynthesis
(b) Respiration
(c) Excretion
(d) Translocation

32. Just as CO_2 is removed from the blood in the lungs, nitrogenous waste such as urea or uric acid are removed from blood in the -
(a) Kidney
(b) Urinary bladder
(c) Urethra

(d) Ureters

33. Which of the main toxic waste that kidney filters from blood?
(a) Ammonia
(b) Uric acid
(c) Urea
(d) Water

34. The functional unit of kidney is:
(a) Nephron
(b) Neuron
(c) Glomerulus
(d) Bowman's Capsule

35. An artificial kidney is a device to remove nitrogenous waste products from the blood through-
(a) Diaphragm
(b) Dialysis
(c) ECG
(d) Electrolysis

36. Normally, in a healthy adult, the initial filtrate in the kidneys is about :
(a) 100 L/day
(b) 150 L/day
(c) 180 L/day
(d) 200 L/day

37. Sweating is meant for:
(a) Regulation of body temperature
(b) Removal of excess salt
(c) Removal of excess water
(d) All of the above

38. Oxygen is a waste product generated during ..... in plants.
(a) Respiration
(b) Photosynthesis
(c) Both respiration and photosynthesis
(d) None of the above

39. Many-plant waste products are stored in:
(a) Chloroplast
(b) Mitochondria
(c) Cellular vacuoles
(d) Cytoplasm

40. How many pairs of salivary glands are found in humans?
(a) Four
(b) Two
(c) Three
(d) Six

41. **Assertion :** Ethanol is obtained during the anaerobic process of respiration.
Reason : This is due to presence of oxygen and it takes place in the mitochondria.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

42. **Assertion :** Carbon monoxide is injurious to the health of the individual.
Reason : Carbon monoxide has very strong affinity for the blood.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

43. **Assertion :** In plants, water is transported

through phloem.
Reason : It is because sieve tubes are absent in phloem.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

44. **Assertion :** Dark phase reactions take place at night.
Reason : Dark phase is independent of light, hence, called light independent phase.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

45. **Assertion :** The main organ of human excretory system is kidney.
Reason : Kidneys perform the function of adding water and nitrogenous wastes from the body.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Direction For Questions (46-50)

This transport of soluble products of photosynthesis is called translocation and it occurs in the part of the vascular tissue known as phloem. Besides the products of photo-synthesis, the phloem transports amino acids and other substances. These substances are especially delivered to the storage organs of roots, fruits and seeds and to growing organs. The translocation of food and other substances takes place in the sieve tubes with the help of adjacent companion cells both in upward and downward directions. Unlike transport in xylem which can be largely explained by simple physical forces, the translocation in phloem is achieved by utilising energy, Material like sucrose is transferred into phloem tissue using energy from ATP. This increases the osmotic pressure of the tissue causing water to move into it. This pressure moves the material in the phloem to tissues which have less pressure. This allows the phloem to move material according to the plant's needs. For example, in the spring, sugar stored in root or stem tissue would be transported to the buds which need energy to grow.

46. The transportation of materials into phloem requires:
(a) Amino acids
(b) Food
(c) Water
(d) Energy

47. The translocation of food in plants takes place in:
(a) Upward direction only
(b) Downwards direction only
(c) Leaves only
(d) Both in upward and downward directions

48. The components which help in the translocation process in plants are:
(a) Amino acid
(b) Sieve tubes and companion cells

(c) Fruit
(d) Seeds

49. The phenomenon of transportation of food in plants in its dissolved form is called:
(a) Translocation
(b) Excretion
(c) Transpiration
(d) Nutrition

50. Which of the following vascular tissue is responsible for the transportation of soluble products of photosynthesis?
(a) Xylem
(b) Phloem
(c) Both Phloem and Xylem
(d) None of the above

Answer Key

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
(b)	(a)	(b)	(d)	(a)	(c)	(a)	(c)	(c)	(a)
11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
(b)	(a)	(a)	(d)	(d)	(b)	(a)	(a)	(a)	(a)
21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
(a)	(c)	(d)	(b)	(c)	(b)	(d)	(a)	(d)	(a)
31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
(c)	(a)	(c)	(a)	(b)	(c)	(d)	(b)	(c)	(c)
41.	42.	43.	44.	45.	46.	47.	48.	49.	50.
(c)	(b)	(d)	(c)	(a)	(d)	(d)	(b)	(a)	(b)

□□□□□□□

CHAPTER 6

Reflection and Refraction

6.1 LIGHT

Light is that form of energy which produces the sensation of sight. Light energy travels through vacuum well as different transparent media in the form of electromagnetic waves. In vacuum as well as in air, light travels with a constant speed of $3 \times 10^8\,\text{ms}^{-1}$.

Light travels from one point to other along a straight path. This is called rectilinear propagation of light. A bundle of rays constitutes a light beam.

6.2 REFLECTION OF LIGHT

It is the phenomenon of bouncing back of light to the same medium after striking a surface. A glass sheet having a uniform thin coating of silver on one side acts as a reflector and is called a mirror.

6.2.1 Laws of Reflection

Two important laws of reflection are as follows:

1. The incident ray, the reflected ray and the normal to the reflecting surface at the point of incidence, all lie in the same plane.
2. The angle of incidence and angle of reflection are equal and they lie on opposite sides of normal.

6.3 IMAGE

When rays of light starting from a point object, after reflection from a mirror, actually meet or appear to meet at a point, then this second point is called the image of that object point.

6.3.1 Real and Virtual Images

If light rays from an object, after reflection or refraction, actually meet at a point, then the image is called a real image. A real image is always inverted and can be obtained on a screen.

If light rays from an object, after reflection or refraction, do not meet but appear to meet at a point, then the image is called a virtual image. A virtual image is always erect and cannot be obtained on a screen.

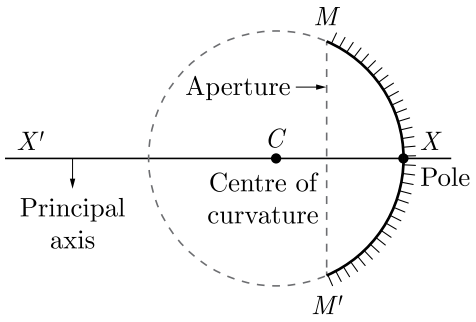
Image of an object formed by a plane mirror is virtual and erect, same size as the object, as much behind the mirror as the object is placed in front of it and is laterally inverted.

6.4 SPHERICAL MIRROR

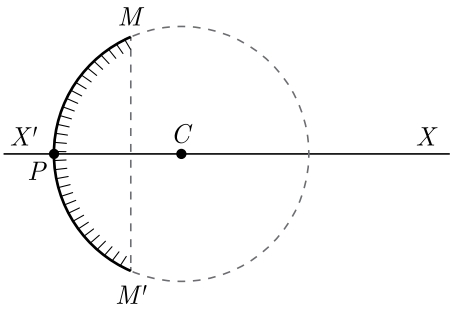
It is a mirror whose reflecting surface is a part of a hollow sphere of the glass. A spherical mirror whose reflecting surface is curved inwards is called a concave mirror. A spherical mirror whose reflecting surface is curved outwards is called a concave mirror.

A spherical mirror whose reflecting surface is curved outwards is called a convex mirror.

1. In a spherical mirror, the centre point of the reflecting surface is 'pole' (P).
2. The centre of curvature (C) of a spherical mirror is the centre of hollow glass sphere, of which the given mirror is a part. The radius of curvature ($R = PC$) of the given mirror is defined as the radius of the sphere, of which the reflecting surface of the mirror forms a part.



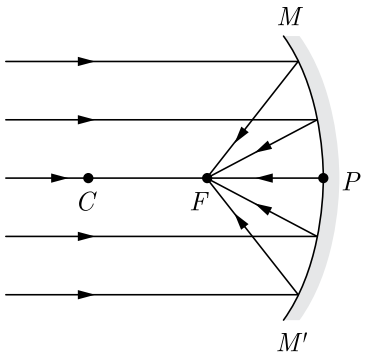
(a)



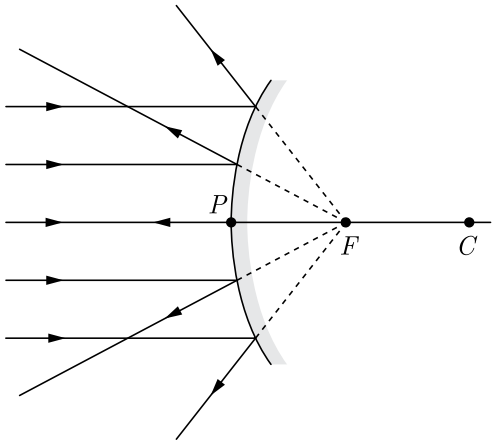
(b)

3. Principal axis is the line passing through pole P and centre of curvature C of a mirror. The diameter of reflecting surface of a spherical mirror is called its aperture.
4. The principal focus (F) of a spherical mirror is a point on its principal axis where light rays travelling parallel to the principal axis of the mirror, after reflection, actually meet (in concave mirror) or appear to meet (in convex mirror). Principal focus of a concave mirror is a real point situated in front of the mirror and of a convex mirror is a virtual point situated behind it.
5. The distance between pole P and principal focus F of a spherical mirror is focal length (f), i.e., $PF = f$. For a spherical mirror,

$$f = \frac{R}{2}$$
$$R = 2f$$



(a)



(b)

6. Focal plane is a plane passing through principal focus and normal to the principal axis of a mirror.
7. The position, nature and relative size of image formed by a concave mirror depend upon the position of the object situated in front of the mirror as shown in the following table.

Formation of image by a concave mirror for different positions of the object

	Position of the object	Position of the image	Relative size of the image	Nature of the image
1.	At infinity	At the focus (F)	Highly diminished (point-sized)	Real and inverted
2.	Beyond C	Between F and C	Diminished	Real and inverted

	Position of the object	Position of the image	Relative size of the image	Nature of the image
3.	At C	At C	Same size as the object	Real and inverted
4.	Between C and F	Beyond C	Enlarged	Real and inverted
5.	At F	At infinity	Highly enlarged	Real and inverted
6.	Between P and F	Behind the mirror	Enlarged	Virtual and erect

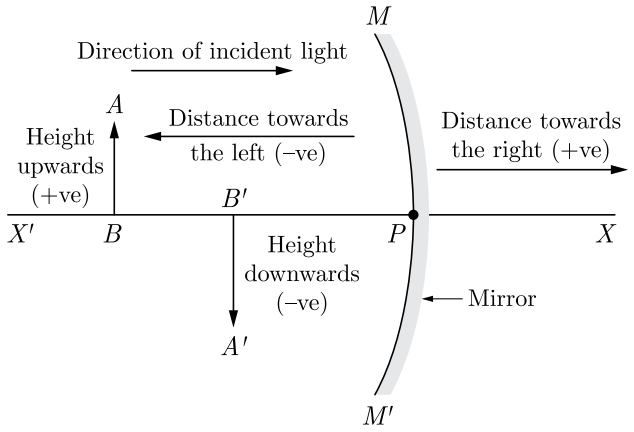
8. A convex mirror forms a virtual, erect and diminished image of an object situated in front of it as shown in the following table.
Formation of image by a convex mirror for different positions of the object

	Position of the object	Position of the image	Relative size of the image	Nature of the image
1.	An infinity	Behind the mirror at the focus F	Highly diminished (point-sized)	Virtual and erect
2.	Between infinity and pole P of the mirror	Behind the mirror between P and F	Diminished	Virtual and erect

9. Concave mirrors are used as shaving and make-up mirrors to see a large-sized erect image of the face. They are used as reflectors in torches, searchlights and headlights of vehicles to get powerful parallel beam of light. They are used by dentists to see large images of a patient's teeth. Eye and ENT specialists also use these mirrors to focus light coming from a lamp onto the eye, ear, nose, throat, etc., of a patient in order to examine better. They are used to concentrate the sun's radiation to a point in a solar furnace.
10. Convex mirrors are used as driver's mirrors in vehicles in order to have a wider field of view for traffic coming from behind. They are also used as reflectors in hilly areas at sharp turns and as shop security mirrors in large shopping halls and malls.

6.5 SIGN CONVENTION

According to new Cartesian sign convention for mirrors, all distances are measured from the pole of the mirror and object is always situated to the left of the mirror. Pole is considered as origin for measuring distances along principal axis. All distances measured to the right of origin along the principal axis are taken positive and to the left of origin are taken negative.



Along a direction perpendicular to principal axis, distances measured above the principal axis are taken positive but below the principle axis are taken negative.

6.6 MIRROR FORMULA

If object distance $= u$, image distance $= v$ and focal length $= f$, then according to mirror formula, we have

$\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$ or $\frac{2}{R}$, where $R=$ Radius of curvature of the mirror

On putting numerical values of $u, v\, f$ or R, proper sign must be used according to sign convention.

6.7 LINEAR MAGNIFICATION

The ratio of height of the image (h') to the height of the object (h) is linear magnification

of an object, i.e.,

$$m = \frac{h'}{h} = \frac{v}{u}$$

Linear magnification is negative for real image but positive for virtual image. If image is magnified, $m > 1$ and if diminished, $m < 1$.

For plane mirror, $m = +1$.

6.8 REFRACTION OF LIGHT

It is the phenomenon of the change in direction/ bending of a ray of light incident obliquely at the interface of two different transparent media.

1. When light travels from optically denser medium to rarer medium, it bends away from normal.
2. When light travels from optically rarer medium to denser medium, it bends towards the normal.

6.8.1 Laws of Refraction

Two important laws of refraction are as follows:

1. The incident ray, the refracted ray and the normal to the interface of two media at the point of incidence, all lie in the same plane.
2. The ratio of sine of angle of incidence ($\sin i$) to the sine of angle of refraction($\sin r$) is a constant for light of a given colour or wavelength and for a given pair of media. This law is called Snell's law of refraction.
   As per the law,

$$\frac{\sin i}{\sin r} = \text{a constant} = (n_{21}) \text{ (Refractive index of med. 2 w.r.t. med. 1)}$$

6.9 REFRACTIVE INDEX OF A MEDIUM

The ratio of speed of light in vacuum (or air) to speed of light in the given medium is called refractive index of a medium.

Refractive index,

$$n = \frac{\text{Speed of light in vacuum (air)}}{\text{Speed of light in the given medium}} = \frac{c}{v}$$

It is a unit-less quantity and its numerical value is 1 or greater than 1. For vacuum and air, $n = 1$.

1. If a light ray is refracted from medium 1 to medium 2, then refractive index of medium 2 w.r.t. medium 1 (n_{21}) is defined as the ratio of speed of light in medium 1 (v_1) to speed of light in medium 2 (v_2).
   So, refractive index of medium 2 w.r.t. medium 1,

$$n_{21} = \frac{v_1}{v_2}$$

   or $$n_{21} = \frac{v_1}{v_2} = \frac{n_2}{n_1}$$

   Therefore, $$n_{12} = \frac{1}{n_{21}}$$

2. Relative refractive index of one medium w.r.t. another medium too is a unit-less quantity and its numerical value may be equal to 1 or greater than 1 or even less than 1.
3. The refractive index of vacuum is called absolute refractive index.
4. If a ray of light is refracted through a rectangular glass slab, the angle of emergence is same as angle of incidence. Hence, emergent ray travels in a direction parallel to that of incident ray.
   But, the ray suffers a lateral displacement whose value is based on (i) thickness of the glass slab, (ii) refractive index of the glass slab, and (iii) angle of incidence. For angle of incidence ($\angle i$) $= 0^\circ$, the lateral displacement is also zero (0).
5. Due to refraction of light, a pencil immersed in water in a glass tumbler appears to be displaced at water-air interface. When a glass slab is placed over some printed matter, words appear raised up when observed or seen through the glass slab.
6. If a coin is placed at the bottom of a tumbler filled with water, the apparent depth of the coin appears to be less than its true depth because of refraction of light.
   Therefore,

$$\frac{\text{Real depth } (h)}{\text{Apparent depth } (h')} = \text{Refractive index}$$

of water (n_w)

For similar reason, a pond of water appears to be shallower.

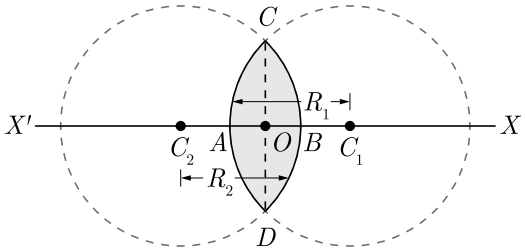
6.10 LENS

Is is a part of refracting material, i.e., glass, bound by two non-parallel surfaces, of which either both or one surface is spherical.

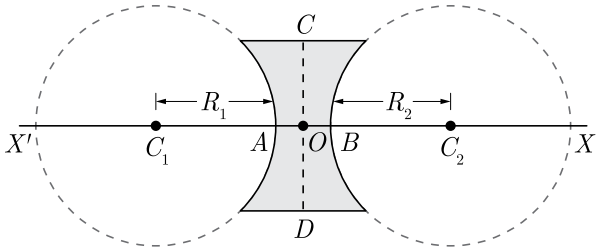
A lens thicker at the middle and thinner at the edges is known as a convex (converging) lens.

A lens thicker at the edges and thinner at the middle is known as a concave (diverging) lens.

1. A lens contains two centres of curvature and two radii of curvature as shown in the figure.

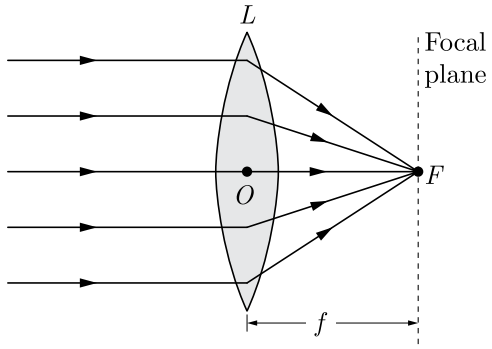


(a)

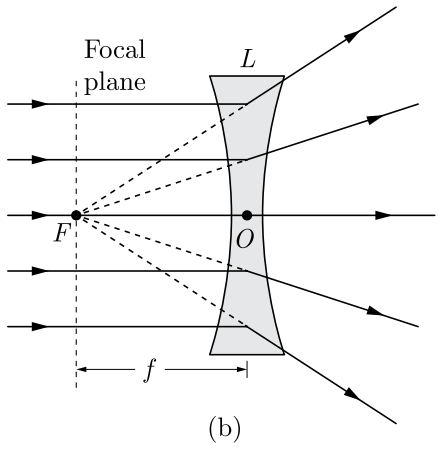


(b)

2. Principal axis is a line passing through two centres of curvature of a lens.
3. The optical centre of a lens is the point on its principal axis, a ray of light passing through which goes undeviated. It is the centre of the lens.
4. A point where a light beam travelling parallel to the principal axis of the lens, after refraction, actually meets in convex lens or appears to be diverged from in concave lens is called principal focus (F) of the lens. As, in a lens, parallel beam of light may be incident on any of its two surfaces having two principal foci F_1 and F_2, placed symmetrically on two sides of a lens.



(a)



(b)

5. Focal length (f) is the distance of principal focus from optical centre of a lens.
6. Focal plane is a plane passing through principal focus and perpendicular to the principal axis of a lens.

The position, nature and size of the image formed by a convex lens are based upon the position of the object placed in front of the lens as mentioned in the following table.

Formation of image by a convex lens for different positions of the object

	Position of the object	Position of the image	Relative size of the image	Nature of the image
1.	At infinity	At focus F_2	Highly diminished (point-sized)	Real and inverted
2.	Beyond $2F_1$	Between F_2 and $2F_2$	Diminished	Real and inverted
3.	At $2F_1$	At $2F_2$	Same size as the object	Real and inverted
4.	Between F_1 and $2F_1$	Beyond $2F_2$	Enlarged	Real and inverted
5.	At focus F_1	At infinity	Infinitely large (highly enlarged)	Real and inverted
6.	Between focus F_1 and optical centre O	On the same side of the lens as the object	Enlarged	Virtual and erect

7. A concave lens always forms a virtual, erect and diminished image of the object on the same side of the lens as mentioned in the following table:

Formation of image by a concave lens for different positions of the object

	Position of the object	Position of the image	Relative size of the image	Nature of the image
1.	An infinity	At focus F_1	Highly diminished (point-sized)	Virtual and erect
2.	Between infinity and optical O of the lens	Behind focus F_1 and optical centre O	Diminished	Virtual and erect

8. Lenses are used in spectacles, different optical instruments such as microscope, telescope, photographic camera, film projector, etc.

The sign convention for lenses is same as that for mirrors except the optical centre of the lens which is taken to be the origin point. If object distance $= u$, image distance $= v$ and focal length $= f$, then from the lens formula, we have

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

9. For a linear object placed normal to the principal axis of a spherical lens, linear magnification of a lens is stated as follows:

Linear magnification of a lens,

$$m = \frac{\text{Height of the } (h')}{\text{Height of the object } (h)}$$

$$= \frac{\text{Distance of the image } (v)}{\text{Distance of the object } (u)}$$

Linear magnification is negative for a real image but positive for a virtual image.

6.11 POWER OF A LENS

It is a measure of its degree of convergence or divergence of light rays incident on it. It is also defined as reciprocal of its focal length.

Power of a lens,

$$(P) = \frac{1}{\text{Focal length of the lens (in metre)}}$$

$$= \frac{1}{f(\text{in m})}$$

The SI unit of power of a lens is dioptre (D), where $1\,\text{D} = 1\,\text{m}^{-1}$.

The power of convex lens is taken positive but power of concave lens is taken negative.

1. When two or more thin lenses of powers $P_1, P_2, P_3, ...$ are brought in contact, then

Combined power,

$$P = P_1 + P_2 + P_3 + ...$$

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3} + ...$$

□□□□□□□

MULITIPLE CHOICE QUESTIONS

1. What is the frequency of violet colour of wavelength 4000 Å?
(a) 7.5×10^{10} Hz
(b) 7.5×10^{12} Hz
(c) 7.5×10^{14} Hz
(d) 3.75×10^{16} Hz

Sol : www.cbse.site/sc/gm101

2. What is the frequency of red colour of wavelength 8000 Å?
(a) 3.75×10^{14} Hz
(b) 3.75×10^{12} Hz
(c) 3.75×10^{16} Hz
(d) none of these

Sol : www.cbse.site/sc/gm102

3. The refractive index of glass is 3/2. The velocity of light in glass is
(a) 3×10^8 m/s
(b) 2×10^8 m/s
(c) 10^8 m/s
(d) 1.33×10^8 m/s

Sol : www.cbse.site/sc/gm103

4. The radius of curvature of a spherical mirror is 20 cm. the focal length of mirror is-
(a) 10 cm
(b) 20 cm
(c) 30 cm
(d) 40 cm

Sol : www.cbse.site/sc/gm104

5. A concave mirror produces three times magnified (enlarged) real image of an object placed at 10 cm in front of it. Where is the image located?
(a) 30 cm
(b) 40 cm
(c) −30 cm
(d) −40 cm

Sol : www.cbse.site/sc/gm105

6. Light enters from air to glass having refractive index 1.50. The speed of light in vacuum is 3×10^8 ms^{-1}. The speed of light in the glass is-
(a) 2×10^8ms^{-1}
(b) 3×10^8ms^{-1}
(c) 4×10^4ms^{-1}
(d) 5×10^5ms^{-1}

Sol : www.cbse.site/sc/gm106

7. A convex lens forms a real and inverted image of a needle at a distance of 50 cm from it. Where is the needle placed in front of the convex lens if the image is equal to the size of the object?
(a) 0.25 m
(b) 0.30 m
(c) 0.35 m
(d) 0.40 m

Sol : www.cbse.site/sc/gm107

8. The power of a concave lens of focal length

of 2 m is-
(a) 0.5 D
(b) −0.5 D
(c) 1 D
(d) −1 D

Sol : www.cbse.site/sc/gm108

9. Which one of the following materials cannot be used to make a lens?
(a) Water
(b) Glass
(c) Plastic
(d) Clay

Sol : www.cbse.site/sc/gm109

10. The image formed by a concave mirror is observed to be virtual, erect and larger than the object. Where should be the position of the object?
(a) Between the principal focus and the centre of curvature
(b) At the centre of curvature
(c) Beyond the centre of curvature
(d) Between the pole of the mirror and its principal focus.

Sol : www.cbse.site/sc/gm110

11. Where should an object is placed in front of a convex lens to get a real image of the size of the object?
(a) At the principal focus of the lens
(b) At twice the focal length
(c) At infinity
(d) Between the optical centre of the lens and its principal focus.

Sol : www.cbse.site/sc/gm111

12. A spherical mirror and a thin spherical lens have each a focal length of −15 cm. The mirror and the lens are likely to be-
(a) both concave
(b) both convex
(c) the mirror is concave and the lens is convex
(d) the mirror is convex, but the lens is concave

Sol : www.cbse.site/sc/gm112

13. No matter how far you stand from a mirror, your image appears erect. The mirror is likely to be-
(a) Plane
(b) Concave
(c) Convex
(d) Either plane or convex

Sol : www.cbse.site/sc/gm113

14. Which of the following lenses would you prefer to use while reading small letters found in a dictionary?
(a) A convex lens of focal length 50 cm.
(b) A convex lens of focal length 50 cm.
(c) A convex lens of focal length 5 cm.
(d) A concave lens of focal length 5 cm.

Sol : www.cbse.site/sc/gm114

15. A concave lens of focal length 15 cm forms as image 10 cm from the lens. How far is the object placed from the lens?
(a) −20 cm
(b) 40 cm
(c) −30 cm
(d) −40 cm

Sol : www.cbse.site/sc/gm115

16. An object is placed at a distance of 10 cm

from a convex mirror of focal length 15 cm. the position of the image is-

(a) 6 cm
(b) 9 cm
(c) 8 cm
(d) 7 cm

Sol : www.cbse.site/sc/gm116

17. An object 5.0 cm in length is placed at a distance of 20 cm in front of a convex mirror or radius of curvature 30 cm. The position of the image is-

(a) 8.57 cm
(b) 9.10 cm
(c) 8.15 cm
(d) 7.15 cm

Sol : www.cbse.site/sc/gm117

18. An object of size 7.0 cm is placed at 27 cm in front of a concave mirror of focal length 18 cm. At what distance from the mirror should a screen be placed, so that a sharp focussed image can be obtained?

(a) 54 cm
(b) 60 cm
(c) -54 cm
(d) -60 cm

Sol : www.cbse.site/sc/gm118

19. The focal length of a lens of power -2.0 D is-

(a) -50 cm
(b) 40 cm
(c) 50 cm
(d) -40 cm

Sol : www.cbse.site/sc/gm119

20. A doctor has prescribed a corrective lens of power $+1.5$ D. The focal length of the lens is-

(a) 67 cm
(b) 70 cm
(c) 40 cm
(d) 65 cm

Sol : www.cbse.site/sc/gm120

21. The angle between incident ray and reflected ray is 60°. What is the angle of incidence?

(a) 30°
(b) 40°
(c) 60°
(d) 50°

Sol : www.cbse.site/sc/gm121

22. When an incident ray makes an angle of 40° with a normal to the air glass interface of the rectangular glass slab. The value of angle of emergence is-

(a) 30°
(b) 60°
(c) 90°
(d) 40°

Sol : www.cbse.site/sc/gm122

23. The speed of light in a transparent medium is 0.6 times that of its speed in vacuum. The refractive index of the medium is:

(a) 1.66
(b) 1.96
(c) 1.26
(d) 1.29

Sol : www.cbse.site/sc/gm123

24. The focal length of a convex mirror is 12.5 cm. How far is its centre of curvature

from the pole?
(a) 25 cm
(b) 30 cm
(c) 40 cm
(d) 50 cm

Sol : www.cbse.site/sc/gm124

25. An object is placed at a distance of 30 cm from a convex mirror, the magnification produced is $\frac{1}{2}$. Where should the object be placed to get the magnification of $\frac{1}{3}$?
(a) -60 cm
(b) 40 cm
(c) 50 cm
(d) 60 cm

Sol : www.cbse.site/sc/gm125

26. An object is kept in front of a concave mirror of focal length 20 cm. The image is three times the size of the object. The possible distances of the object from the mirror is-
(a) $\frac{-80}{3}$
(b) $\frac{-40}{3}$
(c) $\frac{-50}{3}$
(d) $\frac{-10}{3}$

Sol : www.cbse.site/sc/gm126

27. A ray of light falls normally on the surface of a transparent glass slab. The angle of emergence is-
(a) 0°
(b) 90°
(c) 45°
(d) 70°

Sol : www.cbse.site/sc/gm127

28. A ray of light is refracted as per the following diagram. Which of the following medium is optically denser?
(a) Medium A
(b) Medium B
(c) Cannot be identify
(d) Both medium are denser

Sol : www.cbse.site/sc/gm128

29. In an experiment with a rectangular glass slab, a student observed that a ray of light incident at an angle of 55° with the normal on one face of the slab, after refraction strikes the opposite face of the slab before merging out into air making an angle of 40° with the normal. What value would you assign to the angle of refraction and angle of emergence?
(a) 40°, 55°
(b) 55°, 40°
(c) 10°, 20°
(d) 40°, 90°

Sol : www.cbse.site/sc/gm129

30. With respect to air, the refractive index of ice is 1.31 and that of rock salt is 1.54. the refractive index of rock salt with respect to ice is-
(a) 1.25
(b) 1.18
(c) 1.90
(d) 1.40

Sol : www.cbse.site/sc/gm130

31. The refractive index of a medium 'x' with respect to 'y' is $\frac{2}{3}$ and the refractive index of medium 'y' with respect to 'z' is $\frac{4}{3}$. The refractive index of medium 'z' with respect of 'x' is-

(a) $\frac{2}{9}$
(b) $\frac{9}{8}$
(c) $\frac{1}{3}$
(d) $\frac{5}{6}$

Sol : www.cbse.site/sc/gm131

32. For the same angle of incidence in media P, Q and R, the angles of refraction are 45°, 35° and 15° respectively. In which medium will the velocity of light be minimum?
(a) P
(b) Q
(c) R
(d) Q and R

Sol : www.cbse.site/sc/gm132

33. When light enters from air to glass, the angles of incidence and refraction in air and glass are 45° and 30° respectively. The refractive index of glass is (Given that $\sin 45^\circ = \frac{1}{\sqrt{2}}$, $\sin 30^\circ = \frac{1}{2}$)
(a) 1.90
(b) 1.41
(c) 1.20
(d) 1.55

Sol : www.cbse.site/sc/gm133

34. Two thin lenses of power $+3.5\,\text{D}$ and $-2.5\,\text{D}$ are placed in contact. The power of the lens combination is-
(a) $+1\,\text{D}$
(b) $+1.5\,\text{D}$
(c) $+2.5\,\text{D}$
(d) $+2\,\text{D}$

Sol : www.cbse.site/sc/gm134

35. A convex lens of focal length 25 cm and a concave lens of focal length 10 cm are placed in close contact with each other. The power of this combination is-
(a) 2 D
(b) 6 D
(c) $-6\,\text{D}$
(d) 9 D

Sol : www.cbse.site/sc/gm135

36. The power of a combination of two lenses XY is 5 D if the focal length of lens X is 15 cm. The focal length of lens Y is-
(a) 60 cm
(b) -60 cm
(c) 50 cm
(d) -10 cm

Sol : www.cbse.site/sc/gm136

37. A student wants to project the image of a candle flame on a screen 80 cm in front of a mirror by keeping the candle flame at a distance of 20 cm from its pole. The magnification of the image produced is-
(a) -4
(b) -2
(c) -6
(d) -1

Sol : www.cbse.site/sc/gm137

38. A 4.5 cm needle is placed 12 cm away from a convex mirror of focal length 15 cm. The location of the image is-
(a) 6.7 cm
(b) 4.5 cm
(c) 9.2 cm
(d) 5 cm

Sol : www.cbse.site/sc/gm138

39. If the speed of light in vacuum is 3×10^8 m/s, the absolute refractive index of a medium in which light travels with a speed of 1.4×10^8 m/s is
(a) 2.14
(b) 3.14
(c) 4.15
(d) 1.14

Sol : www.cbse.site/sc/gm139

40. An object of height 6 cm is placed perpendicular to the principal axis of a concave lens of focal length 5 cm. If the distance of the object from the lens is 10 cm. The position of image is:
(a) $\frac{10}{3}$ cm
(b) $\frac{-10}{3}$ cm
(c) $\frac{20}{3}$ cm
(d) $\frac{-20}{3}$ cm

Sol : www.cbse.site/sc/gm140

41. An object of height 5 cm is placed perpendicular to the principal axis of a concave lens of focal length 10 cm. If the distance of the object from the optical centre of the lens is 20 cm, the size of the image is-
(a) 1.66 cm
(b) 2.16 cm
(c) 1.69 cm
(d) 2.91 cm

Sol : www.cbse.site/sc/gm141

42. The image of a candle flame placed at a distance of 30 cm from a spherical lens is formed on a screen placed on the other side of the lens at distance of 60 cm from the optical centre of the lens. The focal length of lens is-
(a) 40 cm
(b) 30 cm
(c) 50 cm
(d) 20 cm

Sol : www.cbse.site/sc/gm142

43. A 6 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 15 cm. The distance of the object from the lens is 10 cm. The position, of the image is-
(a) 20 cm
(b) 30 cm
(c) −30 cm
(d) 50 cm

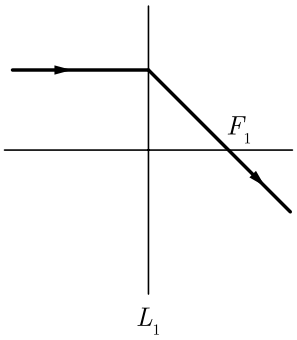
Sol : www.cbse.site/sc/gm143

44. A convex lens has a focal length of 10 cm. At what distance from the lens should the object be placed so that it forms a real and inverted image 20 cm away from the lens?
(a) −20 cm
(b) −40 cm
(c) −60 cm
(d) −80 cm

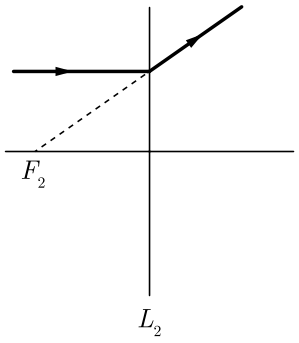
Sol : www.cbse.site/sc/gm144

45. The following figures show the path of light rays through three lenses marked L_1, L_2 and L_3 and their focal points F_1, F_2 and F_3 respectively.

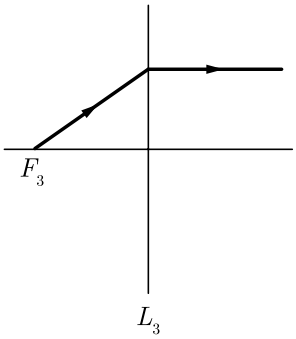
(i)



(ii)



(iii)



Which of the following diagram shows the concave lens properties?

(a) (i)
(b) (ii)
(c) (iii)
(d) (i), (ii)

Sol : www.cbse.site/sc/gm145

46. Consider the following statements about refraction of light :

1. The incident ray, refracted ray and the normal ray lie in the same plane.
2. The angle of incidence is equal to the angle of refraction.

Choose the correct option from the codes given below:

(a) Only 1
(b) Only 2
(c) Both 1 and 2
(d) Neither 1 nor 2

Sol : www.cbse.site/sc/gm146

Ans : (a) Only 1

According to the first laws of refraction of light are :
"The incident ray, the refracted ray and the normal to the interface of two transparent media at the point of incidence, all lie in the same plane".
According to the law of refraction the ratio of sine of angle of incidence to the sine of angle of refraction is constant, for the light of a given colour and for the given pair of media. This law is also known as Snell's law of refraction.

47. Which of the following are correctly matched for the concave mirror?

	Object	**Image**
1.	Between P and F	at infinity
2.	At C	at C
3.	Beyond C	between F and C
4.	At infinity	at focus

Choose the correct option from the codes given below :

(a) 1, 3, 4
(b) 2, 3, 4
(c) 1, 2, 3
(d) 1, 2, 3, 4

Sol : www.cbse.site/sc/gm147

48. As light travels from a rarer to a denser medium it will have
(a) increased velocity
(b) decreased velocity
(c) decreased wavelength
(d) both (b) and (c)

Sol : www.cbse.site/sc/gm148

49. The correct order of refractive index of various materials is :
(a) Diamond > Ice > Alcohol > Rock salt
(b) Ice > Diamond > Rock salt > Alcohol
(c) Diamond > Rock salt > Alcohol > Ice
(d) Rock salt > Alcohol > Ice > Diamond

Sol : www.cbse.site/sc/gm149

50. A full length of a distant tall building can definitely be seen by using
(a) a concave mirror
(b) a convex mirror
(c) a plane mirror
(d) both concave as well as plane mirror

Sol : www.cbse.site/sc/gm150

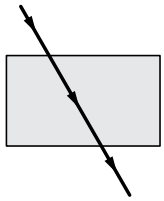
51. In torches, search light and headlights of vehicles the bulb is placed
(a) Between the pole and focus of the reflector
(b) Very near to the focus of the reflector
(c) Between the focus and centre of curvature of the reflector
(d) At the centre of curvature of the reflector

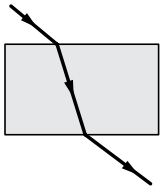
Sol : www.cbse.site/sc/gm151

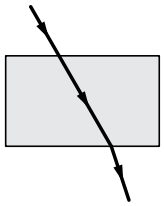
52. The laws of reflection hold good for:
(a) plane mirror only
(b) concave mirror only
(c) convex mirror only
(d) All mirrors irrespective of their shape.

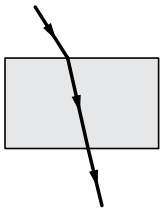
Sol : www.cbse.site/sc/gm152

53. The path of a ray of light coming from air passing through a rectangular glass slab traced by four students are shown in figure. Which one of them is correct?

(a) 

(b) 

(c) 

(d) 

Sol : www.cbse.site/sc/gm153

54. You are given water, mustard oil, glycerine and kerosene. In which of these media, a ray of light incident obliquely at same angle

would bend the most?

(a) Kerosene

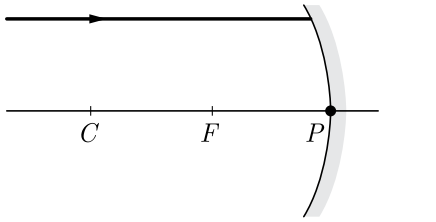
(b) Water

(c) Mustard oil

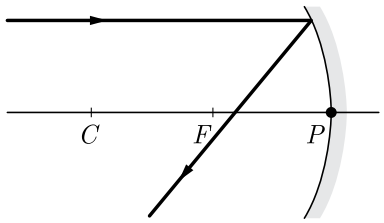
(d) Glycerine

Sol : www.cbse.site/sc/gm154

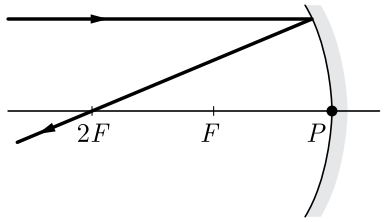
55. Which of the following ray diagrams is correct for the ray of light incident on a concave mirror as shown in Figure?



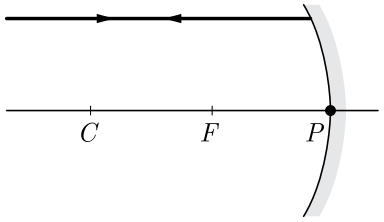
(a)



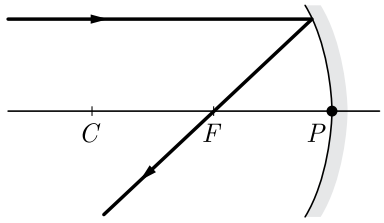
(b)



(c)

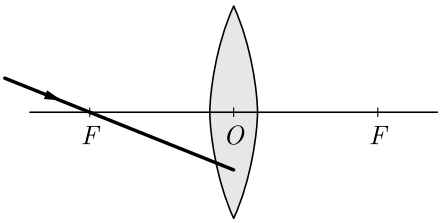


(d)

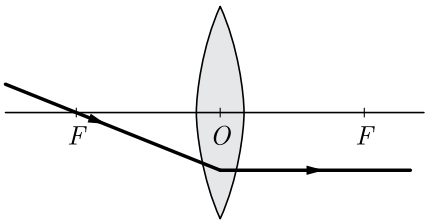


Sol : www.cbse.site/sc/gm155

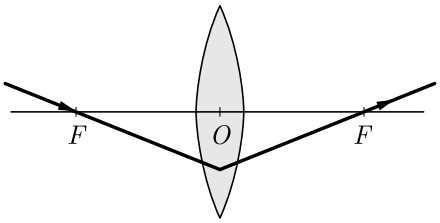
56. Which of the following ray diagrams is correct for the ray of light incident on a lens shown in Figure?



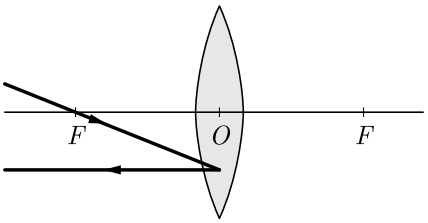
(a)



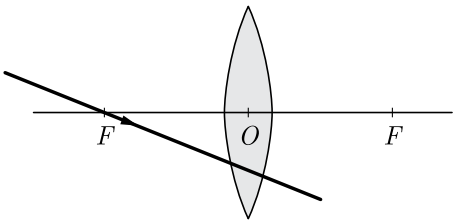
(b)



(c)



(d)



Sol : www.cbse.site/sc/gm156

57. A child standing in front of a magic mirror.

She finds the image of her head bigger, the middle portion of her body of the same size and that of the legs smaller. The following is the order of combinations for the magic mirror from the top.

(a) Plane, convex and concave
(b) Convex, concave and plane
(c) Concave, plane and convex
(d) Convex, plane and concave

Sol : www.cbse.site/sc/gm157

58. In which of the following, the image of an object placed at infinity will be highly diminished and point sized?

(a) Concave mirror only
(b) Convex mirror only
(c) Convex lens only
(d) Concave mirror, convex mirror, concave lens and convex lens

Sol : www.cbse.site/sc/gm158

59. A thin layer of water is transparent but a very thick layer of water is:

(a) translucent
(b) opaque
(c) most transparent
(d) none of these

Sol : www.cbse.site/sc/gm159

60. Air is not visible because it

(a) is nearly a perfectly transparent
(b) neither absorbs nor reflects light
(c) transmits whole of light
(d) all of the above are correct

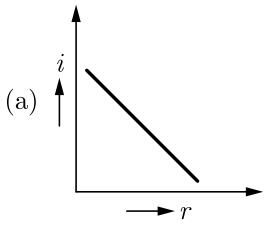
Sol : www.cbse.site/sc/gm160

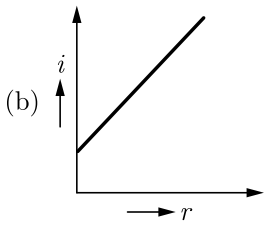
61. According to laws of reflection of light

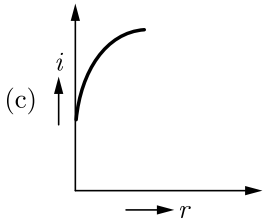
(a) Angle of incidence is equal to the angle of reflection
(b) Angle of incidence is less than the angle of reflection
(c) Angle of incidence is greater than the angle of reflection
(d) None of these

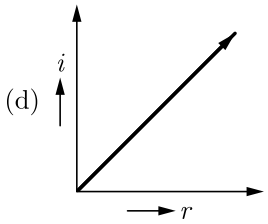
Sol : www.cbse.site/sc/gm161

62. Which of the following correctly represents graphical relation between angle of incidence (i) and angle of reflection (r)?

(a) 

(b) 

(c) 

(d) 

Sol : www.cbse.site/sc/gm162

63. A concave mirror of focal length f (in air)

is immersed in water ($\mu = 4/3$). The focal length of the mirror in water will be-

(a) f

(b) $\frac{4}{3}f$

(c) $\frac{3}{4}f$

(d) $\frac{7}{3}f$

Sol : www.cbse.site/sc/gm163

64. Convergence of concave mirror can be decreased by dipping in

(a) Water

(b) Oil

(c) Both

(d) None of these

Sol : www.cbse.site/sc/gm164

65. For a real object, which of the following can produce a real image

(a) Plane mirror

(b) Concave lens

(c) Convex mirror

(d) Concave mirror

Sol : www.cbse.site/sc/gm165

66. If an object is placed 10 cm infront of a concave mirror of focal length 20 cm, the image will be

(a) Diminished, upright, virtual

(b) Enlarged, upright, virtual

(c) Diminished, inverted, real

(d) Enlarged, upright, real

Sol : www.cbse.site/sc/gm166

67. While using an electric bulb, the reflection for street lighting should be from

(a) Concave mirror

(b) Convex mirror

(c) Cylindrical mirror

(d) Parabolic mirror

Sol : www.cbse.site/sc/gm167

68. A convex mirror is used to form the image of an object. Then which of the following statement is wrong

(a) The image lies between the pole and the focus

(b) The image is diminished in size

(c) The image is erect

(d) The image is real

Sol : www.cbse.site/sc/gm168

69. Image formed by convex mirror is-

(a) Virtual

(b) Real

(c) Enlarged

(d) Inverted

Sol : www.cbse.site/sc/gm169

70. The field of view is maximum for

(a) Plane mirror

(b) Concave mirror

(c) Convex mirror

(d) Cylindrical mirror

Sol : www.cbse.site/sc/gm170

71. The image of the moon is formed by a concave mirror whose radius of curvature is 4.8 m at a time when distance from the moon is 2.4×10^8 m. If the diameter of the image is 2.2 cm, the diameter of the moon is-

(a) 1.1×10^6 m

(b) 2.2×10^6 m

(c) 2.2×10^8 m
(d) 2.2×10^{10} m

Sol : www.cbse.site/sc/gm171

72. The focal length of a concave mirror is f and the distance of the object from the principal focus is a. The magnitude of magnification obtained will be-
(a) $(f+a)/f$
(b) f/a
(c) $\sqrt{f}/\sqrt{a}$
(d) f^2/a^2

Sol : www.cbse.site/sc/gm172

73. The magnification produced by a concave mirror-
(a) is always more than one
(b) is always less than one
(c) is always equal to one
(d) may be less than or greater than one

Sol : www.cbse.site/sc/gm173

74. The ratio of the refractive index of red light to blue light in air is-
(a) Less than unity
(b) Equal to unity
(c) Greater than unity
(d) Less as well as greater than unity depending upon the experimental arrangement

Sol : www.cbse.site/sc/gm174

75. When light travels from one medium to the other of which the refractive index is different, then which of the following will change
(a) Frequency, wavelength and velocity
(b) Frequency and wavelength
(c) Frequency and velocity
(d) Wavelength and velocity

Sol : www.cbse.site/sc/gm175

76. A beam of light propagating in medium A with index of reflection $n(A)$ passes across an interface into medium B with index of refraction $n(B)$. The angle of incidence is greater than the angle of refraction; $v(A)$ and $v(B)$ denotes the speed of light in A and B. Then which of the following is true
(a) $v(A) > v(B)$ and $n(A) > n(B)$
(b) $v(A) > v(B)$ and $n(A) < n(B)$
(c) $v(A) < v(B)$ and $n(A) > n(B)$
(d) $v(A) < v(B)$ and $n(A) < n(B)$

Sol : www.cbse.site/sc/gm176

77. The refractive indices of glass and water w.r.t. air are $\frac{3}{2}$ and $\frac{4}{3}$ respectively. the refractive index of glass w.r.t. water will be :
(a) $\frac{8}{9}$
(b) $\frac{9}{8}$
(c) $\frac{7}{6}$
(d) None of these

Sol : www.cbse.site/sc/gm177

78. An object is immersed in a fluid. In order that the object becomes invisible, it should
(a) Behave as a perfect reflector
(b) Absorb all light falling on it
(c) Have refractive index one
(d) Have refractive index exactly matching with that of the surrounding fluid

Sol : www.cbse.site/sc/gm178

79. When light travels from glass to air, the incident angle is θ_1 and the refracted angle is θ_2. True relation is-

(a) $\theta_1 = \theta_2$

(b) $\theta_1 < \theta_2$

(c) $\theta_1 > \theta_2$

(d) Not predictable

Sol : www.cbse.site/sc/gm179

80. In vacuum the speed of light depends upon

(a) Frequency

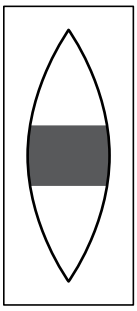
(b) Wavelength

(c) Velocity of the source of light

(d) None of these

Sol : www.cbse.site/sc/gm180

81. If the central portion of a convex lens is wrapped in black paper as shown in the figure



(a) No image will be formed by the remaining portion of the lens

(b) The full image will be formed but it will be less bright

(c) The central portion of the image will be missing

(d) There will be two images each produced by one of the exposed portions of the lens

Sol : www.cbse.site/sc/gm181

82. A boy is standing in front of a plane mirror at a distance of 3 m from it. What is the distance between the boy and his image?

(a) 3 m

(b) 4.5 m

(c) 6 m

(d) None of these

Sol : www.cbse.site/sc/gm182

83. Choose the correct relation between u, v and R for spherical mirrors.

(a) $R = \dfrac{2uv}{u+v}$

(b) $R = \dfrac{2}{u+v}$

(c) $R = \dfrac{2(u+v)}{(uv)}$

(d) None of these

Sol : www.cbse.site/sc/gm183

84. The image formed by a concave mirror is real, inverted and of the same size as that of the object. the position of the object should be :

(a) Beyond C

(b) Between C and F

(c) At C

(d) At F

Sol : www.cbse.site/sc/gm184

85. A lens of focal power 0.5 D is:

(a) A convex lens of focal length 0.5 m

(b) A concave lens of focal length 0.5 m

(c) A convex lens of focal length 2 m

(d) A concave lens of focal length 2 m

Sol : www.cbse.site/sc/gm185

86. Where should an object be placed in front

of a convex lens to get a real image of the size of the object?
(a) At the principle focus of the lens
(b) At twice focal length
(c) At infinity
(d) Between the optical centre of the lens and its principle focus

Sol : www.cbse.site/sc/gm186

87. A spherical mirror and a thin spherical lens each has a focal length of $-15\,\text{cm}$. The mirror and the lens are likely to be-
(a) Both concave
(b) Both convex
(c) The mirror is concave and lens is convex
(d) The mirror is convex, but the lens is concave

Sol : www.cbse.site/sc/gm187

88. A ray of light incident on a plane mirror makes an angle of 20° with the mirror. Then the angle between the incident ray and the reflected ray is-
(a) 70°
(b) 90°
(c) 120°
(d) 140°

Sol : www.cbse.site/sc/gm188

89. A ray of light incident normally on the mirror, retraces its path on reflection. Which of the following is true?
(a) $\angle i = \angle r = 90^\circ$
(b) $\angle i + \angle r = 90^\circ$
(c) $\angle i - \angle r = 0^\circ$
(d) $\angle i = \angle r = 0^\circ$

Sol : www.cbse.site/sc/gm189

90. The inner shining surface of a steel spoon serves as a
(a) Plane mirror
(b) Concave mirror
(c) Convex mirror
(d) Any one of the above

Sol : www.cbse.site/sc/gm190

91. Which type of mirror is used by ENT specialists as a 'head mirror'?
(a) Plane mirror
(b) Convex mirror
(c) Concave mirror
(d) None of these

Sol : www.cbse.site/sc/gm191

92. When linear magnification is negative, the image formed by a concave mirror must be-
(a) erect
(b) virtual
(c) real or virtual
(d) real and inverted

Sol : www.cbse.site/sc/gm192

93. In a convex mirror, focus (F) and centre of curvature (C) of the mirror lie
(a) behind the mirror
(b) in front of the mirror
(c) on the mirror
(d) nothing can be decided

Sol : www.cbse.site/sc/gm193

94. A ray of light falls on a plane mirror making an angle of 30° with normal. On deviation, the ray of light deviates through an angle of
(a) 120°

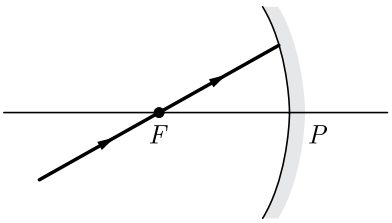
(b) 140°
(c) 160°
(d) 180°

Sol : www.cbse.site/sc/gm194

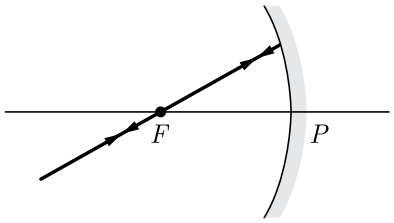
95. The magnification of a concave mirror is -1. it implies that
(a) the object must be at the focus of the concave mirror
(b) the image formed is virtual
(c) the image formed is erect
(d) none of these

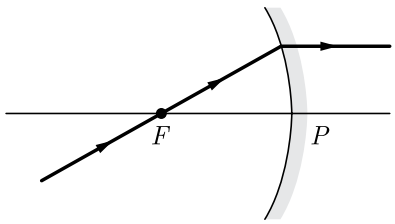
Sol : www.cbse.site/sc/gm195

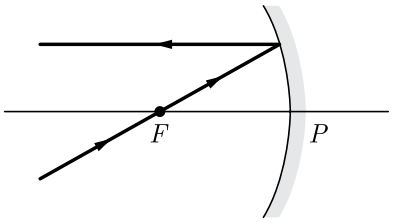
96. An incident ray strikes a concave mirror after passing through the focus (F) as shown in the figure.

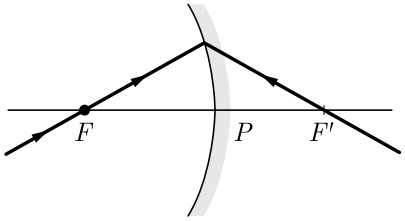


Which of the following shows the correct path of reflected rays?

(a)


(b)


(c)


(d)


Sol : www.cbse.site/sc/gm196

97. The magnification of a spherical mirror is ± 2. Then the mirror must be
(a) Plane
(b) Concave
(c) Convex
(d) Any one of these

Sol : www.cbse.site/sc/gm197

98. A full length image of a distant tall building can definitely be seen by using
(a) a concave mirror
(b) a convex mirror
(c) a plane mirror
(d) both concave as well as plane mirror

Sol : www.cbse.site/sc/gm198

99. Magnification produced by a rear view mirror fitted in vehicles
(a) is less than one
(b) is more than one
(c) is equal to one
(d) can be more than or less than one depending upon the position of the object in front of it.

Sol : www.cbse.site/sc/gm199

100. SI unit of radius of curvature of a concave mirror is

(a) $-m$

(b) m^{-1}

(c) m

(d) None of these

Sol : www.cbse.site/sc/gm200

101. The rays from the sun converge at a point 25 cm in front of a concave mirror. Where should an object be kept so that size of its image is equal to size of the object?

(a) 12.5 cm in front of the mirror

(b) 25 cm in front of the mirror

(c) 50 cm in front of the mirror

(d) between 25 cm and 30 cm in front of the mirror

Sol : www.cbse.site/sc/gm201

102. A student has to do the experiment on finding the focal length of a given concave mirror by using a distant object. Out of the following set ups 1, 2, 3, 4 available to her.

1. a screen, a mirror holder and a scale.
2. a mirror holder, a screen holder and a scale.
3. a screen holder and a scale.
4. a mirror holder and a screen holder.

The set up that is likely to give her the best result is the set-up labelled as:

(a) 1

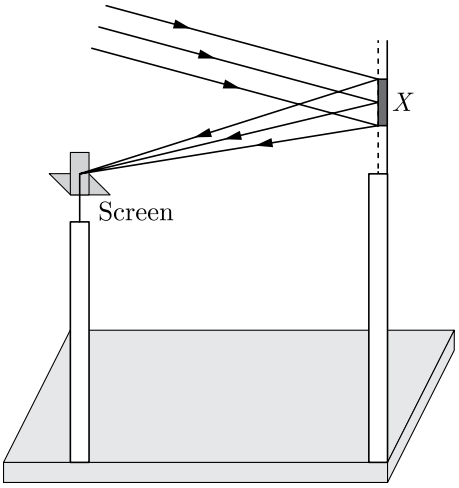
(b) 2

(c) 3

(d) 4

Sol : www.cbse.site/sc/gm202

103. A student determines the focal length of a device X, by focusing the image of a far off object on the screen positioned as shown in figure The device X is a



(a) Convex lens

(b) Concave lens

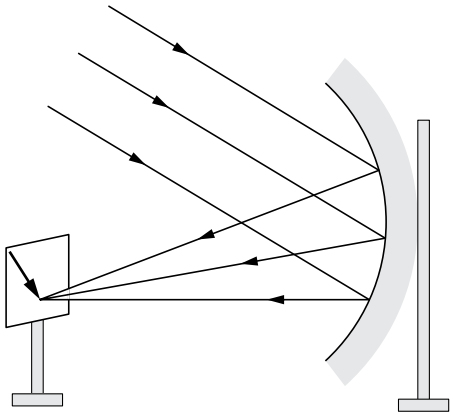
(c) Convex mirror

(d) Concave mirror

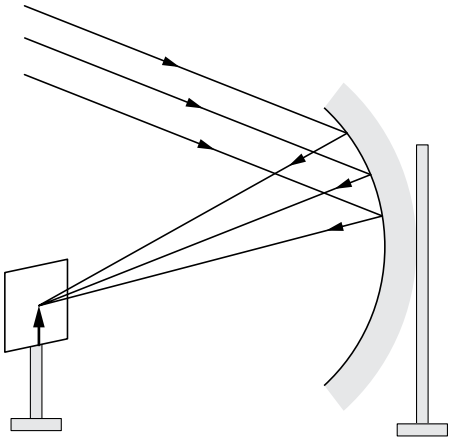
Sol : www.cbse.site/sc/gm203

104. Parallel rays from the top of a distant object, incident on a concave mirror form an image on the screen. The diagram correctly showing the image of the object on the screen in figure is:

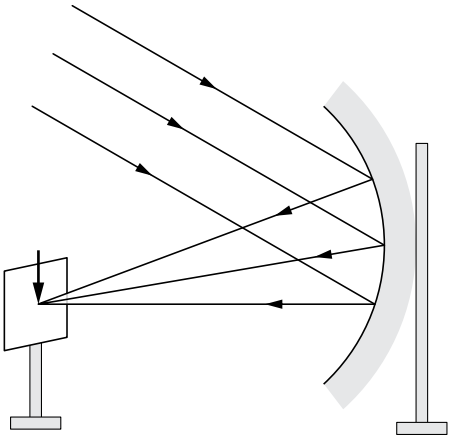
(a)



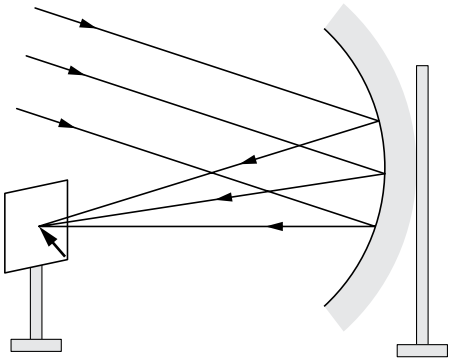
(b)



(c)



(d)



Sol : www.cbse.site/sc/gm204

105. Hold a concave mirror with its shining surface towards the sun. Take a sheet of paper and hold it in front of the mirror. Take the sheet of paper away from the mirror gradually till a sharp, bright spot appears on the paper. The sharp, bright spot is due to-

(a) reflection of light
(b) refraction of light
(c) scattering of light
(d) diffraction of light

Sol : www.cbse.site/sc/gm205

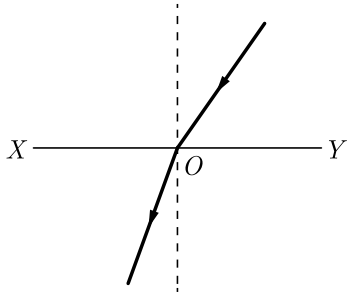
106. A convex lens of focal length 20 cm is placed in contact with a concave lens of focal length 10 cm. The power of the combination is-

(a) 10 dioptre
(b) -10 dioptre
(c) -5 dioptre
(d) 5 dioptre

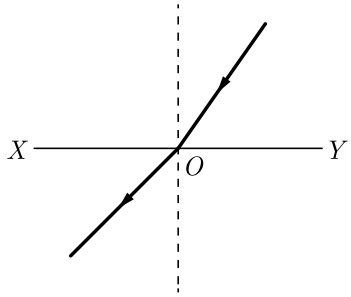
Sol : www.cbse.site/sc/gm206

107. Which of the following figures shows refraction of light while going from denser to rarer medium?

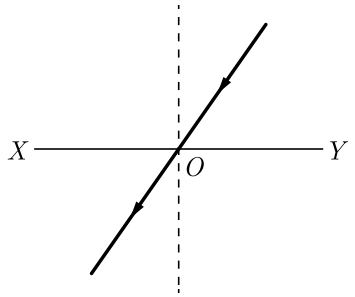
(a)



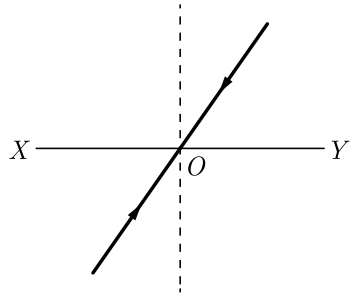
(b)



(c)

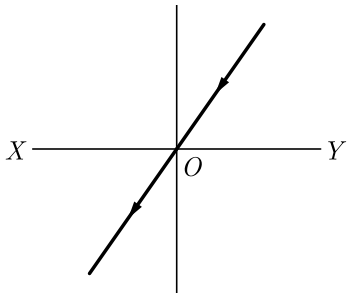


(d)

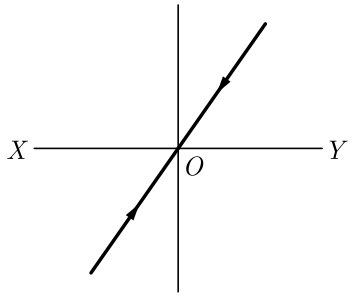


Sol : www.cbse.site/sc/gm207

(c)



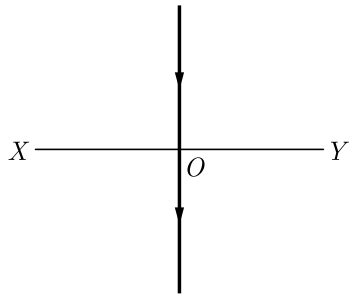
(d)



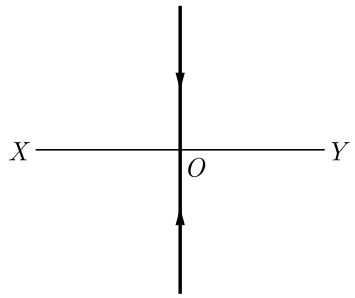
Sol : www.cbse.site/sc/gm208

108. Which of the following figures shows no refraction of light when it is incident normally on a boundary of two media?

(a)

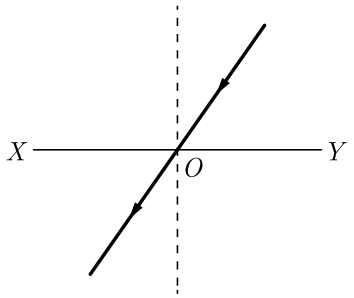


(b)

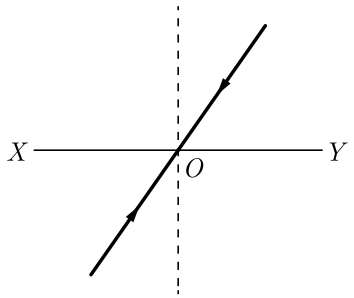


109. No refraction occurs at the boundary that separates two media of equal refractive indices. Which of the following figures shows such type of refraction?

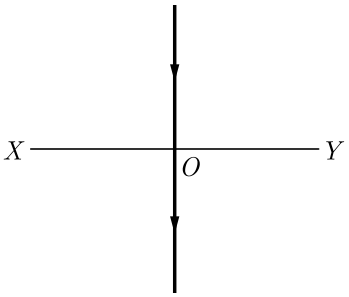
(a)



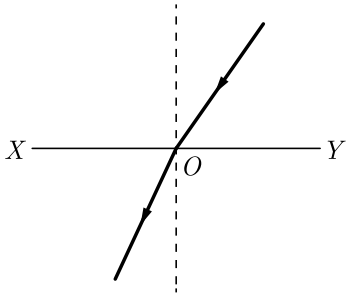
(b)



(c)



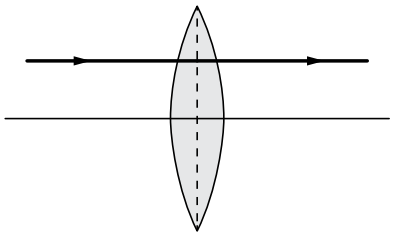
(d)



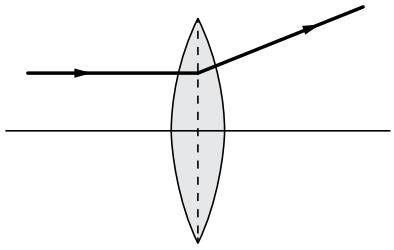
Sol : www.cbse.site/sc/gm209

110. Which of the following correctly shows refraction of a ray of light from a convex lens?

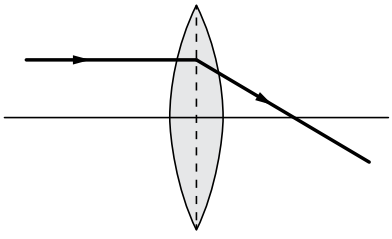
(a)



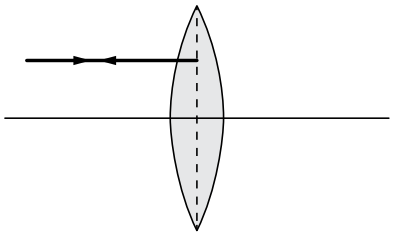
(b)



(c)



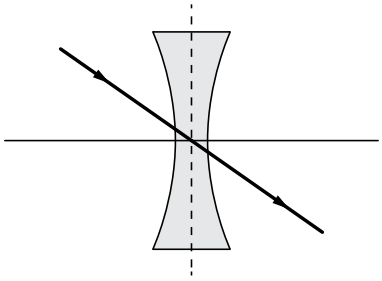
(d)



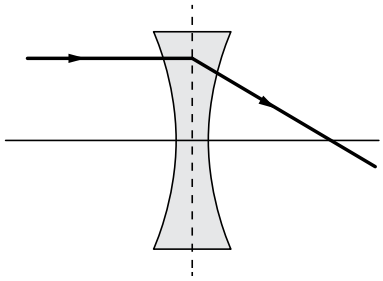
Sol : www.cbse.site/sc/gm210

111. Which of the following correctly shows refraction of a ray of light from a concave lens?

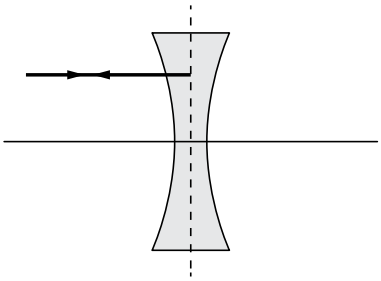
(a)



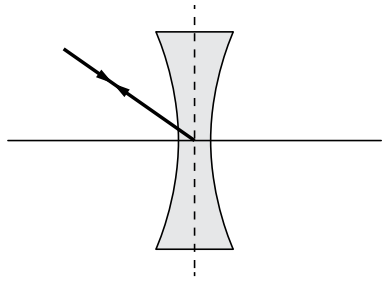
(b)



(c)



(d)



Sol : www.cbse.site/sc/gm211

112. The focal length of a combination of convex lens of power 1 D and concave lens of power -1.5 D is-

(a) -2 m

(b) 2 m

(c) 2.5 m

(d) 0.5 m

Sol : www.cbse.site/sc/gm212

113. SI unit of power is-

(a) metre

(b) watt

(c) kilowatt

(d) dioptre

Sol : www.cbse.site/sc/gm213

114. Does the focal length of a lens change on changing the object distance?

(a) Yes, always

(b) Yes, sometimes

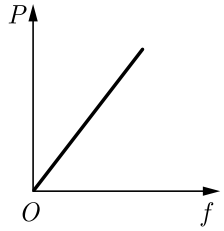
(c) No, never

(d) Cannot say

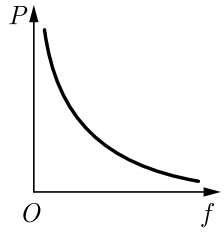
Sol : www.cbse.site/sc/gm214

115. Which of the following graphs shows correct variation between the power (P) of a converging lens and its focal length (f)?

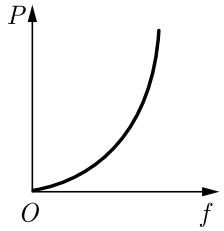
(a)



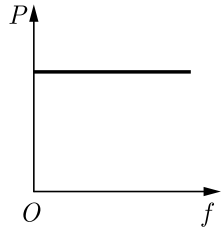
(b)



(c)



(d)



Sol : www.cbse.site/sc/gm215

116. Given below are a few steps (not in proper sequence) followed in the determination of focal length of a given convex lens by obtaining a sharp image of a distant object-

A. Measure the distance between the lens and screen.

B. Adjust the position of the lens to form a sharp image.

C. Select a suitable distant object.

D. Hold the lens between the object and the screen with its faces parallel to the screen the correct sequence of steps for determination of focal length is:

(a) C, A, D, B
(b) C, D, B, A
(c) C, A, B, D
(d) A, B, C, D

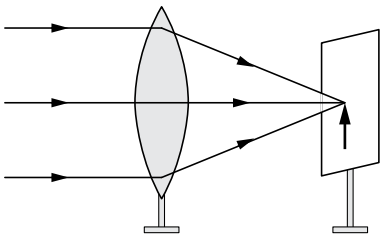
Sol : www.cbse.site/sc/gm216

117. A student obtains a blurred image of an object on a screen by using a convex lens. In order to obtain a sharp image of the same object on the screen, he will have to shift the lens
(a) to a position very far away from the screen.
(b) little away from the screen.
(c) towards the screen.
(d) either towards or away from the screen depending upon the position of the object.

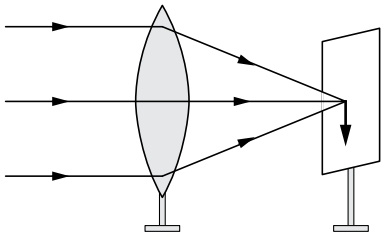
Sol : www.cbse.site/sc/gm217

118. Parallel rays from a distant object incident on a convex lens form an image on the screen. The diagram showing correctly the image of the object on the screen in figure is :

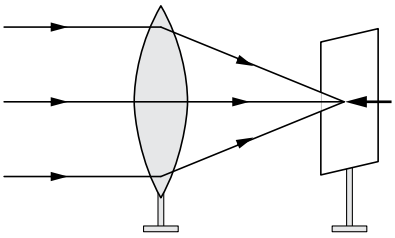
(a)



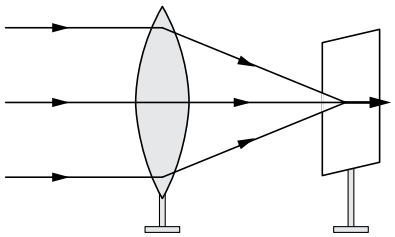
(b)



(c)



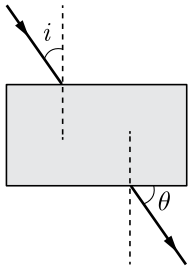
(d)



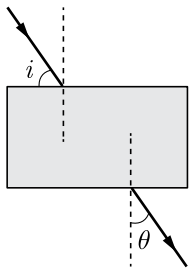
Sol : www.cbse.site/sc/gm218

119. A student does the experiment on tracing the path of a ray of light passing through a rectangular glass slab for different angles of incidence. He can get a correct measure of the angles of incidence and the angle of emergence by following the labelling indicated in figure.

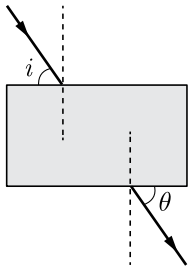
(a)



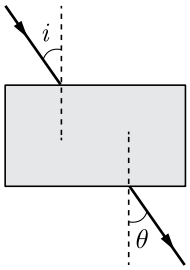
(b)



(c)

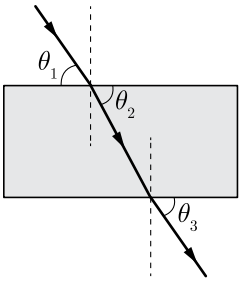


(d)



Sol : www.cbse.site/sc/gm219

120. A student, while doing the experiment on tracing the path of ray of light passing through a rectangular glass slab, measured the three angles marked as θ_1, θ_2 and θ_3 in figure. His measurements could be correct if he were to find :

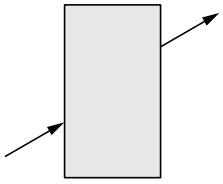


(a) $\theta_1 < \theta_2 < \theta_3$
(b) $\theta_1 < \theta_2$, but $\theta_1 = \theta_3$
(c) $\theta_1 > \theta_2 > 3$
(d) $\theta_1 > \theta_2$ but $\theta_2 = \theta_3$

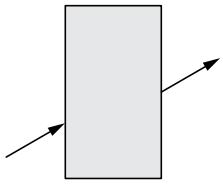
Sol : www.cbse.site/sc/gm220

121. Four students showed the following traces of the path of a ray of light passing through a rectangular glass slab.
The trace most likely to be correct is that of student :

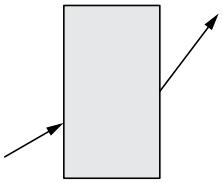
(a)



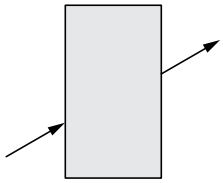
(b)



(c)



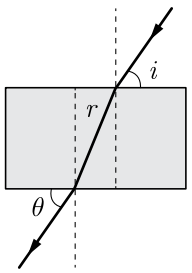
(d)



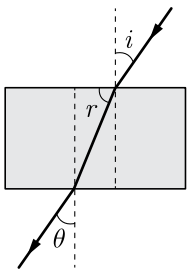
Sol : www.cbse.site/sc/gm221

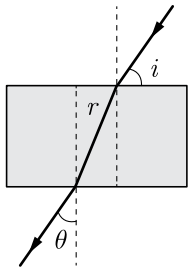
122. The path of a ray of light passing through a rectangular glass slab was traced and angles measured. Which one out of the following is the correct representation of an angle of incidence i, angle of refraction r and angle of emergence e as shown in the diagrams?

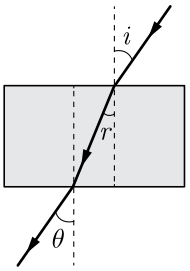
(I)



(II)



(III) 

(IV) 

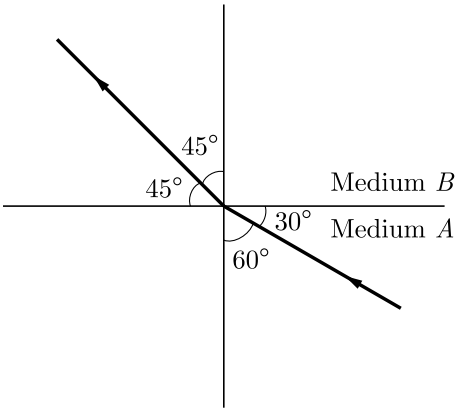
(a) I
(b) II
(c) III
(d) IV

Sol : www.cbse.site/sc/gm222

123. Which of the following can make a parallel beam of light when light from a point source is incident on it?
(a) Concave mirror as well as convex lens.
(b) Convex mirror as well as concave lens.
(c) Two plane mirrors placed at 90° to each other.
(d) Concave mirror as well as concave lens.

Sol : www.cbse.site/sc/gm223

124. Figure shows a ray of light as it travels from medium A to medium B. Refractive index of the medium B relative to medium A is-



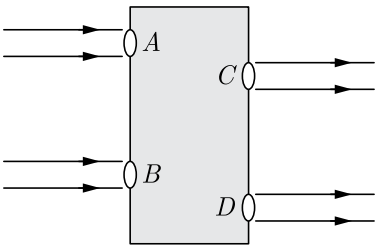
(a) $\frac{\sqrt{3}}{\sqrt{2}}$
(b) $\frac{\sqrt{2}}{\sqrt{3}}$
(c) $\frac{1}{\sqrt{2}}$
(d) $\sqrt{2}$

Sol : www.cbse.site/sc/gm224

125. A light ray enters from medium A to medium B as shown in figure. The refractive index of medium A relative to B will be-
(a) greater than unity
(b) less than unity
(c) equal to unity
(d) zero

Sol : www.cbse.site/sc/gm225

126. Beams of light are incident through the holes A and B and emerge out of box through the holes C and D respectively as shown in figure. Which of the following could be inside the box?

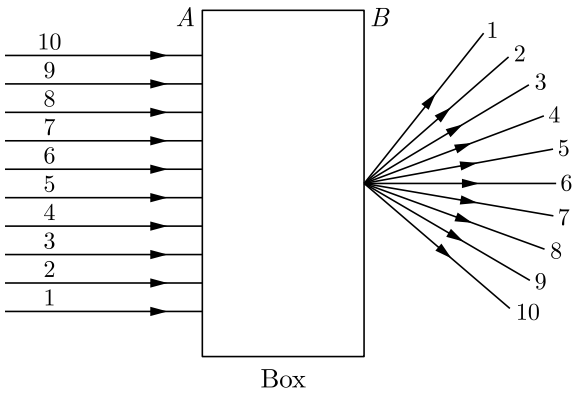


(a) A rectangular glass slab
(b) A convex lens
(c) A concave lens
(d) A prism

Sol : www.cbse.site/sc/gm226

127. A beam of light is incident through the holes on side A and emerges out of the holes on the other face of the box as shown in figure. Which of the following could be

inside the box?



(a) Concave lens
(b) Rectangular glass slab
(c) Prism
(d) Convex lens

Sol : www.cbse.site/sc/gm227

128. In which of the following, the image of an object placed at infinity will be highly diminished and point-sized?
(a) Concave mirror only
(b) Convex mirror only
(c) Convex lens only
(d) Concave mirror, convex mirror, concave lens and convex lens

Sol : www.cbse.site/sc/gm228

129. An object is at a distance of 0.5 m in front of a plane mirror. Distance between the object and image is-
(a) 0.5 m
(b) 1 m
(c) 0.25 m
(d) 1.5 m

Sol : www.cbse.site/sc/gm229

130. A watch shows time as 3.25. When seen through a mirror, the time will appear to be
(a) 8.35
(b) 9.35
(c) 7.35
(d) 8.25

Sol : www.cbse.site/sc/gm230

131. Given a point source of light, which of the following can produce a parallel beam of light?
(a) Convex mirror
(b) Concave mirror
(c) Concave lens
(d) Two plane mirrors inclined at an angle of 90°

Sol : www.cbse.site/sc/gm231

132. A Convex mirror has a focal length f. A real object placed at a distance f in front of it from the pole produces an image at
(a) infinity
(b) f
(c) $\frac{f}{2}$
(d) $2f$

Sol : www.cbse.site/sc/gm232

133. The minimum distance between the object and its real image for a concave mirror is-
(a) f
(b) $2f$
(c) $4f$
(d) zero

Sol : www.cbse.site/sc/gm233

134. A plane glass slab is kept over various coloured letters. The letter, which appears

least raised, is-
(a) blue
(b) violet
(c) green
(d) red

Sol : www.cbse.site/sc/gm234

135. If the rays constituting the beam actually meet at a point or appear to meet at a point, then the beam is:
(a) divergent
(b) convergent
(c) parallel
(d) equal

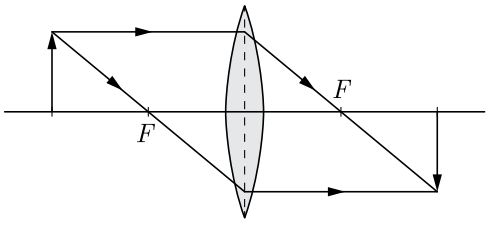
Sol : www.cbse.site/sc/gm235

136. What is the power of a concave lens whose focal length is -75.0 cm?
(a) 1.33 D
(b) -13.3 D
(c) 13.3 D
(d) -1.33 D

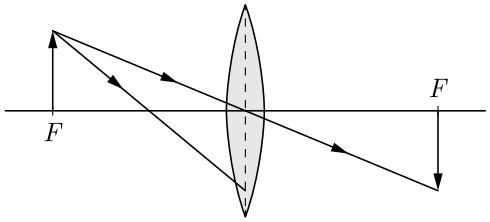
Sol : www.cbse.site/sc/gm236

137. Which of the following ray diagram is correct?

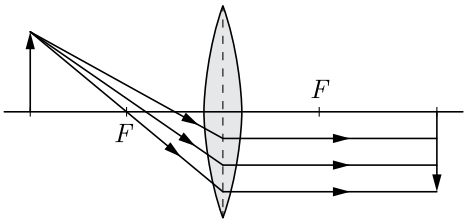
(a)



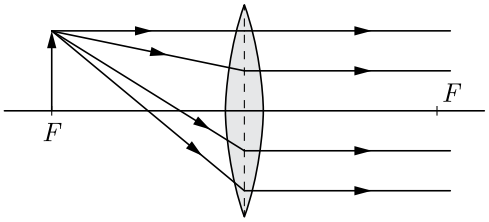
(b)



(c)



(d)



Sol : www.cbse.site/sc/gm237

138. A concave lens always gives a virtual image. In optical lenses worn by humans which of the following statements is true?
(a) The lens can never be concave.
(b) In some cases the lens can be concave if the focal length is much larger than 2.5 cm.
(c) All focal length concave lenses are possible.
(d) All focal length convex lenses are possible.

Sol : www.cbse.site/sc/gm238

139. Amount of light entering into the camera depends upon:
(a) focal length of objective lens.
(b) product of focal length and diameter of objective lens.
(c) distance of objective form camera.
(d) aperture setting of the camera.

Sol : www.cbse.site/sc/gm239

140. When sun rays are focussed with a convex lens, a sharp, bright spot is observed at its

focus. What does this spot indicate?
(a) The real image of the sun.
(b) The virtual image of the sun.
(c) An optical illusion produced by the convex lens.
(d) The magnified image of the sun.

Sol : www.cbse.site/sc/gm240

141. A convex lens has a focal length of 0.5 m. It has to combined with a second lens, so that the combination has a power of 1.5 dioptre. Which of the following could be the second lens?
(a) A concave lens of focal length 2 m.
(b) Another convex lens of focal length 0.5 m.
(c) A convex lens of focal length 0.5 m.
(d) A convex lens of focal length 2 m.

Sol : www.cbse.site/sc/gm241

142. When a ray of light enters a glass slab its wavelength
(a) decreases
(b) increases
(c) remains unchanged
(d) data are not complete

Sol : www.cbse.site/sc/gm242

143. When light travels from one medium to another which of the following factors changes?
(a) Wavelength
(b) Frequency
(c) Amplitude
(d) None of these

Sol : www.cbse.site/sc/gm243

144. The radius of curvature of plane mirror is
(a) infinite
(b) zero
(c) +5 cm
(d) −5 cm

Sol : www.cbse.site/sc/gm244

145. If a glass rod is immersed in a liquid of the same refractive index, then it will
(a) disappear
(b) look bent
(c) look longer
(d) look shorter

Sol : www.cbse.site/sc/gm245

146. An object is immersed in a fluid. In order that the object becomes invisible, it should
(a) have refractive index one
(b) absorb all light falling on it
(c) behave as a perfect reflector
(d) have refractive index exactly matching with that of the surrounding fluid

Sol : www.cbse.site/sc/gm246

147. A beam of light composed of red and green rays is incident obliquely at a point on the face of a rectangular glass slab. When coming out on the opposite parallel face, the red and green rays emerge from
(a) one point propagating in the same direction.
(b) one point propagating in two different directions.
(c) two points propagating in two different parallel directions.
(d) two points propagating in two different non-parallel directions.

Sol : www.cbse.site/sc/gm247

148. Light appears to travel in a straight line, because
(a) frequency of light is very small
(b) wavelength of light is very small
(c) light consists of very small particles
(d) velocity is different for different colours

Sol : www.cbse.site/sc/gm248

149. The velocity of light in vacuum can be changed by changing
(a) amplitude
(b) frequency
(c) wavelength
(d) medium

Sol : www.cbse.site/sc/gm249

150. The velocity of light is maximum in a medium of
(a) glass
(b) water
(c) vacuum
(d) diamond

Sol : www.cbse.site/sc/gm250

151. A man runs towards a mirror with a speed of 15 m-s^{-1}. What is the speed of his image ?
(a) 7.5 m-s^{-1}
(b) 15 m-s^{-1}
(c) 30 m-s^{-1}
(d) 45 m-s^{-1}

Sol : www.cbse.site/sc/gm251

152. The light reflected by a plane mirror will form a real image
(a) under no circumstances.
(b) if object is placed close to the mirror.
(c) if rays incident on mirror are parallel.
(d) if rays incident on mirror are converging.

Sol : www.cbse.site/sc/gm252

153. When two converging lenses of same focal length f are placed in contact, the focal length of the combination is
(a) f
(b) $2f$
(c) $\frac{f}{2}$
(d) $3f$

Sol : www.cbse.site/sc/gm253

154. A plane mirror produces a magnification of
(a) 0
(b) -1
(c) $+1$
(d) between 0 and $+1$

Sol : www.cbse.site/sc/gm254

155. If a ray of light is incident on a plane mirror at an angle of 30°, then deviation produced by the plane mirror is
(a) 30°
(b) 60°
(c) 90°
(d) 120°

Sol : www.cbse.site/sc/gm255

156. An object is placed at a distance f in the front of a convex mirror. If focal length of the mirror is f, then distance of image from pole of the mirror is
(a) f
(b) $2f$

(c) $\frac{f}{2}$

(d) $\frac{f}{4}$

Sol : www.cbse.site/sc/gm256

157. The refractive indices of water and glass are 1.2 and 1.5 respectively. What will be the refractive index of glass with respect to water ?

(a) 1.75

(b) 1.25

(c) 0.8

(d) 0.6

Sol : www.cbse.site/sc/gm257

158. The velocity of light in a medium is 2×10^8 m-s^{-1}. Refractive index of the medium is

(a) 1

(b) 1.1

(c) 1.4

(d) 1.5

Sol : www.cbse.site/sc/gm258

159. The power of combination of two lenses of powers $+1.5$ D and -2.5 D is

(a) $+1.5$ D

(b) -2.5 D

(c) -1 D

(d) $+1$ D

Sol : www.cbse.site/sc/gm259

160. A convex lens of focal length 40 cm is in contact with a concave lens of focal length 25 cm. The power of the combination is

(a) -6.5 D

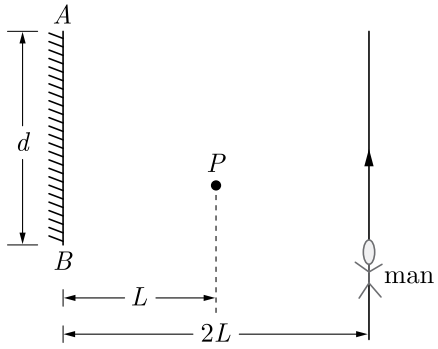
(b) $+6.5$ D

(c) $+6.67$ D

(d) -1.5 D

Sol : www.cbse.site/sc/gm260

161. A point source of light P is placed at a distance L in front of a mirror of width d hung vertically on a wall. A man walks in front of the mirror along a line parallel to the mirror at a distance $2L$ as shown in the figure. The greatest distance over which he can see the image of the light source, in the mirror, is



(a) $\frac{d}{2}$

(b) d

(c) $2d$

(d) $3d$

Sol : www.cbse.site/sc/gm261

162. If the refractive index of a medium is 1.2, then light will pass through this medium with a velocity of

(a) 2.5×10^8 m -s^{-1}

(b) 3×10^8 m -s^{-1}

(c) 3.6×10^8 m -s^{-1}

(d) 4.8×10^8 m -s^{-1}

Sol : www.cbse.site/sc/gm262

163. A candle placed 25 cm from a lens, forms an image on a screen placed 75 cm on the other end of the lens. The focal length and

type of the lens should be
(a) $+18.75$ cm and convex lens
(b) -18.75 cm and concave lens
(c) $+20.25$ cm and convex lens
(d) -20.25 cm and concave lens

Sol : www.cbse.site/sc/gm263

164. The power of a plane glass is
(a) zero
(b) 1 D
(c) 2 D
(d) infinity

Sol : www.cbse.site/sc/gm264

165. If the power of a lens is $+5$ D, then its focal length is
(a) $+0.2$ cm
(b) -0.2 cm
(c) $+20$ cm
(d) -20 cm

Sol : www.cbse.site/sc/gm265

166. A combination of a concave and convex lens has power 5 D. If the power of convex lens is 4 D, then focal length of the concave lens is
(a) 10 cm
(b) 20 cm
(c) 100 cm
(d) 200 cm

Sol : www.cbse.site/sc/gm266

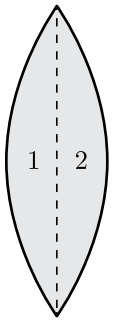
167. If two lenses of power 2 D and 3 D are kept in contact with each other, then focal length of the combination will be
(a) 5 cm
(b) 10 cm
(c) 20 cm
(d) 40 cm

Sol : www.cbse.site/sc/gm267

168. The projection lens of a projector has focal length 5 cm. It is desired to get an image with a magnification 30. The distance of the screen from the lens must be
(a) 0.3 m
(b) 0.8 m
(c) 1.55 m
(d) 2.55 m

Sol : www.cbse.site/sc/gm268

169. A convex lens has a focal length f. It is cut into two parts along the dotted line as shown in the figure. The focal length of each part will be



(a) $\frac{f}{2}$
(b) f
(c) $\frac{3f}{2}$
(d) $2f$

Sol : www.cbse.site/sc/gm269

170. The radius of curvature of concave mirror is 24 cm. Then, the focal length will be
(a) -12 cm
(b) 6 cm
(c) -24 cm

(d) -6 cm

Sol : www.cbse.site/sc/gm270

171. An object is placed 20 cm from the concave mirror of focal length 10 cm, then image is formed at

(a) centre of curvature of mirror
(b) behind the mirror
(c) between the mirror and focus
(d) at focus

Sol : www.cbse.site/sc/gm271

172. Velocity of light in air is 3×10^8 m/s. While its velocity in a medium is 1.5×10^8 m/s. Then, refractive index of this medium is

(a) 3
(b) 5
(c) 0.5
(d) 2

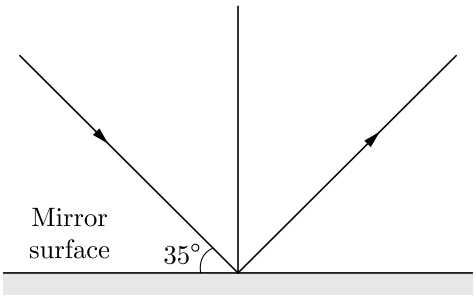
Sol : www.cbse.site/sc/gm272

173. A virtual image three times the size of the object is obtained with a concave mirror of radius of curvature 24 cm. The distance of the object from the mirror is

(a) 20 cm
(b) 10 cm
(c) 12 cm
(d) 5 cm

Sol : www.cbse.site/sc/gm273

174. The angle of incidence and angle of reflection in the following diagram.



(a) 45°, 40°
(b) 55°, 55°
(c) 60°, 60°
(d) 30°, 30°

Sol : www.cbse.site/sc/gm274

175. One light wave is incident upon a plate of refracting index μ. Incident angle i, for which refractive and reflective waves are mutually perpendicular will be

(a) $i = 45^\circ$
(b) $i = \sin^{-1}(\mu)$
(c) $i = \text{cosec}^{-1}(\mu)$
(d) $i = \tan^{-1}(\mu)$

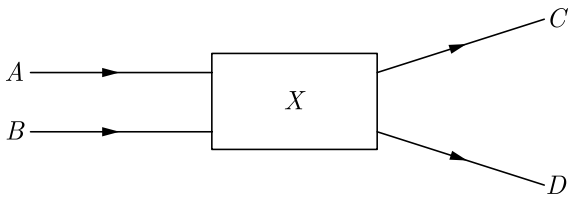
Sol : www.cbse.site/sc/gm275

176. An object is situated at a distance of $f/2$ from a convex lens of focal length f. Distance of image will be

(a) $+(f/2)$
(b) $+(f/3)$
(c) $+(f/4)$
(d) $-f$

Sol : www.cbse.site/sc/gm276

177. Light rays A and B fall on optical component X and come out as C and D.



The optical component is a

(a) concave lens

(b) convex lens

(c) convex mirror

(d) prism

Sol : www.cbse.site/sc/gm277

178. If the refractive indices for water and diamond relative to air are 1.33 and 2.4 respectively, then the refractive index of diamond relative to water is-

(a) .55

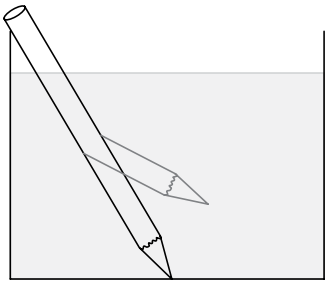
(b) 1.80

(c) 3.19

(d) None of these

Sol : www.cbse.site/sc/gm278

179. Which statement best describes the property of light waves illustrated in the diagram below?



(a) Some materials absorb light waves.

(b) Some materials refracted by some materials.

(c) Light waves are refracted by some materials.

(d) Light waves are emitted by some materials.

Sol : www.cbse.site/sc/gm279

180. **Assertion :** Convex mirror is used as a rear view mirror.
Reason : Convex mirror always forms inverted image.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm280

181. **Assertion :** Refractive indices of all transparent mediums are more than 1 (except air).
Reason : Air is the rarest medium.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm281

182. **Assertion :** When light travels from one medium to another. The direction of propagation of light in second medium changes.
Reason : Light travels with different speeds in different mediums.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm282

183. **Assertion :** Radius of curvature of a spherical minor is half its focal length.
Reason : A ray of light incident parallel to principal axis after reflection passes through C.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm283

184. **Assertion :** After refraction though a rectangular glass slab, emergent ray is parallel to the direction of incident ray.
Reason : Refractive indices of air and glass are different.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm284

185. **Assertion :** Magnification of real images is taken negative.
Reason : Magnification is ratio of image distance and object distance.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm285

186. **Assertion :** On moving from optically rarer to denser medium, a ray of light bends away from the normal.
Reason : Speed of light is more in denser medium and less in rarer medium.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm286

187. **Assertion :** When light from sun is focussed on a sheet of paper using a convex lens, the paper begins to burn producing smoke. It may even catch fire after a while.
Reason : Convex lens is a converging lens.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm287

188. **Assertion :** Power of a convex lens is positive and that of a concave lens is negative.
Reason : Convex lens forms real image and concave lens forms virtual image.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm288

189. **Assertion :** Convex mirror is used as a shaving mirror.
Reason : Convex minor always forms an enlarged image.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm289

190. **Assertion :** A small source of light casts a sharp shadow of an opaque object.
Reason : Light travels in straight lines.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm290

191. **Assertion :** Concave mirror has a real focus.
Reason : Concave mirror always forms real image.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm291

192. **Assertion :** The twinkling of star is due to reflection of light.
Reason : The velocity of light changes while going from one medium to the other.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm292

193. **Assertion :** For observing traffic at our back, we prefer to use a convex mirror.
Reason : A convex mirror has a much larger field of view than a plane mirror or a concave mirror.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are

true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/gm293

194. **Assertion :** A concave mirror of focal length 'f' in air is used in a medium of refractive index 2. Then the focal length of mirror in medium becomes double.
Reason : The radius of curvature of a mirror is double of the focal length.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm294

195. **Assertion :** Large concave mirrors are used to concentrate sunlight to produce heat in solar cookers.
Reason : Concave mirror converges the light rays falling on it to a point.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm295

196. **Assertion :** A ray incident along normal to the mirror retraces its path.
Reason : In reflection, angle of incidence is not equal to angle of reflection.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm296

197. **Assertion :** When a concave mirror is held under water, its focal length will decrease.
Reason : The focal length of a concave mirror is independent of the medium in which it is placed.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Assertion is false but reason is true.

Sol : www.cbse.site/sc/gm297

198. **Assertion :** Plane mirror may form virtual image.
Reason : Plane mirror forms virtual image, if objects is real.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/gm298

199. **Assertion :** An object is placed at a distance of d from a convex mirror of focal length d, its image will form at infinity.
Reason : The distance of image in convex mirror can never be infinity.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but reason is true.

Sol : www.cbse.site/sc/gm299

200. **Assertion :** The mirror used in search lights are concave spherical.
Reason : In concave spherical mirror the image formed is always virtual.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but reason is true.

Sol : www.cbse.site/sc/gm300

201. **Assertion :** For observing traffic at back, the driver mirror is convex mirror.
Reason : A convex mirror has much larger field of view than a plane mirror.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but reason is true.

Sol : www.cbse.site/sc/gm301

202. **Assertion :** Refractive index has no units.
Reason : The refractive index is a ratio of two similar quantities.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but reason is true.

Sol : www.cbse.site/sc/gm302

COMPETENCY BASED QUESTIONS

203. Three students measured the focal length of a convex lens using parallel rays from a distant object. All of them measured the distance between the lens and the inverted image on the screen. Student A saw a sharp image on the screen and labelled the distance as f_1. Student B saw a slightly larger blurred image on the screen and labelled the distance as f_2. Student C saw a slightly smaller blurred image on the screen and labelled at distance as f_3. The relation between the three measurements would not likely be :
(a) $f_1 = f_2 = f_3$
(b) $f_1 < f_2$ and f_3
(c) $f_3 < f_1 < f_2$
(d) $f_1 < f_2$ and $f_1 = f_3$

Sol : www.cbse.site/sc/gm303

Direction For Questions (201-203)

A spherical mirror produces an image of magnification -1 on a screen placed at a distance of 50 cm from the mirror

204. The type of mirror is-
(a) Concave
(b) Convex
(c) Plane convex
(d) None of these

Sol : www.cbse.site/sc/gm304

205. The distance of the image from the object is-
(a) 50 cm
(b) 100 cm
(c) 150 cm
(d) 200 cm

Sol : www.cbse.site/sc/gm304

206. The focal length of the mirror is-
(a) -30 cm
(b) 40 cm
(c) 30 cm
(d) -25 cm

Sol : www.cbse.site/sc/gm304

Direction For Questions (204-208)

A student performs the experiment with a convex lens and he marked the table between image distance (v) and object distance (u).

	Object distance (u) (cm)	**Image distance (v) (cm)**
1	-90	$+18$
2	-60	$+20$
3	-30	$+30$
4	-20	$+60$
5	-18	$+90$
6	-10	$+100$

On the basis of the above table give the answer of following questions.

207. The focal length of the convex lens is:
(a) -15
(b) $+25$
(c) -25
(d) $+15$

Sol : www.cbse.site/sc/gm305

208. In the table which observation is wrong?
(a) S.No. 1
(b) S.No. 4
(c) S.No. 3
(d) S.No. 6

Sol : www.cbse.site/sc/gm305

209. If a convex lens is used to focus sunlight on a paper, where the paper should be placed so that it catches fire.
(a) At 25 cm away from lens
(b) At optical centre of lens
(c) At principal focus.
(d) At centre of curvature

Sol : www.cbse.site/sc/gm305

210. The approximate value of magnification in case of S.No. 4 is
(a) -1
(b) -3
(c) $+4$
(d) $+1$

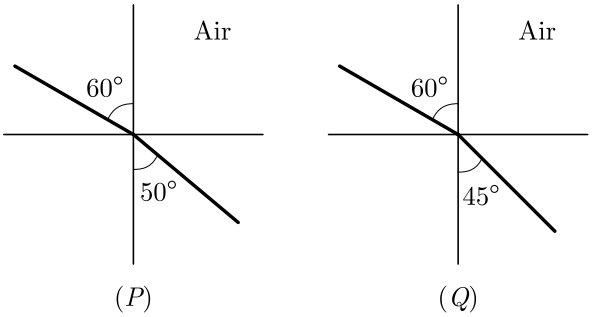
Sol : www.cbse.site/sc/gm305

211. The image formed in case of S.No. 2 is
(a) real and enlarged
(b) real and diminished
(c) virtual and diminished
(d) virtual and enlarged

Sol : www.cbse.site/sc/gm305

Direction For Questions (209-213)

Mohan is performing an experiment with four different optical media, he traced the path of light in different media P, Q, R and S as below:



212. When a light travel from medium P to S it will:
(a) reflect back to medium P
(b) pass straight without bending
(c) bend away from normal
(d) bend towards normal

Sol : www.cbse.site/sc/gm306

213. Which of the following media has maximum optical density?
(a) P
(b) R
(c) S
(d) Q

Sol : www.cbse.site/sc/gm306

214. Through which media, will speed of light be maximum?
(a) Q
(b) R
(c) S
(d) P

Sol : www.cbse.site/sc/gm306

215. Absolute refractive index of medium is maximum in:
(a) P
(b) Q
(c) R
(d) S

Sol : www.cbse.site/sc/gm306

216. Which is correct about absolute refractive index of medium?
(a) $P > Q$
(b) $R = Q$
(c) $S > P$
(d) $P = R$

Sol : www.cbse.site/sc/gm306

Direction For Questions (214-218)

When a beam of light is incident from are homogeneous medium on a shiny surface of other medium, a part of it is returned back into the same medium. The return of light into the some medium after streaking

a surface is called reflection. The law of reflection are following.

Let us recall these laws:

(a) The angle of incidence is equal to the angle of reflation, and

(b) The incident ray, the normal to the mirror at the point of incidence and the reflected ray, all lie in the same plane.

These laws of reflection are applicable to all types of reflecting surfaces including spherical surfaces. You are familiar with the formation of image by a plane mirror. What are the properties of the image? Image formed by a plane mirror is always virtual and erect. The size of the image is equal to that of the object. The image formed is as far behind the mirror as the object is in front of it. Further, the image is laterally inverted.

217. What is magnification produced by the plane mirror if the size of object is 24 cm?

(a) -24

(b) $+24$

(c) -1

(d) $+1$

Sol : www.cbse.site/sc/gm307

218. If the angle of incidence of light on mirror is 30°. The value of angle of reflection is

(a) 30°

(b) 45°

(c) 60°

(d) 90°

Sol : www.cbse.site/sc/gm307

219. The phenomenon of bouncing back of a ray of light after striking to a surface is called ..... .

(a) Dispersion of light

(b) Scattering of light

(c) Refraction of light

(d) Reflection of light

Sol : www.cbse.site/sc/gm307

220. Which of the following shows the phenomenon of reflection?

(a) A concave mirror

(b) A plane mirror

(c) A convex mirror

(d) All of these

Sol : www.cbse.site/sc/gm307

221. What is the formula for magnification obtained with a plane mirror?

(a) Ratio of height of image to height of object.

(b) Inverse of image distance.

(c) Inverse of object distance.

(d) Ratio of height of object to height of image.

Sol : www.cbse.site/sc/gm307

Direction For Questions (219-223)

The ability of a lens to converge or diverge light rays depends on its focal length. For example, a convex lens of short focal length bends the light rays through large angles, by focussing them closer to the optical centre. Similarly, concave lens of very short focal length causes higher divergence than the one with longer focal length. The degree of convergence or divergence of light rays achieved by a lens is expressed in terms of its power. The power of a lens is defined as the reciprocal of its focal length. It is represented by the lefter P. The power P of a lens of focal length f is given by

$$P = \frac{1}{f}$$

The SI unit of power of a lens is 'dioptre'. It

is denoted by the letter D. If f is expressed in metres, then, power is expressed in dioptres. Thus, 1 dioptre is the power of a lens whose focal length is 1 metre. $1\,\text{D} = 1\,\text{m}^{-1}$. The power of a convex lens is positive and that of a concave lens is negative.

222. Which one of the following lens is a converging lens?
(a) Flat lens
(b) Bifocal lens
(c) Convex lens
(d) Concave lens

Sol : www.cbse.site/sc/gm308

223. The power of a diversing lens is 2.0 D. The focal length of lens is:
(a) $+0.5\,\text{m}$
(b) $-50\,\text{cm}$
(c) $+500\,\text{mm}$
(d) $-40\,\text{cm}$

Sol : www.cbse.site/sc/gm308

224. The focal length of a lens is $+40\,\text{cm}$. The power of lens is:
(a) $+5.0\,\text{D}$
(b) $-2.5\,\text{D}$
(c) $+9.5\,\text{D}$
(d) $-9.5\,\text{D}$

Sol : www.cbse.site/sc/gm308

225. The S.I. unit of power of a lens is:
(a) Kwh
(b) Meter
(c) Watt
(d) Dioptre

Sol : www.cbse.site/sc/gm308

226. If the ratio of focal length of two convex lenses is 1 : 5 then what is the ratio of their power?
(a) 1 : 1
(b) 1 : 2
(c) 5 : 1
(d) 3 : l

Sol : www.cbse.site/sc/gm308

Direction For Questions (224-228)

If the position of object in front of the mirror is changed, the size of image changes. If the lengths of the object and image are measured perpendicular to the principle axis, the ratio of length of the image to the length of the object is called linear magnification it is represent by 'm'. The magnification m is also related to the object distance and image distance. It can be expressed as:

Magnification, $\quad m = \dfrac{h'}{h} = -\dfrac{v}{u}$

The height of the object is taken to be positive as the object is usually placed above the principal axis. The height of the image should be taken as positive for virtual images. However, it is to be taken as negative for real images. A negative sign in the value of the magnification indicates that the image is real. A positive sign in the value of the magnification indicates that the image is virtual.

227. The magnification produced by a spherical mirror of an object of 5 cm is 2. The size of the image formed by this spherical mirror will be:
(a) 20 cm
(b) 0.4 cm
(c) 2.5 cm
(d) 10 cm

Sol : www.cbse.site/sc/gm309

228. A concave mirror forms a virtual image of an object placed at a distance 20 cm. If the size of the image is twice of the size of the object then the image will be formed at a distance:
(a) 40 cm
(b) 10 cm
(c) 20 cm
(d) 30 cm

Sol : www.cbse.site/sc/gm309

229. The magnification produced by a spherical mirror is –2. What type of mirror is it?
(a) Either a convex or a concave mirror
(b) A plane mirror
(c) A convex mirror
(d) A concave mirror

Sol : www.cbse.site/sc/gm309

230. An object of size 5 cm is placed at a distance of 20 cm in front of a concave mirror focal length 10 cm. The distance of the image from the mirror and its height will be:
(a) $v = -20$ cm, $h_i = +5$ cm
(b) $v = +30$ cm, $h_i = +5$ cm
(c) $v = +20$ cm, $h_i = +10$ cm
(d) $v = -20$ cm, $h_i = -5$ cm

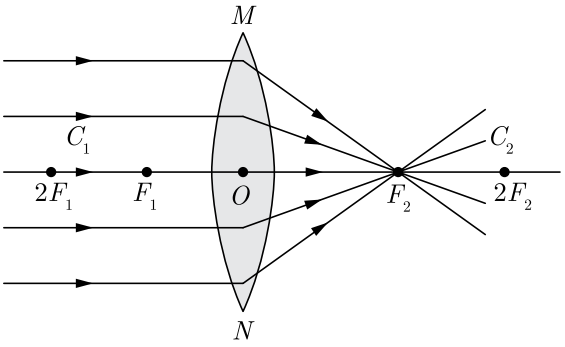
Sol : www.cbse.site/sc/gm309

231. The magnification produced by a spherical mirror is +1/2. The image formed by the mirror will be:
(a) Real, inverted and larger in size.
(b) Virtual, erect and larger in size.
(c) Virtual, erect and larger in size.
(d) Virtual, erect and smaller in size.

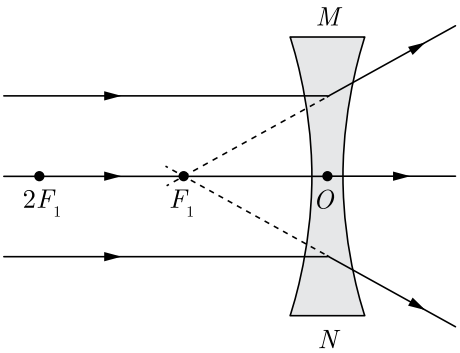
Sol : www.cbse.site/sc/gm309

Direction For Questions (229-233)

Lenses are made of transparent material usually glass, bounded by polished spherical or cylindrical surface. This means that a lens is bound by at least one spherical surface. In such lenses, the other surface would be plane. A lens which is thickes at the middle and thinner at the edge is convex lens. Is also called converging lens. A convex lens is of there types. i.e., biconvex, planoconvex and convexo-concave lens. Similarly. a double concave lens is bounded by two spherical surfaces, curved inwards. It is thicker at the edges than at the middle. Such lenses diverge light rays. Such lenses are called diverging lenses. A double concave lens is simply called a concave lens



(a)



(b)

232. The lens which is also called a diverging lens is:
(a) Plano-convex lens

(b) Convex lens
(c) Concave lens
(d) Plano-concave lens

Sol : www.cbse.site/sc/gm310

233. Which of the following difference is correct between a convex lens and a concave lens?
(a) A convex lens forms both real and virtual images while a concave lens forms only virtual images.
(b) A convex lens is a converging lens while a concave lens is a diverging lens.
(c) A convex lens is thick at the middle and thin at the edges while a concave lens is thin at the middle and thick at the edges.
(d) All of the above

Sol : www.cbse.site/sc/gm310

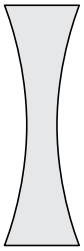
234. A transparent medium bounded by two surfaces, atleast one of them is spherical is called a:
(a) Lens
(b) Telescope
(c) Convex mirror
(d) Concave mirror

Sol : www.cbse.site/sc/gm310

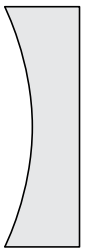
235. Which of the following lens is called a convex lens?
(a) A lens which is bounded by two spherical surfaces
(b) A lens which is thicker at the middle as compared to the edges
(c) A lens which converges light rays
(d) Both (b) and (c)

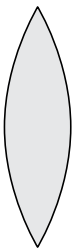
Sol : www.cbse.site/sc/gm310

236. Which of the following lens is a diverging lens?

(a) 

(b) 

(c) 

(d) 

Sol : www.cbse.site/sc/gm310

Direction For Questions (234-238)

Many optical instrument (like compound microscope)having number of lenses which are arranged is same specific manner and it is increases the magnification and sharpness of image which is formed by optical instrument. The net power (P) of the lenses placed in contact is given by the algebraic sum of the individual powers

P_1, P_2, P_3, ... as

$$P = P_1 + P_2 + P_3 + ...$$

The use of powers, instead of focal lengths, for lenses is quite convenient for opticians During eye-testing, an optician puts several different combinations of corrective lenses of known power, in contact, inside the testing spectacles frame. The optician calculates the power of the lens required by simple algebraic addition. For example, a combination of two lenses of power +2.0 D and +0.25 D is equivalent to a single lens of power +2.25 D. The simple additive property of the powers of lenses can be used to design lens systems to minimise certain defects in images produced by a single lens. Such a lens system, consisting of several lenses, in contact, is commonly used in the design of camera lenses and the objectives of microscopes and telescopes.

237. The power of a convex lens is 4.0 D. The focal length of this lens will be:
(a) 0.5 m
(b) 0.25 m
(c) 2.5 m
(d) 5 m

Sol : www.cbse.site/sc/gm311

238. Two lenses of power $\frac{1}{2}$ D and −0.3 D are in contact to each other. Their combined power will be:
(a) + 0.2 D
(b) −0.2 D
(c) + 0.5 D
(d) + 0.8 D

Sol : www.cbse.site/sc/gm311

239. Which of the following instrument consists of a lens system consisting of two or more lenses in contact?
(a) Microscope
(b) Telescope
(c) Camera
(d) All of the above

Sol : www.cbse.site/sc/gm311

240. The focal lengths of two lenses in contact to each other are 20 cm and 50 cm respectively. Their combined power is:
(a) + 7.0 D
(b) + 70 D
(c) + 3.0 D
(d) + 30 D

Sol : www.cbse.site/sc/gm311

241. In many optical instruments, the lenses are combined due to the following reason:
(a) to increase the magnification of the image
(b) to increase sharpness of the image
(c) to get virtual images of the object
(d) Both (a) and (b)

Sol : www.cbse.site/sc/gm311

Direction For Questions (239-243)

Lenses are objects made or transparent materials such as glass or clear plastic that has curved surfaces. Diverging lenses are thicker at their edges than at their centres and make light rays passing through them spread out. Converging lenses are thicker in middle than at edges and make light rays passing through them focus at a point. These are used in spectacles to help people with poor vision see better. The converging lenses magnify by bending the rays or light that pass through them to meet at a point called focus. Thicker the converging lens

is at its centre, the more it magnifies and closer the focus is to the lens.

242. Which relation of powers of lenses are correct?

(a) P_1 is positive and P_2 is negative

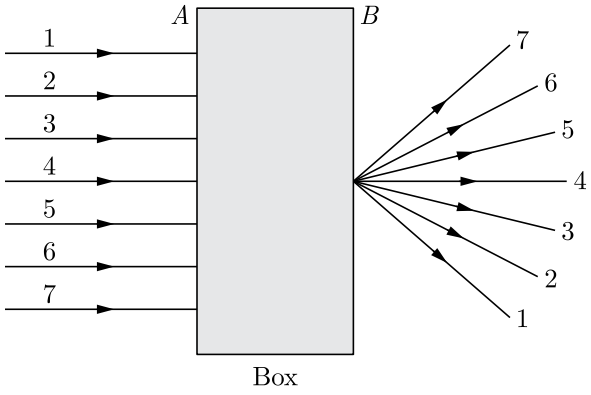
(b) $P_1 > P_2$

(c) $P_1 < P_2$

(d) $P_1 = P_2$

Sol : www.cbse.site/sc/gm312

243. A beam of light is incident on the box through the holes on side A and emerges out of the holes on the other face of the box as shown in the figure.



Which of the following could be inside the box?

(a) Rectangular glass plate

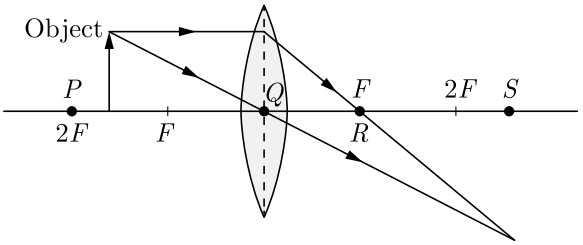
(b) Prism

(c) Convex lens

(d) Concave lens

Sol : www.cbse.site/sc/gm312

244. The image represents the rays of light travelling through a convex lens.



Where is the image most likely to form?

(a) Position S

(b) Position P

(c) Position Q

(d) Position R

Sol : www.cbse.site/sc/gm312

245. Rakhi conducts an experiment to produce an image of an object on a screen which is placed at 20 cm from the lens
She uses a convex lens of focal length 15 cm for the experiment.
Where should she place the object in order to produce the sharpest image?

(a) 60 cm in front or the lens

(b) 15 cm in front or the lens

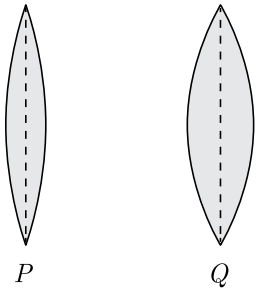
(c) 8 cm in front or the lens

(d) 20 cm in front or the lens

Sol : www.cbse.site/sc/gm312

246. Abhishek uses two lenses P and Q of same size and same material as shown. P_1 and P_2 are the powers of P and Q. An object is kept at the same distance from the lenses between F and $2F$ of each lens on the principal axis in turn. Let I_1 and I_2 be the image formed by two lenses respectively. Which one of the following statements is

correct for the images formed?

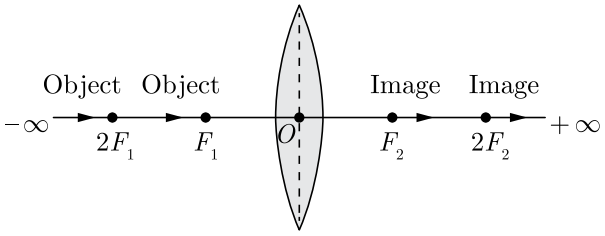


(a) Size of image I_1 will be lesser than size or image I_2.
(b) Size of image I_1 will be equal to size or image I_2.
(c) Distance of image I_2 will be greater than distance or image I_1 from the lens.
(d) Distance of image I_2 will be less than distance or image I_1 from the lens.

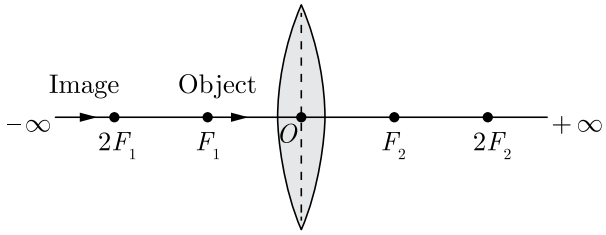
Sol : www.cbse.site/sc/gm312

Direction For Questions (244-248)

The image formed by a convex lens depends on the position of the object in front of the lens. When the object is placed anywhere between focus and infinity, the image formed by convex lens is real and inverted. The image is not obtained on the screen when the object is placed between focus and the lens.
The distance between the optical centre O of the convex lens and the focus point F_1 or F_2 is its focal length.
When the object shifts from $-\infty$ to F_1, the image moves from F_2 to $+\infty$.



When the object shifts from F_1 to O, the image moves from $-\infty$ to O.



A student did an experiment with a convex lens. He put an object at different distances from the lens. In each case he measured the distance of the image from the lens. The results were recorded in the following table

Object distance (in cm)	25	30	40	60	120
Image distance (in cm)	100	24	60	30	40

Unfortunately his results are written in the wrong order.

247. A virtual image is formed by convex lens when object is placed
(a) between F and O
(b) at infinity
(c) between C and F
(d) at F

Sol : www.cbse.site/sc/gm313

248. The minimum distance between an object and its real image formed by a convex lens is
(a) zero
(b) $2f$
(c) $4f$
(d) $3f$

Sol : www.cbse.site/sc/gm313

249. Which of this object distances gives the biggest image?
(a) 60 cm

(b) 40 cm
(c) 30 cm
(d) 25 cm

Sol : www.cbse.site/sc/gm313

250. The image distances in the correct order (in cm) is
(a) 100, 60, 40, 30, 24
(b) 100, 60, 30, 40, 24
(c) 100, 24, 60, 40, 30
(d) 24, 30, 40, 60, 100

Sol : www.cbse.site/sc/gm313

251. The focal length of this lens is
(a) 10 cm
(b) 20 cm
(c) 30 cm
(d) 40 cm

Sol : www.cbse.site/sc/gm313

Direction For Questions (249-253)

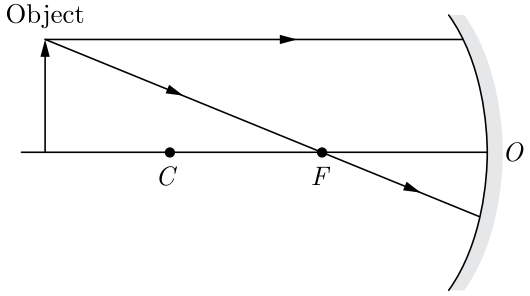
A real image (always inverted) is the one through which the rays of light actually pass after reflection from concave mirror and which can be formed on a screen. A virtual image (always erect) is the one through which the rays do not actually pass, although they appear to come from it. The position, nature and size of the image of an object formed by a concave mirror changes with the position of the object. The size of image may be determined by using a graph paper fixed on the screen.

Object	**Image**	**Nature of the image**
$u = \infty$	$v = f$	Real, inverted and highly diminished
$\infty > u > 2f$	$2f < v < \infty$	Real inverted and diminished
$u = 2f$	$v = 2f$	Real inverted and same size
$2f > u > f$	$2f < v < \infty$	Real inverted and enlarged
$u = f$	$v = \infty$	Real inverted and highly enlarged
$f > u > 0$	Behind the mirror	Virtual, erect and enlarged

252. Which of the following mirror is used by a dentist to examine a small cavity?
(a) Concave mirror
(b) Convex mirror
(c) Combination of (a) and (b)
(d) None of these

Sol : www.cbse.site/sc/gm314

253. The image shows the path of incident rays to a concave mirror.



Where would the reflected rays meet for the image formation to take place?
(a) Between F and O
(b) Beyond C
(c) Between C and F
(d) Behind the mirror

Sol : www.cbse.site/sc/gm314

254. A student conducts an activity using a concave mirror with focal length of 10 cm. He placed the object 15 cm from the mirror. Where is the image likely to form?

(a) At 6 cm in front of the mirror

(b) At 6 cm behind the mirror

(c) At 30 cm behind the mirror

(d) At 30 cm in front of the mirror

Sol : www.cbse.site/sc/gm314

255. Rekha placed a juice bottle at a distance of 20 cm in front of a convex mirror which has a focal length of 20 cm. Where is the image likely to form?

(a) At a distance of 10 cm in front of the mirror

(b) At focus in front of the mirror

(c) At a distance of 10 cm behind the mirror

(d) At focus behind the mirror

Sol : www.cbse.site/sc/gm314

256. Sunil conducts an activity using an object of height 10 cm and a convex mirror of focal length 20 cm. He placed the object at a distance of 20 cm in front of the mirror. What is likely to be height of the image produced?

(a) 15 cm

(b) 5 cm

(c) 1 cm

(d) 20 cm

Sol : www.cbse.site/sc/gm314

257. A concave mirror forms image of an object thrice in its size on a screen. Magnification of a mirror gives information about the size of the image relative to the object. It is defined as the ratio of size of image to the size of object. It is represented by m.

$$m = \frac{\text{Size of image}}{\text{Size of object}}$$

Sign of magnification by mirror gives the information about the nature of the image produce by it.

If the object x distance from the pole of mirror. The distance of image from the pole is:

(a) $2x$

(b) $3x$

(c) $-2x$

(d) $-3d$

Sol : www.cbse.site/sc/gm315

Direction For Questions (255-256)

A concave lens is thick at the edges and thin at the centre, while a convex lens is thick at the centre and thin at the edges. We can distinguish between a concave lens and a convex lens without touching them. For this keep a book close to a lens and observe the image of the text of the book through the lens. If the letters appear enlarged, then it is a convex lens and if the letters appear diminished then it is a concave lens.

Convex lens converges light rays and hence known as converging lens. Similarly, concave lens diverges light rays and is known as diverging lens. Linear magnification produced by a lens is equal to the ratio of the image distance to the object distance. Power of a lens is defined as the reciprocal of its focal length.

258. If magnification produced by a spherical lens is +0.75, then the nature of the lens is:

(a) Concave

(b) Convex

(c) Planoconvex

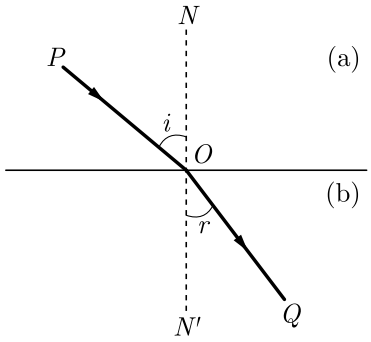
(d) None of these

Sol : www.cbse.site/sc/gm316

259. If the focal length of the convex lens is 80 cm. The power of the lens will be
(a) 1.25 D
(b) 2.25 D
(c) 1.90 D
(d) 2.90 D

Sol : www.cbse.site/sc/gm316

260. When light ray goes from one transparent medium to another transparent medium, it suffers a change in direction, into second medium. The extent of the change in direction suffered by the phenomenon of change in the path of light rays when going from one medium to another medium is known as refraction. Ray is a given pair of media can be expressed in terms of refractive index. The refractive index is related to an important physical quantity in the relative speed of light in different media.



Light enters from air to glass having refractive index 1.009. The speed of light in vacuum is $3 \times 10^8\ \text{ms}^{-1}$. The speed of light in the glass is:
(a) $2 \times 10^8\ \text{ms}^{-1}$
(b) $3 \times 10^8\ \text{ms}^{-1}$
(c) $4 \times 10^8\ \text{ms}^{-1}$
(d) $9 \times 10^8\ \text{ms}^{-1}$

Sol : www.cbse.site/sc/gm317

□□□□□□□

SELF ASSESSMENT TEST

1. The power of a concave lens of focal length of 2 m is-
(a) 0.5 D
(b) −0.5 D
(c) 1 D
(d) −1 D

2. No matter how far you stand from a mirror, your image appears erect. The mirror is likely to be-
(a) Plane
(b) Concave
(c) Convex
(d) Either plane or convex

3. An object of size 7.0 cm is placed at 27 cm in front of a concave mirror of focal length 18 cm. At what distance from the mirror should a screen be placed, so that a sharp focussed image can be obtained?
(a) 54 cm
(b) 60 cm
(c) −54 cm
(d) −60 cm

4. The speed of light in a transparent medium is 0.6 times that of its speed in vacuum. The refractive index of the medium is:
(a) 1.66
(b) 1.96
(c) 1.26
(d) 1.29

5. With respect to air, the refractive index of ice is 1.31 and that of rock salt is 1.54. the refractive index of rock salt with respect to ice is-
(a) 1.25
(b) 1.18
(c) 1.90
(d) 1.40

6. A convex lens of focal length 25 cm and a concave lens of focal length 10 cm are placed in close contact with each other. The power of this combination is-
(a) 2 D
(b) 6 D
(c) −6 D
(d) 9 D

7. A student wants to project the image of a candle flame on a screen 80 cm in front of a mirror by keeping the candle flame at a distance of 20 cm from its pole. The magnification of the image produced is-
(a) −4
(b) −2
(c) −6
(d) −1

8. The image of a candle flame placed at a distance of 30 cm from a spherical lens is formed on a screen placed on the other side of the lens at distance of 60 cm from the optical centre of the lens. The focal length of lens is-
(a) 40 cm
(b) 30 cm
(c) 50 cm
(d) 20 cm

9. Which of the following are correctly matched for the concave mirror?

	Object	**Image**
1.	Between P and F	at infinity
2.	At C	at C

3.	Beyond C	between F and C
4.	At infinity	at focus

Choose the correct option from the codes given below :

(a) 1, 3, 4

(b) 2, 3, 4

(c) 1, 2, 3

(d) 1, 2, 3, 4

10. The laws of reflection hold good for:

(a) plane mirror only

(b) concave mirror only

(c) convex mirror only

(d) All mirrors irrespective of their shape.

11. A child standing in front of a magic mirror. She finds the image of her head bigger, the middle portion of her body of the same size and that of the legs smaller. The following is the order of combinations for the magic mirror from the top.

(a) Plane, convex and concave

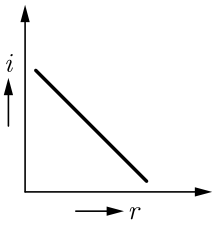
(b) Convex, concave and plane

(c) Concave, plane and convex

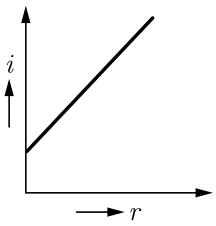
(d) Convex, plane and concave

12. Which of the following correctly represents graphical relation between angle of incidence (i) and angle of reflection (r)?

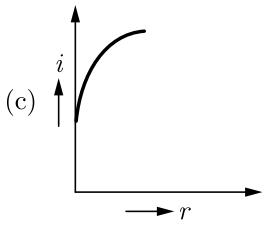
(a)



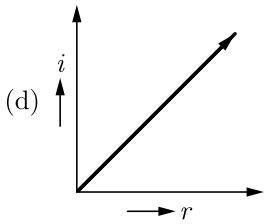
(b)



(c)



(d)



13. All of the following statements are correct except

(a) The magnification produced by a convex mirror is always less than one

(b) A virtual, erect, same-sized image can be obtained using a plane mirror

(c) A virtual, erect, magnified image can be formed using a concave mirror

(d) A real inverted, same-sized image can be formed using a convex mirror

14. The field of view is maximum for

(a) Plane mirror

(b) Concave mirror

(c) Convex mirror

(d) Cylindrical mirror

15. The ratio of the refractive index of red light to blue light in air is-

(a) Less than unity

(b) Equal to unity

(c) Greater than unity

(d) Less as well as greater than unity depending upon the experimental arrangement

16. An object is immersed in a fluid. In order that the object becomes invisible, it should

(a) Behave as a perfect reflector

(b) Absorb all light falling on it
(c) Have refractive index one
(d) Have refractive index exactly matching with that of the surrounding fluid

17. Choose the correct relation between u, v and R for spherical mirrors.
(a) $R = \dfrac{2uv}{u+v}$
(b) $R = \dfrac{2}{u+v}$
(c) $R = \dfrac{2(u+v)}{(uv)}$
(d) None of these

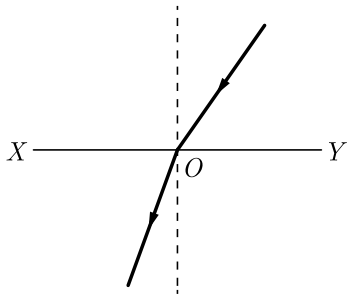
18. A spherical mirror and a thin spherical lens each has a focal length of $-15\,\text{cm}$. The mirror and the lens are likely to be-
(a) Both concave
(b) Both convex
(c) The mirror is concave and lens is convex
(d) The mirror is convex, but the lens is concave

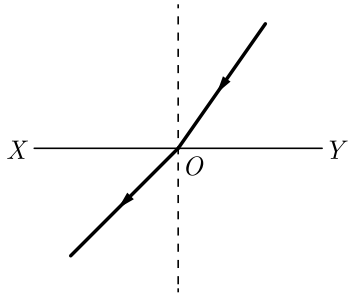
19. The inner shining surface of a steel spoon serves as a
(a) Plane mirror
(b) Concave mirror
(c) Convex mirror
(d) Any one of the above

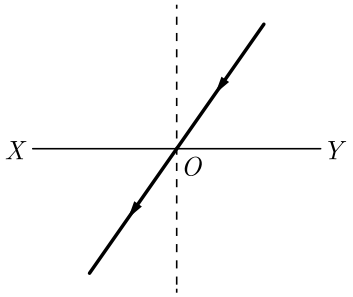
20. A ray of light falls on a plane mirror making an angle of 30° with normal. On deviation, the ray of light deviates through an angle of
(a) 120°
(b) 140°
(c) 160°
(d) 180°

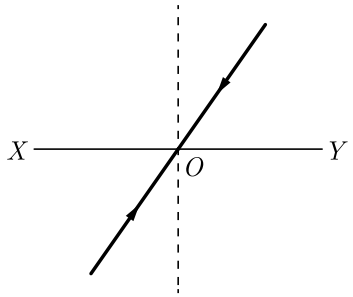
21. A full length image of a distant tall building can definitely be seen by using
(a) a concave mirror
(b) a convex mirror
(c) a plane mirror
(d) both concave as well as plane mirror

22. Which of the following figures shows refraction of light while going from denser to rarer medium?

(a)


(b)


(c)


(d)


23. The focal length of a combination of convex lens of power 1 D and concave lens of power -1.5 D is-

(a) -2 m

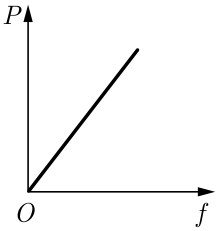
(b) 2 m

(c) 2.5 m

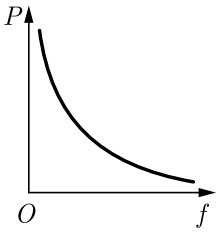
(d) 0.5 m

24. Which of the following graphs shows correct variation between the power (P) of a converging lens and its focal length (f)?

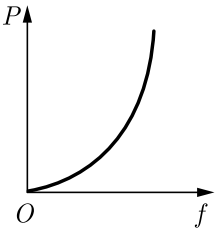
(a)



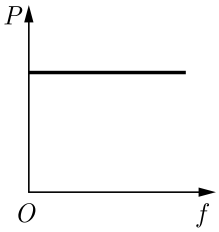
(b)



(c)

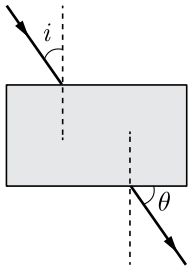


(d)

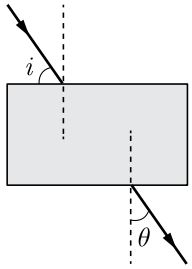


25. A student does the experiment on tracing the path of a ray of light passing through a rectangular glass slab for different angles of incidence. He can get a correct measure of the angles of incidence and the angle of emergence by following the labelling indicated in figure.

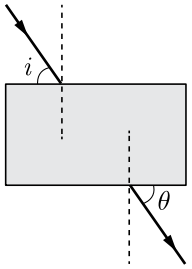
(a)



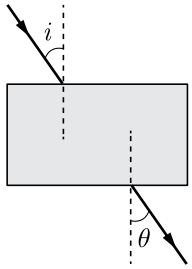
(b)



(c)



(d)



26. Which of the following can make a parallel beam of light when light from a point source is incident on it?

(a) Concave mirror as well as convex lens.

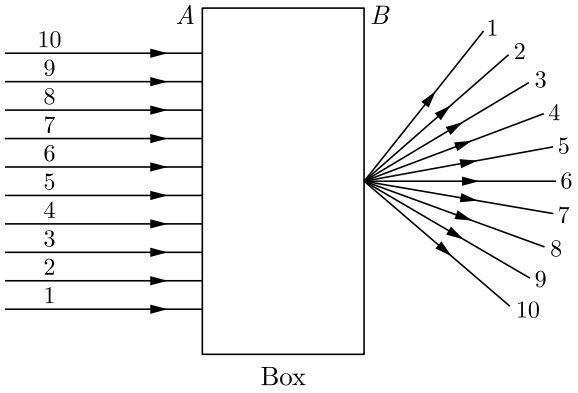
(b) Convex mirror as well as concave lens.

(c) Two plane mirrors placed at 90° to each other.

(d) Concave mirror as well as concave

lens.

27. A beam of light is incident through the holes on side A and emerges out of the holes on the other face of the box as shown in figure. Which of the following could be inside the box?



(a) Concave lens
(b) Rectangular glass slab
(c) Prism
(d) Convex lens

28. Given a point source of light, which of the following can produce a parallel beam of light?
(a) Convex mirror
(b) Concave mirror
(c) Concave lens
(d) Two plane mirrors inclined at an angle of 90°

29. What is the power of a concave lens whose focal length is $-75.0\,\text{cm}$?
(a) 1.33 D
(b) $-13.3\,\text{D}$
(c) 13.3 D
(d) $-1.33\,\text{D}$

30. When sun rays are focussed with a convex lens, a sharp, bright spot is observed at its focus. What does this spot indicate?
(a) The real image of the sun.
(b) The virtual image of the sun.
(c) An optical illusion produced by the convex lens.
(d) The magnified image of the sun.

31. SI unit of power of a lens is
(a) joule
(b) dioptre
(c) candela
(d) watt

32. A beam of light composed of red and green rays is incident obliquely at a point on the face of a rectangular glass slab. When coming out on the opposite parallel face, the red and green rays emerge from
(a) one point propagating in the same direction.
(b) one point propagating in two different directions.
(c) two points propagating in two different parallel directions.
(d) two points propagating in two different non-parallel directions.

33. A man runs towards a mirror with a speed of $15\,\text{m}-\text{s}^{-1}$. What is the speed of his image ?
(a) $7.5\,\text{m}-\text{s}^{-1}$
(b) $15\,\text{m}-\text{s}^{-1}$
(c) $30\,\text{m}-\text{s}^{-1}$
(d) $45\,\text{m}-\text{s}^{-1}$

34. An object is placed at a distance f in the front of a convex mirror. If focal length of the mirror is f, then distance of image from pole of the mirror is
(a) f
(b) $2f$
(c) $\frac{f}{2}$
(d) $\frac{f}{4}$

35. The projection lens of a projector has focal length 5 cm. It is desired to get an image with a magnification 30. The distance of the screen from the lens must be

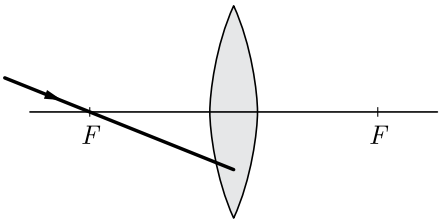
(a) 0.3 m

(b) 0.8 m

(c) 1.55 m

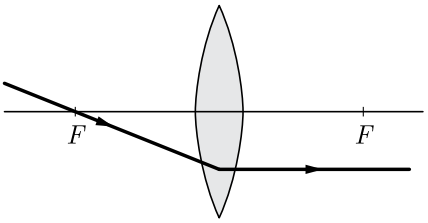
(d) 2.55 m

36. Which of the following ray diagrams is correct for the ray of light incident on a lens shown in figure.

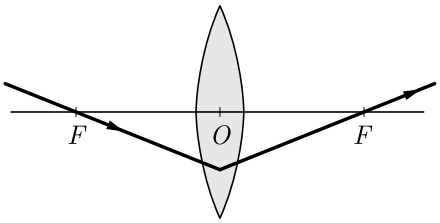


Choices are given in figure.

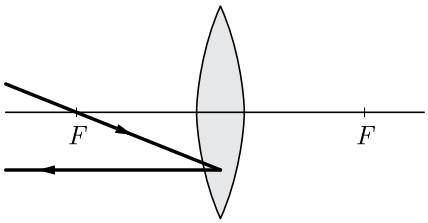
(a)



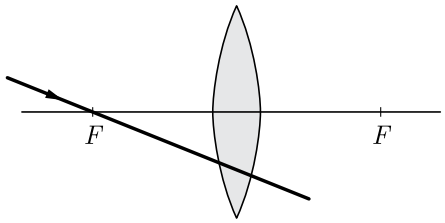
(b)



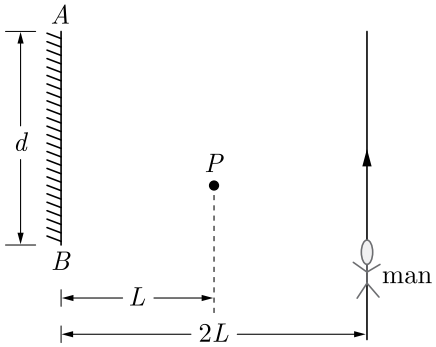
(c)



(d)



37. A point source of light P is placed at a distance L in front of a mirror of width d hung vertically on a wall. A man walks in front of the mirror along a line parallel to the mirror at a distance $2L$ as shown in the figure. The greatest distance over which he can see the image of the light source, in the mirror, is



(a) $\frac{d}{2}$

(b) d

(c) $2d$

(d) $3d$

38. A combination of a concave and convex lens has power 5 D. If the power of convex lens is 4 D, then focal length of the concave lens is

(a) 10 cm

(b) 20 cm

(c) 100 cm

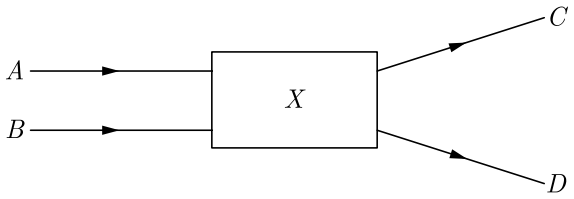
(d) 200 cm

39. An object is placed 20 cm from the concave mirror of focal length 10 cm, then image is formed at

(a) centre of curvature of mirror

(b) behind the mirror
(c) between the mirror and focus
(d) at focus

40. Light rays A and B fall on optical component X and come out as C and D.



The optical component is a
(a) concave lens
(b) convex lens
(c) convex mirror
(d) prism

41. **Assertion :** When light travels from one medium to another. The direction of propagation of light in second medium changes.
Reason : Light travels with different speeds in different mediums.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

42. **Assertion :** Power of a convex lens is positive and that of a concave lens is negative.
Reason : Convex lens forms real image and concave lens forms virtual image.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

43. **Assertion :** The twinkling of star is due to reflection of light.
Reason : The velocity of light changes while going from one medium to the other.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

44. **Assertion :** A ray incident along normal to the mirror retraces its path.
Reason : In reflection, angle of incidence is not equal to angle of reflection.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

45. **Assertion :** The mirror used in search lights are concave spherical.
Reason : In concave spherical mirror the image formed is always virtual.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but reason is true.

Direction For Questions (46-50)

Many optical instrument (like compound microscope) having number of lenses which are arranged is same specific manner and it is increases the magnification and sharpness of image which is formed by optical instrument. The net power (P) of the lenses placed in contact is given by the algebraic sum of the individual powers $P_1, P_2, P_3, \ldots$ as

$$P = P_1 + P_2 + P_3 + \ldots$$

The use of powers, instead of focal lengths, for lenses is quite convenient for opticians During eye-testing, an optician puts several different combinations of corrective lenses of known power, in contact, inside the testing spectacles frame. The optician calculates the power of the lens required by simple algebraic addition. For example, a combination of two lenses of power $+2.0$ D and $+0.25$ D is equivalent to a single lens of power $+2.25$ D. The simple additive property of the powers of lenses can be used to design lens systems to minimise certain defects in images produced by a single lens. Such a lens system, consisting of several lenses, in contact, is commonly used in the design of camera lenses and the objectives of microscopes and telescopes.

46. The power of a convex lens is 4.0 D. The focal length of this lens will be:
(a) 0.5 m
(b) 0.25 m
(c) 2.5 m
(d) 5 m

47. Two lenses of power $\frac{1}{2}$ D and -0.3 D are in contact to each other. Their combined power will be:
(a) + 0.2 D
(b) -0.2 D
(c) + 0.5 D
(d) + 0.8 D

48. Which of the following instrument consists of a lens system consisting of two or more lenses in contact?
(a) Microscope
(b) Telescope
(c) Camera
(d) All of the above

49. The focal lengths of two lenses in contact to each other are 20 cm and 50 cm respectively. Their combined power is:
(a) + 7.0 D
(b) + 70 D
(c) + 3.0 D
(d) + 30 D

50. In many optical instruments, the lenses are combined due to the following reason:
(a) to increase the magnification of the image
(b) to increase sharpness of the image
(c) to get virtual images of the object
(d) Both (a) and (b)

Answer Key

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
(b)	(d)	(c)	(b)	(b)	(c)	(a)	(d)	(b)	(d)
11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
(c)	(d)	(d)	(c)	(a)	(d)	(a)	(a)	(b)	(a)
21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
(b)	(b)	(a)	(b)	(d)	(a)	(d)	(b)	(d)	(a)
31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
(b)	(c)	(b)	(c)	(c)	(a)	(d)	(c)	(a)	(a)
41.	42.	43.	44.	45.	46.	47.	48.	49.	50.
(a)	(c)	(d)	(c)	(c)	(b)	(a)	(d)	(a)	(d)

□□□□□□□

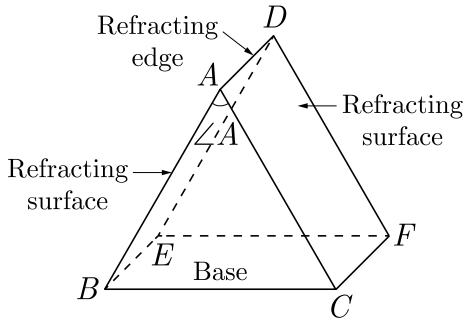
CHAPTER 7

The Human Eye and Colourful World

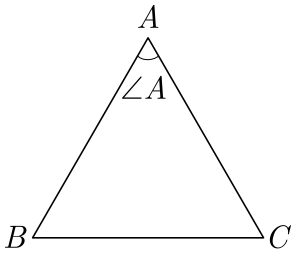
SUMMARY

7.1 ANGLE OF PRISM

A triangular prism is a homogeneous, transparent refracting medium bound by two non-parallel refracting surfaces inclined at some angle ($\angle A$) called the angle of prism. A section of the prism is a triangle ABC as shown in the figure.



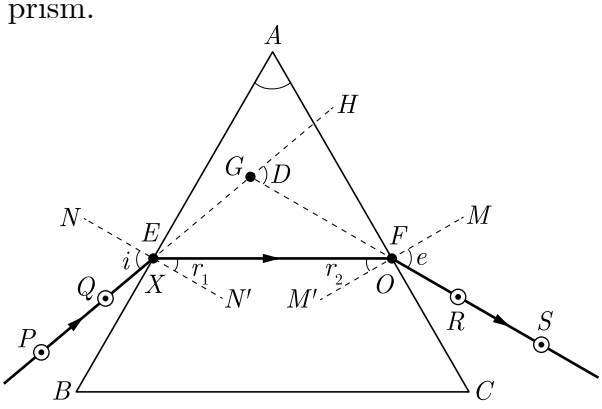
(a)



(b)

7.2 INCIDENT, REFRACTED AND EMERGENT RAYS

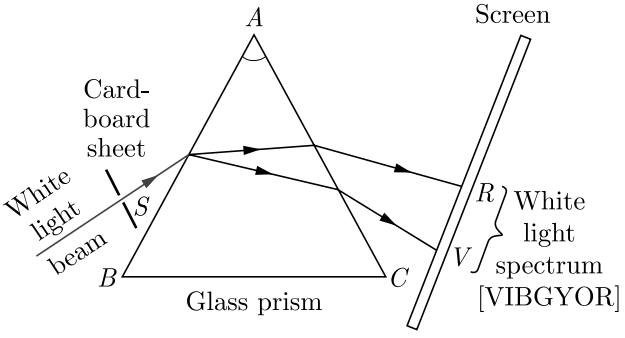
Refraction through a prism is shown in the given figure. In this figure, PQE is the incident ray, EF the refracted ray and FRS the emergent ray. $\angle i$ is the angle of incidence, $\angle e$ the angle of emergence and $\angle D$ the angle of deviation suffered by light ray due to refraction at the glass prism.



7.3 DISPERSION OF LIGHT

When a narrow beam of white light passes through a prism, it splits up into a band of seven colours. Splitting of white light into its seven constituent (acronym VIBGYOR) colours on passing through a dispersive medium, i.e., the glass prism is called dispersion of light.

Out of seven colours, the violet deviates maximum and red deviates minimum. As a result, the coloured band obtained on the screen is called spectrum.



1. Dispersion is caused by the difference in deviation angles for light rays of different wavelengths. The violet light has minimum wavelength, so, it deviates the maximum.

The red light has maximum wavelength, so, it deviates the minimum.

2. The seven constituent colours of white light splitted by a glass prism can be recombined to form white light by passing them through another identical prism fixed in an inverted position.
3. Rainbow forms after rains because of dispersion on light and the interval reflection caused by tiny water droplets suspended in air. Thus, the tiny water droplets act as prisms.

A rainbow always forms in a direction opposite to that of the sun. In a rainbow, the innermost arc is violet and the outermost arc is red.

7.4 ATMOSPHERIC REFRACTION

1. In the atmosphere, the layers of cooler air have higher optical density and act as optically denser medium. The layers of warmer air have lower optical density and act as optically rarer medium.
   Atmospheric refraction is the refraction of light while passing from one air layer to another air layer of different optical densities (or refractive indices).
2. Stars twinkle in night sky due to atmospheric refraction. The apparent positions of a star appears slightly higher than its actual position.
3. Due to atmospheric refraction, the sun is visible to us 2 minutes before actual sunrise. Again, the sun remains visible for 2 minutes even after actual sunset. So, apparent duration of time from sunrise to sunset is 4 minutes more than the actual duration.
4. Due to atmospheric refraction, the shape of the sun at the time of sunrise or sunset appears to be of oval shape.

7.5 SCATTERING OF LIGHT

The process due to which light gets deflected and diffused all over as a result of its interplay with tiny matter particles is called scattering of light. The tiny particle which causes scattering of light is called the scatterer particle.

1. The colour of the scattered light is based upon the size a of the scattering particle as compared to wavelength λ of the light. If $a << \lambda$, then light of shorter wavelengths is scattered much more than light of longer wavelengths. According to Rayleigh's law of scattering, the intensity I of scattered light is inversely proportional to fourth power of its wavelength, i.e., $I \propto 1/\lambda^4$ (when $a << \lambda$).
2. The phenomenon of scattering of light by suspended particles present in the medium (through which a light beam is passing) and making the path of the light beam visible, is called Tyndall effect. The path of a light beam passing through a colloidal solution becomes visible because of scattering of light caused by colloidal particles. When light beam form the headlight of an automobile comes through mist and fog, then particles become visible because of Tyndall effect. The particles scatter the light beam and become visible.
3. Air molecules have a size much smaller than the wavelength of light. Hence, they scatter blue-violet light of smaller wavelengths much more than red-orange light of longer wavelengths. Consequently, clear sky appears to be blue. But when looking the sky from a spaceship, it appears to be dark as there are no air particles in space to cause scattering of light.
4. Danger signals are always red in colour. This is because red colour has the maximum wavelength and hence is scattered the least by atmospheric particles. Thus, red signal is visible from a longer distance.
5. The sun appears reddish at the time of sunrise and sunset. This is because sun is near the horizon and sunlight has to travel a longer distance to reach our eyes. All shorter wavelengths are scattered away by air particles and only red colour reaches our eyes.

□□□□□□□

MULITIPLE CHOICE QUESTIONS

1. Consider the following statements about dispersion by glass prism :
1. Splitting of light into its component colours is called dispersion.
2. Issac Newton was the first to observe dispersion.

Choose the correct option from the codes given below:
(a) Only 1
(b) Only 2
(c) Both 1 and 2
(d) Neither 1 nor 2

Sol : www.cbse.site/sc/hm101

2. Which of the following are effects of atmospheric refraction?
1. Twinkling of stars.
2. Tyndall effect.
3. Advance sunrise and delayed sunset.

Choose the correct option from the codes given below:
(a) 1 and 2
(b) 2 and 3
(c) 1 and 3
(d) 1, 2 and 3

Sol : www.cbse.site/sc/hm102

3. At noon the sun appears white as
(a) light is least scattered
(b) all the colours of the white light are scattered away
(c) blue colour is scattered the most
(d) red colour is scattered the most

Sol : www.cbse.site/sc/hm103

4. Which of the following phenomena of light are involved in the formation of a rainbow?
(a) Reflection, refraction and dispersion.
(b) Reflection, dispersion and total internal reflection.
(c) Refraction, dispersion and internal reflection.
(d) Dispersion, scattering and total internal reflection.

Sol : www.cbse.site/sc/hm104

5. Twinkling of stars is due to atmospheric
(a) dispersion of light by water droplets
(b) refraction of light by different layers of varying refractive indices
(c) scattering of light by dust particles
(d) internal reflection of light by clouds

Sol : www.cbse.site/sc/hm105

6. The clear sky appears blue because
(a) blue light gets absorbed in the atmosphere
(b) ultraviolet radiations are absorbed in the atmosphere
(c) violet and blue lights get scattered more than lights of all other colours by the atmosphere
(d) light of all other colours is scattered more than the violet and blue colour lights by the atmosphere

Sol : www.cbse.site/sc/hm106

7. Which of the following statements is correct regarding the propagation of light of different colours of white light in air?
(a) Red light moves fastest.
(b) Blue light moves faster than green light.
(c) All the colours of the white light move with the same speed.

(d) Yellow light moves with the mean speed as that of the red and the violet light.

Sol : www.cbse.site/sc/hm107

8. The danger signals installed at the top of tall buildings are red in colour. These can be easily seen from a distance because among all other colours, the red light:
(a) is scattered the most by smoke or fog
(b) is scattered the least by smoke or fog
(c) is absorbed the most by smoke or fog
(d) moves fastest in air.

Sol : www.cbse.site/sc/hm108

9. Which of the following phenomena contributes significantly to the reddish appearance of the sun at sunrise or sunset?
(a) Dispersion of light
(b) Scattering of light
(c) Total internal reflection of light
(d) Reflection of light from the earth

Sol : www.cbse.site/sc/hm109

10. The bluish colour of water in deep sea is due to
(a) the presence of algae and other plants found in water
(b) reflection of sky in water
(c) scattering of light
(d) absorption of light by the sea.

Sol : www.cbse.site/sc/hm110

11. Which colour suffers least deviation on passing through a prism?
(a) Green
(b) Violet
(c) Red
(d) Yellow

Sol : www.cbse.site/sc/hm111

12. To an astronaut, the sky appears
(a) blue
(b) red
(c) white
(d) dark

Sol : www.cbse.site/sc/hm112

13. Which phenomenon is responsible for increasing the apparent length of the day by 4 minutes?
(a) Refraction of light
(b) Scattering of light
(c) Dispersion of light
(d) Atmospheric refraction

Sol : www.cbse.site/sc/hm113

14. What is the order of shortest visible wavelength?
(a) 3000 Å
(b) 4000 Å
(c) 6500 Å
(d) 8000 Å

Sol : www.cbse.site/sc/hm114

15. The intensity of scattered light (I) varies with wavelength as, $I \propto \lambda^n$, where n equals
(a) 4
(b) 3
(c) 2
(d) -4

Sol : www.cbse.site/sc/hm115

16. How many times does a ray of light bend on passing through a prism?
(a) Once
(b) Twice
(c) Thrice
(d) Four times

Sol : www.cbse.site/sc/hm116

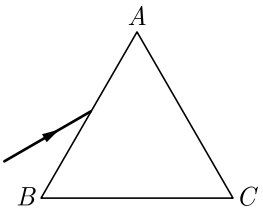
17. Which phenomenon is not explained on the basis scattering of light?
(a) White colour of clouds
(b) Blue colour of clear sky
(c) Red colour of danger signals
(d) Advanced sunrise

Sol : www.cbse.site/sc/hm117

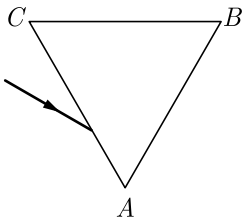
18. Advanced sunrise and delayed sunset are explained on the basis of
(a) Tyndall effect
(b) scattering of light
(c) dispersion of light
(d) atmospheric refraction

Sol : www.cbse.site/sc/hm118

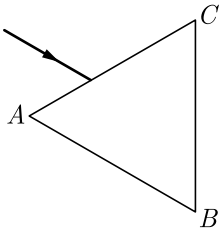
19. A prism ABC (with BC as base) is placed in different orientations. A narrow beam of white light is incident on the prism as shown in figure. In which of the following cases, after dispersion, the third colour from the top corresponds to the colour of the sky?



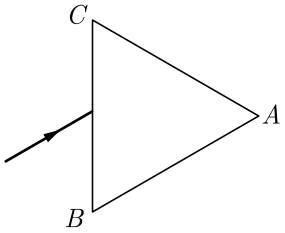
(i)



(ii)



(iii)



(iv)

(a) (i)
(b) (ii)
(c) (iii)
(d) (iv)

Sol : www.cbse.site/sc/hm119

20. A ray of light falls on one face of an equilateral glass prism at 40° and emerges from the other face at the same angle. The deviation suffered by the ray is
(a) 20°
(b) 40°
(c) 60°
(d) 80°

Sol : www.cbse.site/sc/hm120

21. Angle of deviation through a prism of angle 60° when angles of incidence and emergence are 40° each is:
(a) 40°
(b) 30°
(c) 60°
(d) None of these

Sol : www.cbse.site/sc/hm121

22. If angle of deviation through a prism of angle 60° is 40°, angle of incidence (being equal to angle emergence) would be:
(a) 50°
(b) 60°
(c) 40°
(d) None of these

Sol : www.cbse.site/sc/hm122

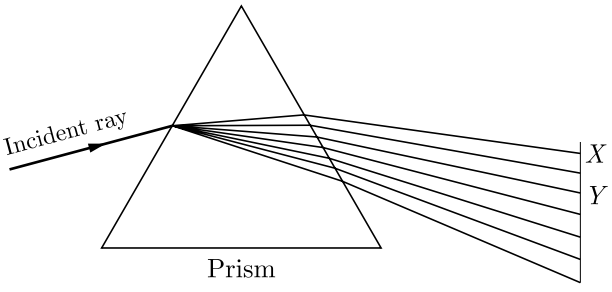
23. A prism is a transparent medium which has ..... triangular bases and ..... rectangular lateral surfaces.
(a) two, three
(b) three, two
(c) one, two
(d) two, four

Sol : www.cbse.site/sc/hm123

24. Angle of deviation is depends on:
(a) Angle of prism
(b) Nature of material of prism
(c) Angle of incidence on the prism
(d) All of the above

Sol : www.cbse.site/sc/hm124

25.



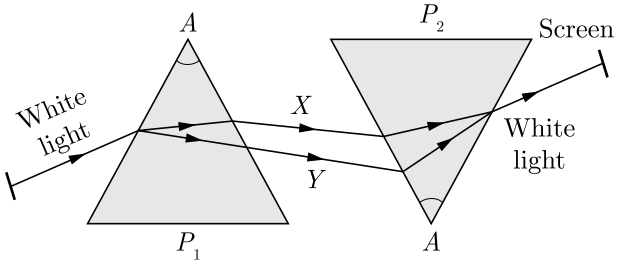
Dispersion of light by glass prism is shown in the above figure. Here x and y indicates ..... and ..... colour respectively.
(a) red, blue
(b) red, indigo
(c) red, yellow
(d) violet, green

Sol : www.cbse.site/sc/hm125

26. The phenomenon of splitting of white light by prism is called ..... .
(a) refraction
(b) reflection
(c) dispersion
(d) Total internal reflection

Sol : www.cbse.site/sc/hm126

27.



Here X and Y indicates:
(a) Green colour, violet colour
(b) Red colour, violet colour
(c) Violet colour, red colour
(d) Green colour, red colour

Sol : www.cbse.site/sc/hm127

28. Which of the following phenomena contributes significantly to the reddish appearance of sun at sunrise or sunset?
(a) Dispersion of light
(b) Scattering of light
(c) Total internal reflection of light
(d) Reflection of light from the earth

Sol : www.cbse.site/sc/hm128

29. The relation between intensity of scattered light (I) and wavelength (λ) is:

(a) $I \propto \frac{1}{\lambda^2}$

(b) $I \propto \frac{1}{\lambda^3}$

(c) $I \propto \frac{1}{\lambda}$

(d) $I \propto \frac{1}{\lambda^4}$

Sol : www.cbse.site/sc/hm129

30. Which of the colours of visible light has minimum frequency?

(a) violet
(b) red
(c) yellow
(d) green

Sol : www.cbse.site/sc/hm130

31. The optical density of our atmosphere ..... with altitude.

(a) decreases
(b) increases
(c) remain same
(d) first increase than decrease

Sol : www.cbse.site/sc/hm131

32. The angle between the refracting surfaces of prism is called angle of ..... .

(a) refraction
(b) prism
(c) reflection
(d) both (a) and (b)

Sol : www.cbse.site/sc/hm132

33. Which of the following colour has maximum frequency?

(a) Indigo
(b) Orange
(c) Red
(d) Violet

Sol : www.cbse.site/sc/hm133

34. Which of following gives monochromatic light?

(a) Sodium lamp
(b) Mercury lamp
(c) Spark lamp
(d) All of the above

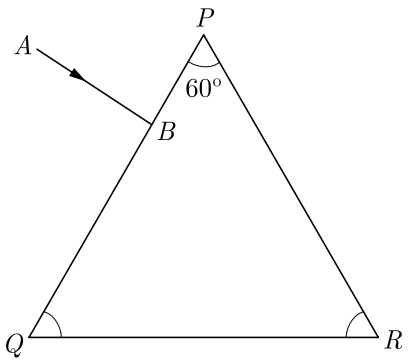
Sol : www.cbse.site/sc/hm134

35. ..... is a natural spectrum appearing in sky after a rain shower.

(a) Twinkling of stars
(b) Advance sunrise and delay sunset
(c) Colour of the sun at sunrise and sunset
(d) Rainbow

Sol : www.cbse.site/sc/hm135

36. In given figure, a light ray AB is incident normally on one face PQ of an equilateral glass prism.
The angles at faces PR is:

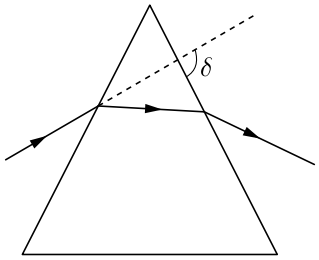


(a) 60°

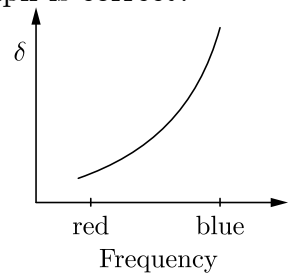
(b) 30°
(c) 45°
(d) 90°

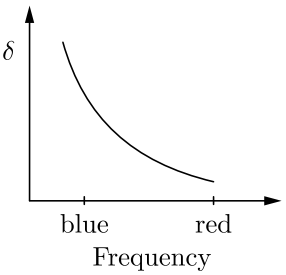
Sol : www.cbse.site/sc/hm136

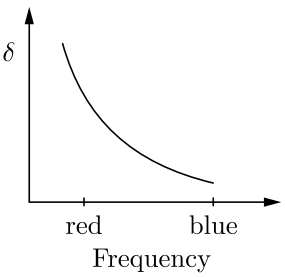
37. Light rays are deviated by a prism as shown in the figure.

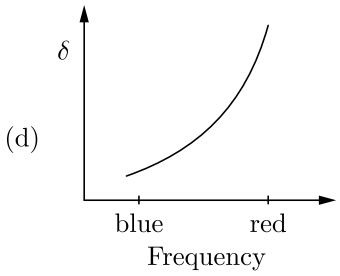


The deviation angle δ is measured for light rays of different frequency, including blue light and red light. Which of the following graph is correct?

(a)


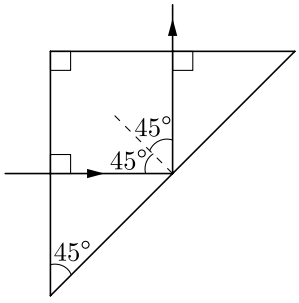
(b)


(c)


(d)


Sol : www.cbse.site/sc/hm137

38. A light ray is incident perpendicularly to one face of a 90° prism and is totally internally reflected at the glass-air interface. If the angle of reflection is 45°, we conclude that the refractive index



(a) $n > \dfrac{1}{\sqrt{2}}$
(b) $n > \sqrt{2}$
(c) $n < \dfrac{1}{\sqrt{2}}$
(d) $n < \sqrt{2}$

Sol : www.cbse.site/sc/hm138

39. A student traces the path of a ray of light through a glass prism for different angles of incidence. He analysis each diagram and draws the following conclusion:

I. On entering prism, the light ray bends towards its base.
II. Light ray suffers refraction at the point of incidence and point of emergence while passing through the prism.

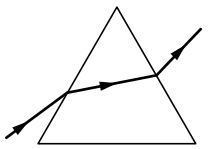
III. Emergent ray bends at certain angle to the direction of the incident ray.
IV. While emerging from the prism, the light ray bends towards the vertex of the prism.

Out of the above inferences, the correct ones are:

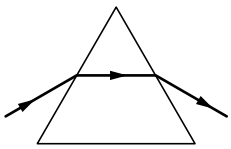
(a) I, II and III
(b) I, III and IV
(c) II, III and IV
(d) I and IV

Sol : www.cbse.site/sc/hm139

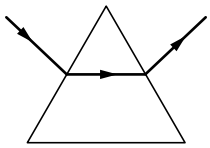
40. In which of the following diagrams is the path of a ray of light passing through a glass prism shown correctly?



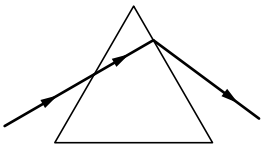
(I)



(II)



(III)

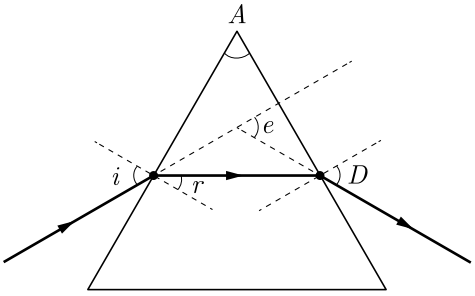


(IV)

(a) I
(b) II
(c) III
(d) IV

Sol : www.cbse.site/sc/hm140

41.

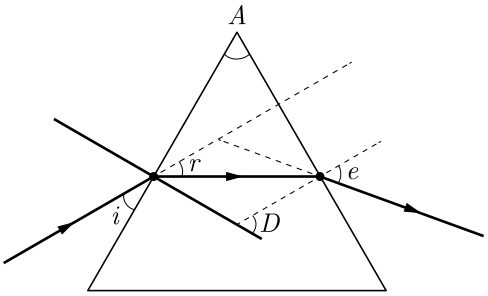


Which of the following angles are correctly marked in the above ray diagram?

(a) $\angle i$, $\angle A$ and $\angle D$
(b) Only $\angle i$ and $\angle A$
(c) $\angle i$, $\angle r$ and $\angle A$
(d) All of the angles

Sol : www.cbse.site/sc/hm141

42.



Which of the following angles are correctly marked in the above diagram?

(a) $\angle A$, $\angle r$ and $\angle D$
(b) $\angle A$ and $\angle e$
(c) $\angle i$, $\angle A$ and $\angle D$
(d) $\angle A$, $\angle r$ and $\angle e$

Sol : www.cbse.site/sc/hm142

43. During the experiment, to trace the path of ray of light through the glass prism, students reported at the following observations:

1. The ray of light from air to glass at the first refracting surface bends away from the normal after refraction.

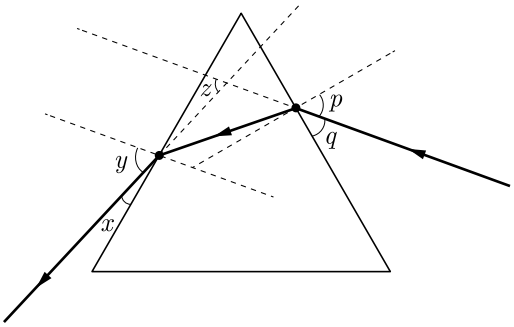
2. At the second refracting surface, light rays entered from air to glass.
3. Light ray suffers two refractions on passing through a prism and in each refraction it bends towards the base of the prism.
4. Light ray suffers two refractions on passing through a prism. In first refraction it bends away from the normal while in the second refraction it bends towards the normal.

The correct observation(s) is/are:

(a) 1 and 2 only
(b) 3 only
(c) 2 and 4 only
(d) 1 and 4 only

Sol : www.cbse.site/sc/hm143

44. Study the following ray diagram:



In this diagram, the angle of incidence, the angle of emergence and the angle of deviation respectively have been represented by

(a) y, p, z
(b) x, q, z
(c) p, y, z
(d) p, z, y

Sol : www.cbse.site/sc/hm144

45. When white light passes through the achromatic combination of prisms, then what is observed ?

(a) Deviation
(b) Dispersion
(c) Both deviation and dispersion
(d) Atmospheric refraction

Sol : www.cbse.site/sc/hm145

46. A student traces the path of a ray of light through a triangular glass prism for different values of angle of incidence. On analyzing the ray diagrams, which one of the following conclusions is he likely to draw?

(a) The emergent ray is not parallel to the incident ray.
(b) The emergent ray bends at an angle to the direction of the incident ray.
(c) The emergent ray and the refracted ray are at right angles to each other.
(d) The emergent ray is perpendicular to the incident ray.

Sol : www.cbse.site/sc/hm146

47. Which one of the following statements is correct?

(a) The rainbow is produced by the reflection of white sun light by water drops in the atmosphere.
(b) The blue colour of the sky is due to scattering of light.
(c) The stars appear higher in the sky than actually are,due to scattering of light.
(d) The planets twinkle at night due to atmospheric refraction of light.

Sol : www.cbse.site/sc/hm147

48. Rainbow is observed when the Sun is

(a) Vertically above the observer
(b) Behind the observer
(c) In front of the observer
(d) Position is not defined

Sol : www.cbse.site/sc/hm148

49. Which phenomenon does not play a role in the formation of rainbow ?
(a) Absorption
(b) Reflection
(c) Refraction
(d) Dispersion

Sol : www.cbse.site/sc/hm149

50. The phenomenon of dispersion proves that:
(a) light does not pass through an opaque medium and absence of the light causes shadow.
(b) light moves in the straight line.
(c) light passes through a transparent medium.
(d) white light is made up of seven constituent colours.

Sol : www.cbse.site/sc/hm150

51. How will you use two identical prisms so that a narrow beam of white light incident on one prism emerges out of the second prism as white light?
(a) One placed inverted with respect to the other.
(b) One placed on top of the other.
(c) Just put them side by side.
(d) Parallel to each other.

Sol : www.cbse.site/sc/hm151

52. A light ray of a single wavelength is incident on the prism. The emergent light is best described by a
(a) Light ray of same wavelength deviated by an angle.
(b) Laterally shifted ray of same wavelength.
(c) Spectrum of component colours.
(d) Light ray of different wavelength deviated by an angle.

Sol : www.cbse.site/sc/hm152

53. When white light is passed through two consecutive prisms, the resultant will be
(a) Seven colour
(b) White beam
(c) Yellow light
(d) Green light

Sol : www.cbse.site/sc/hm153

54. **Assertion :** Colour of sun is red at the time of sunset and sunrise.
Reason : Colour of blue end of spectrum get scattered due to their smaller wavelengths and light reaching earth's surface from sun is rich in red colour end.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/hm154

55. **Assertion :** Planets do not twinkle.
Reason : Planets do not show the phenomenon of scattering.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/hm155

56. **Assertion :** When a light ray is refracted through a glass prism, emergent ray is parallel to incident ray.
Reason : Two sides of prism doing refraction are parallel to each other.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/hm156

57. **Assertion :** A rainbow is a natural spectrum appearing in the sky after a rain shower.
Reason : It is caused by reflection of sunlight by tiny water droplets present in the atmosphere.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/hm157

58. **Assertion :** Different colour of light bends through different angles with respect to the incident ray when they pass through a prism. The red light bends the least while violet the most.
Reason : Different colour of light bends through different angles with respect to the incident ray when they pass through a prism. The red light bends the least while violet the most.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/hm158

59. **Assertion :** A prism deviates a ray of light towards its base.
Reason : Both refracting sides scatter the light.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/hm159

60. **Assertion :** Sun is visible to us 2 minutes after the actual sunrise and about 2 minutes before the actual sunset.
Reason : It is caused due to rotation and revolution of earth.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

Sol : www.cbse.site/sc/hm160

61. **Assertion :** The stars twinkle while the planet do not.
Reason : The stars are much lesser in size than the planets.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/hm161

62. **Assertion :** Blue colour of sky appears due to scattering of blue colour.
Reason : Blue colour has longest wave length in visible spectrum.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/hm162

63. **Assertion :** The light of violet colour deviates the least and the light of red colour the most, while passing through a prism.
Reason : For a prism material, refractive index is highest for red light and lowest for the violet light.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/hm163

64. **Assertion :** Sunlight reaches us without dispersion in the form of white light and not as its components.
Reason : Dispersion takes place due to variation of refractive index for different wavelength but in vacuum the speed of light is independent of wavelength and hence vacuum is a non-dispersive medium.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/hm164

65. **Assertion :** In case of rainbow, light at the inner surface of the water drop gets internally reflected.
Reason : The angle between the refracted ray and normal to the drop surface is greater than the critical angle.
(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/hm165

66. **Assertion :** Secondary rainbow is fainter than primary rainbow.
Reason : Secondary rainbow formation is

three step process and hence, the intensity of light is reduced at the second reflection inside the rain drop.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Assertion is false but Reason is true.

Sol : www.cbse.site/sc/hm166

COMPETENCY BASED QUESTIONS

67. Four friends went to a picnic. The weather was pleasant. They played various games and then had snacks. Suddenly, Shyam, one of them, noticed seven colours in the sky. He said to others, "Wow, what a rainbow!" Then Ram, one of them, asked him "What is Rainbow"? He then explained to all about its formation. After that everyone in the group thanked him for the knowledge, he had given to them.

The device can be used to obtain such phenomenon is:

(a) Lens

(b) Mirror

(c) Prism

(d) Glass plate

Sol : www.cbse.site/sc/hm167

68. Four friends went to a forest for a picnic. When they were moving around the forest, they saw that the light was filtering from the leaves of the trees. The path of the light beam becomes visible to all of them. They wondered how this happen so. Suddenly, they saw two hunters. They immediately went to the nearest police station to complain about them. Police immediately with their force went to the forest to arrest those people. The effect they observed in the canopy of the dense forest is:

(a) Reflection

(b) Refraction

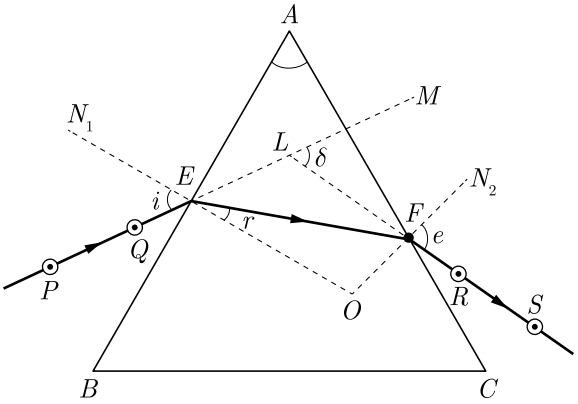
(c) Total internal reflection

(d) Tyndall effect

Sol : www.cbse.site/sc/hm168

Direction For Questions (60-74)

Refer to the path of rays of light through a glass prism. Now answer the following questions.



69. A glass prism has

(a) six rectangular surfaces

(b) four rectangular surfaces

(c) two triangular bases and three rectangular surfaces

(d) none of the above.

Sol : www.cbse.site/sc/hm169

70. In passing through a glass prism, a ray of light undergoes how many refractions?

(a) One

(b) Two
(c) Three
(d) Four

Sol : www.cbse.site/sc/hm169

71. Two refractions on passing through the prism occur at
(a) E and A
(b) E and B
(c) A and B
(d) E and F

Sol : www.cbse.site/sc/hm169

72. Angle of deviation is
(a) $\angle MLF$
(b) $\angle FEO$
(c) $\angle LEF$
(d) none of these

Sol : www.cbse.site/sc/hm169

73. The ray FRS is
(a) emergent ray
(b) refracted ray
(c) incident ray
(d) none of these

Sol : www.cbse.site/sc/hm169

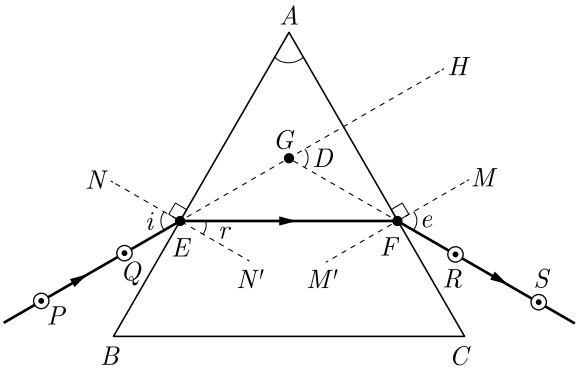
74. If A is angle of prism, D is angle of deviation; i is angle of incidence and e is angle of emergence through a prism, then the correct relation between them is:
(a) $A+i=D+e$
(b) $A+D=i+e$
(c) $A+e=D+i$
(d) $A+i+e=D$

Sol : www.cbse.site/sc/hm169

Direction For Questions (75-76)

A student done the following steps :

1. Fix a sheet of white paper on a drawing board using drawing pins.
2. Place a glass prism on it in such a way that it rests on its triangular base. Trace the outline of the prism using a pencil.
3. Draw a straight line PE inclined to one of the refracting surfaces say AB, of the prism.
4. Fix two pins say at points P and Q, on the line PE as shown in Figure.
5. Look for the images of the pins, fixed at P and Q, through the other face AC.
6. Fix two more pins, at points R and S, such that the pins at R and S and the images of the pins at P and Q lie on the same straight line.
7. Remove the pins and the glass prism.
8. The line PE meets the boundary of the prism at point E (see figure below) Similarly, join and produce the points R and S. Let these line meet the boundary of the prism at E and F, respectively. Join E and F.
9. Draw perpendiculars to the refracting surfaces AB and AC of the prism at points E and F, respectively.
10. Mark the angle of incidence $\angle i$, the angle of refraction $\angle r$ and the angle of emergence $\angle e$ as shown in Figure.



75. If the emergent ray makes an angle of 30° with the second face of prism. The angle of

emergence is:
(a) 50°
(b) 60°
(c) 30°
(d) 90°

Sol : www.cbse.site/sc/hm170

76. What is angle of deviation in the case of parallel glass slab?
(a) 0°
(b) 90°
(c) 45°
(d) 60°

Sol : www.cbse.site/sc/hm170

Direction For Questions (77-81)

The hotter air is lighter (less dense) than the cooler air above it and has a refractive index slightly less than that of the cooler air. Since the physical condition of the refracting medium (air) are not stationary, therefore, the light goes from rarer medium to denser medium in atmosphere. This phenomenon is called atmospheric refraction.
The twinkling of stars and advanced sunrise and delayed sunset are common examples of atmospheric refraction.

77. Stars appear to twinkle because of
(a) movement of air
(b) atmospheric refraction
(c) both (a) and (b)
(d) none of these

Sol : www.cbse.site/sc/hm171

78. Which of the following is not caused because of atmospheric refraction?
(a) Apparent image of Sun is formed closer to the Earth.
(b) Dawn or dusk are formed
(c) Sun can be seen 2 minutes before actual sunrise and 2 minutes after actual sunset.
(d) Clouds look white

Sol : www.cbse.site/sc/hm171

79. During sunset or sunrise the Sun appears reddish because
(a) due to longer passage in atmosphere, even red light in the sunlight scatters
(b) Sun produces red light at this time
(c) at this time Sun is not very hot
(d) none of these

Sol : www.cbse.site/sc/hm171

80. When sunlight enters the atmosphere the colours which scatter first are
(a) only red
(b) red, orange and yellow
(c) blue and green
(d) violet, indigo and blue

Sol : www.cbse.site/sc/hm171

81. The order of wavelength of seven colours in atmosphere is
(a) V < I < B < G < Y <O < R
(b) V > I > B > G > Y > O > R
(c) V < B < I < G < Y < O < R
(d) V > I > B > G > O > R > Y

Sol : www.cbse.site/sc/hm171

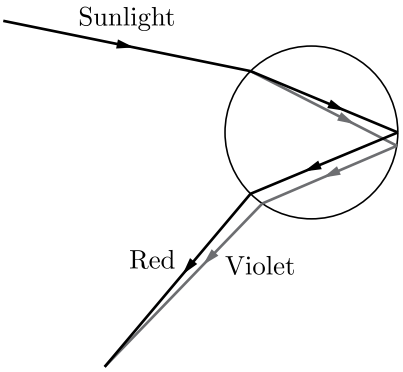
Direction For Questions (82-86)

A beautiful atmospheric phenomenon commonly seen after rain is the rainbow. The colourful arc of a rainbow across the sky is the result of several optical effects: refraction, internal reflection and dispersion. But the conditions must be just right. As we all know, a rainbow is seen after a rain but not after every rain.

Following a rain, there are many tiny water droplets in the air. Sunlight incident on the droplets in air produces a rainbow. But whether a rainbow is seen depends on the relative positions of the Sun and the observer. As you may have noticed, the Sun is generally behind you when you see a rainbow.

To understand the formation and observation of a rainbow, consider what happens when sunlight is incident on a water droplet. On entering the droplet, the light is first refracted and then dispersed into component colours as it travels in the water.

These seven colours strike the inner surface of the water drop and get internally reflected. The reflected light is refracted again as it comes out of the drop as shown in figure.



82. Which of the following phenomena of light are involved in the formation of a rainbow?
(a) Reflection, refraction and dispersion
(b) Refraction, dispersion and total internal reflection
(c) Refraction, dispersion and internal reflection
(d) Dispersion, scattering and total internal reflection

Sol : www.cbse.site/sc/hm172

83. Which phenomenon does not occur during rainbow formation?
(a) Refraction
(b) Induction
(c) Dispersion
(d) Reflection

Sol : www.cbse.site/sc/hm172

84. The order of wavelength of red, yellow and orange is
(a) yellow $<$ orange $<$ red
(b) yellow $>$ orange $>$ red
(c) orange $>$ red $>$ yellow
(d) none of these

Sol : www.cbse.site/sc/hm172

85. The order of frequency of the seven colours of rainbow is
(a) V = I = B = G = Y = O = R
(b) V $>$ I $>$ B $>$ G $>$ Y $>$ O $>$ R
(c) I $<$ B $<$ Y $<$ G $<$ O $<$ R $<$ V
(d) none of the above

Sol : www.cbse.site/sc/hm172

86. Which of the seven colours travels fastest in a medium?
(a) Red
(b) Yellow
(c) Green
(d) Orange

Sol : www.cbse.site/sc/hm172

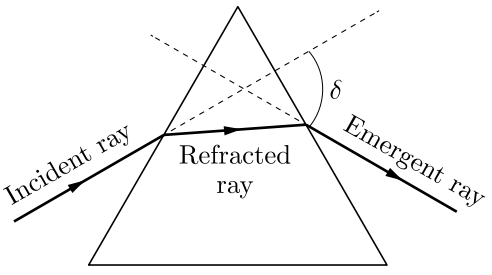
Direction For Questions (87-91)

Newton found that when a beam of white light passes through a prism it is spread out by the prism into a band of all the colours of the rainbow from red to violet. The band of colours is called a spectrum and the separation of the colours by the prism is known as dispersion. He concluded that white light is a mixture of light of various colours and identified red, orange, yellow, green, blue, indigo and violet.
All colours of light travel at the same speed in a vacuum. When they enter a transparent substance like glass, they all slow down but by different amounts. Because they slow down, they are refracted but because they slow down by different amounts, different colours are refracted through different angles.

87. Which of the following statements is correct regarding the propagation of light of different colours of white light in air?
(a) Red light moves fastest.
(b) Blue light travels faster than green light.
(c) All colours of white light move with the same speed.
(d) Yellow light moves with the mean speed as that of red and violet lights.

Sol : www.cbse.site/sc/hm173

88. A ray of light passes through a prism as shown in figure



The angle δ is known as
(a) angle of emergence
(b) angle of dispersion
(c) angle of prism
(d) angle of deviation

Sol : www.cbse.site/sc/hm173

89. Splitting of white light into seven colours on passing through a glass prism is called
(a) scattering
(b) refraction
(c) dispersion
(d) reflection

Sol : www.cbse.site/sc/hm173

90. Rainbow is formed due to
(a) diffraction and dispersion
(b) reflection only
(c) scattering and refraction
(d) total internal reflection and dispersion

Sol : www.cbse.site/sc/hm173

91. The rectangular surface of a prism is known as:
(a) reflecting surface
(b) dispersing surface
(c) refracting surface
(d) none of these

Sol : www.cbse.site/sc/hm173

Direction For Questions (92-95)

When light is passed through a prism it spit into. Its spectrum of colours (in order violet, indigo, blue, green, yellow, orange and red) and this process of while light. Splitting into its constituent colours intermed as dispersion of light.
This splitting of the light ray occurs because

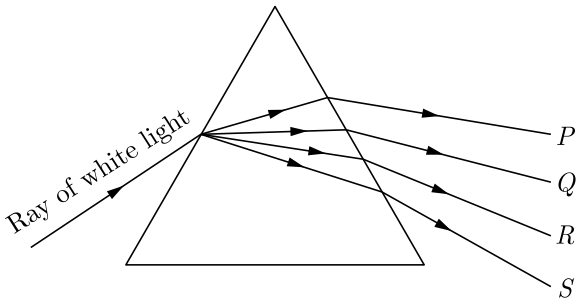
of the different angles of bending for each colour. Hence, each colour while passing through the prism bends at different angles with respect to the incident beam. This gives rise to the formation of the coloured spectrum.

92. Which of the following colour of white light suffers least deviation?

(a) Red
(b) Blue
(c) Violet
(d) Green

Sol : www.cbse.site/sc/hm174

93. Which of the following colours viz., P, Q, R and S has more speed in the prism?



(a) P
(b) Q
(c) R
(d) S

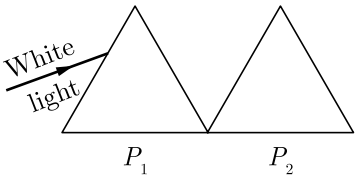
Sol : www.cbse.site/sc/hm174

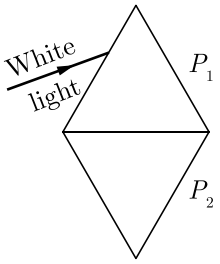
94. Among the seven colours visible due to splitting of white light through prism which colour has shortest wavelength?

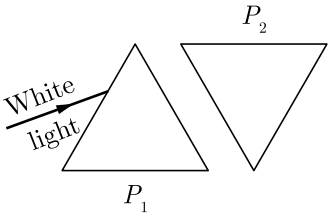
(a) Red
(b) Violet
(c) Yellow
(d) Blue

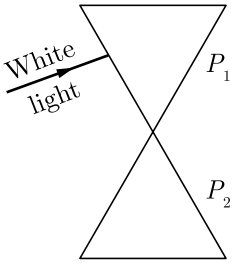
Sol : www.cbse.site/sc/hm174

95. How will you use two identical prisms P_1 and P_2 so that a narrow beam of white light incident on one prism emerges out of the second prism as white light?

(a)


(b)


(c)


(d)


Sol : www.cbse.site/sc/hm174

Direction For Questions (96-99)

The earth's atmosphere is a heterogeneous mixture of minute particles. These particles include smoke, tiny water droplets, suspended particles of dust and molecules of air.

When a beam of light strikes such fine particles, the path of the beam becomes visible. The light reaches us after being

reflected diffusely by these particles. The phenomenon of scattering of light by the colloidal particle is known as Tyndall effect. Tyndall effect can also be observed when sunlight passes through a canopy of dense forest. The colour of the scattered particle's light depend upon size of scattering particles.

96. The phenomenon of scattering of light by colloidal particles is called
(a) Corona effect
(b) Tyndall effect
(c) dispersion effect
(d) none of these

Sol : www.cbse.site/sc/hm175

97. The colour of scattering light depends upon
(a) volume of particles
(b) nature of particles
(c) size of particles
(d) none of these

Sol : www.cbse.site/sc/hm175

98. The colour of scattered light depends upon
(a) frequency of the scattered particles
(b) wavelength of the scattered particles
(c) velocity of the scattered particles
(d) all of the above

Sol : www.cbse.site/sc/hm175

99. If the size of the scattering particles is large enough then
(a) the scattered light may appear red
(b) the scattered light may appear white
(c) the scattered light may appear blue
(d) none of these

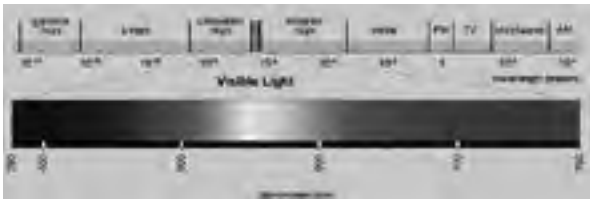
Sol : www.cbse.site/sc/hm175

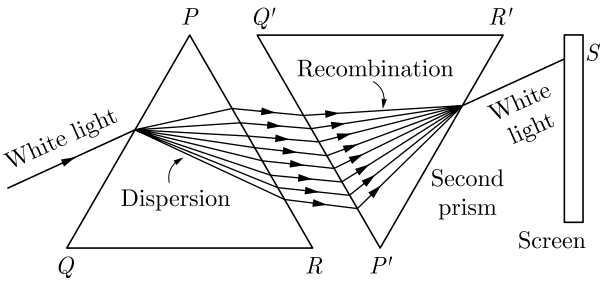
Direction For Questions (100-104)

Light spectrum is the many different wavelengths of energy produced by light source. Light is measured in nanometres (nm). Each nanometre represents a wavelength of light or band of light energy. Visible light is the part of spectrum from 380 nm to 780 nm.

Isaac Newton was the first to use a glass prism to obtain the spectrum of sunlight. He tried to split the colours of the spectrum of white light further by using another similar prism. He then placed a second identical prism in an inverted position with respect to the first prism. This allowed all the colours of the spectrum to pass through second prism. He found a beam of white light emerging from the other side of the second prism. This observation gave Newton the idea that the sunlight is made up of seven colours.

A rainbow is a natural spectrum appearing in the sky after rain.





100. The range of wavelength of visible light spectrum is
(a) 500 nm to 780 nm
(b) 450 nm to 750 nm
(c) 380 nm to 780 nm
(d) 300 nm to 700 nm

Sol : www.cbse.site/sc/hm176

101. The many different wavelength of energy produced by light source through prism is called
(a) hydrogen spectrum
(b) light spectrum
(c) corona discharge
(d) frequency modulation

Sol : www.cbse.site/sc/hm176

102. The critical angle between an equilateral prism and air is 45°, if the incident ray is perpendicular to the refracting surface, then
(a) it is reflected totally from the second surface and emerge perpendicular to the third surface.
(b) it gets reflected from second surface and third surface and emerges from the third surface.
(c) it keeps reflecting from all the three sides of the prism and never emerges out.
(d) after deviation, it gets refracted from the second surface.

Sol : www.cbse.site/sc/hm176

103. The dispersive power of prism depends upon
(a) the shape of the prism
(b) the angle of the prism
(c) height of the prism
(d) the material of the prism

Sol : www.cbse.site/sc/hm176

104. When white light is passed through a hollow prism then there is
(a) no dispersion and no deviation
(b) only dispersion
(c) only deviation
(d) both dispersion and deviation

Sol : www.cbse.site/sc/hm176

Direction For Questions (105-107)

White light is a mixture of seven colours i.e., violet, indigo, blue, green, yellow, orange and red. Every colour has its own characteristic wavelength. Different colours with their wavelengths are given below in the table.

S. No.	Colour	Wavelength
1.	Red	7900 Å
2.	Orange	6000 Å
3.	Yellow	5800 Å
4.	Green	5400 Å
5.	Blue	4800 Å
6.	Indigo	4500 Å
7.	Violet	4000 Å

The phenomenon of splitting white light into seven colours when it passes through a glass prism is called dispersion of white light.

105. The speed of light depends upon :
(a) frequency
(b) wavelength

(c) density
(d) none of these

Sol : www.cbse.site/sc/hm177

106. Which one of the following statement is correct?
(a) Each colour of light travels with same speeds in a given medium.
(b) Each colour of light travels with different speeds in a given medium.
(c) Only red colour of light travels with fast speed in a given medium.
(d) All of the above

Sol : www.cbse.site/sc/hm177

107. Light of two colours P and Q pass through a glass prism. P deviates more than Q from its path of incidence. Which colour has a higher speed in the prism?
(a) P
(b) Q
(c) Neither P nor Q
(d) Both P and Q

Sol : www.cbse.site/sc/hm177

□□□□□□□

SELF ASSESSMENT TEST

1. Which of the following are effects of atmospheric refraction?
1. Twinkling of stars.
2. Tyndall effect.
3. Advance sunrise and delayed sunset.

Choose the correct option from the codes given below:
(a) 1 and 2
(b) 2 and 3
(c) 1 and 3
(d) 1, 2 and 3

2. Which of the following phenomena of light are involved in the formation of a rainbow?
(a) Reflection, refraction and dispersion.
(b) Reflection, dispersion and total internal reflection.
(c) Refraction, dispersion and internal reflection.
(d) Dispersion, scattering and total internal reflection.

3. The clear sky appears blue because
(a) blue light gets absorbed in the atmosphere
(b) ultraviolet radiations are absorbed in the atmosphere
(c) violet and blue lights get scattered more than lights of all other colours by the atmosphere
(d) light of all other colours is scattered more than the violet and blue colour lights by the atmosphere

4. The danger signals installed at the top of tall buildings are red in colour. These can be easily seen from a distance because among all other colours, the red light
(a) is scattered the most by smoke or fog
(b) is scattered the least by smoke or fog
(c) is absorbed the most by smoke or fog
(d) moves fastest in air.

5. The bluish colour of water in deep sea is due to
(a) the presence of algae and other plants found in water
(b) reflection of sky in water
(c) scattering of light
(d) absorption of light by the sea.

6. To an astronaut, the sky appears
(a) blue
(b) red
(c) white
(d) dark

7. What is the order of shortest visible wavelength?
(a) 3000 Å
(b) 4000 Å
(c) 6500 Å
(d) 8000 Å

8. The intensity of scattered light (l) varies with wavelength as, $I \propto \lambda^n$, where n equals
(a) 4
(b) 3
(c) 2
(d) -4

9. The refractive index of glass is 3/2. The velocity of light in glass is
(a) 3×10^8 m/s
(b) 2×10^8 m/s
(c) 10^8 m/s
(d) 1.33×10^8 m/s

10. Which phenomenon is not explained on the basis scattering of light?
(a) White colour of clouds
(b) Blue colour of clear sky
(c) Red colour of danger signals
(d) Advanced sunrise

11. A ray of light falls on one face of an equilateral glass prism at 40° and emerges from the other face at the same angle. The deviation suffered by the ray is
(a) 20°
(b) 40°
(c) 60°
(d) 80°

12. Two refractions on passing through the prism occur at
(a) E and A
(b) E and B
(c) A and B
(d) E and F

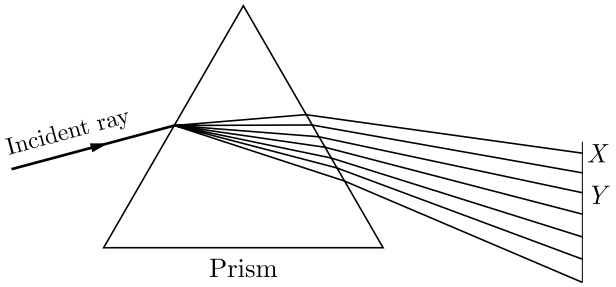
13. The ray FRS is
(a) emergent ray
(b) refracted ray
(c) incident ray
(d) none of these

14. Angle of deviation through a prism of angle 60° when angles of incidence and emergence are 40° each is:
(a) 40°
(b) 30°
(c) 60°
(d) None of these

15. Four friends went to a picnic. The weather was pleasant. They played various games and then had snacks. Suddenly, Shyam, one of them, noticed seven colours in the sky. He said to others, "Wow, what a rainbow!" Then Ram, one of them, asked him "What is Rainbow"? He then explained to all about its formation. After that everyone in the group thanked him for the knowledge, he had given to them.
The device can be used to obtain such phenomenon is:
(a) Lens
(b) Mirror
(c) Prism
(d) Glass plate

16. A prism is a transparent medium which has ..... triangular bases and ..... rectangular lateral surfaces.
(a) two, three
(b) three, two
(c) one, two
(d) two, four

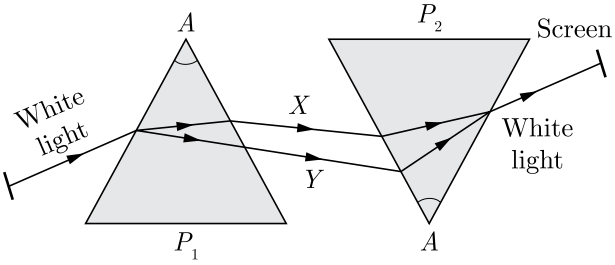
17.



Dispersion of light by glass prism is shown in the above figure. Here x and y indicates ..... and ..... colour respectively.
(a) red, blue
(b) red, indigo
(c) red, yellow

(d) violet, green

18.



Here X and Y indicates:
(a) Green colour, violet colour
(b) Red colour, violet colour
(c) Violet colour, red colour
(d) Green colour, red colour

19. The relation between intercity of scattered light (I) and wavelength (λ) is:

(a) $I \propto \frac{1}{\lambda^2}$

(b) $I \propto \frac{1}{\lambda^3}$

(c) $I \propto \frac{1}{\lambda}$

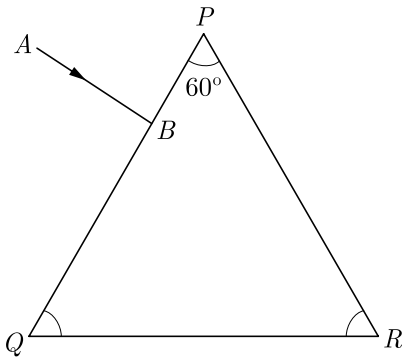
(d) $I \propto \frac{1}{\lambda^4}$

20. Which of following suffers least division on passing through a prism?
(a) red
(b) green
(c) yellow
(d) violet

21. The angle between the refracting surfaces of prism is called angle of ..... .
(a) refraction
(b) prism
(c) reflection
(d) both (a) and (b)

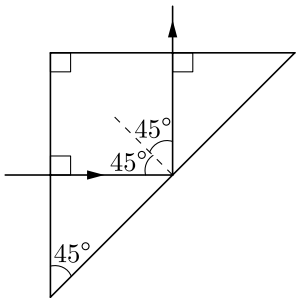
22. Which of following gives monochromatic light?
(a) Sodium lamp
(b) Mercury lamp
(c) Spark lamp
(d) All of the above

23. In given figure, a light ray AB is incident normally on one face PQ of an equilateral glass prism.
The angles at faces PR is:



(a) 60°
(b) 30°
(c) 45°
(d) 90°

24. A light ray is incident perpendicularly to one face of a 90° prism and is totally internally reflected at the glass-air interface. If the angle of reflection is 45°, we conclude that the refractive index



(a) $n > \frac{1}{\sqrt{2}}$

(b) $n > \sqrt{2}$

(c) $n < \dfrac{1}{\sqrt{2}}$

(d) $n < \sqrt{2}$

25. Which of the following statements is correct regarding the propagation of light of different colours of white light in air?

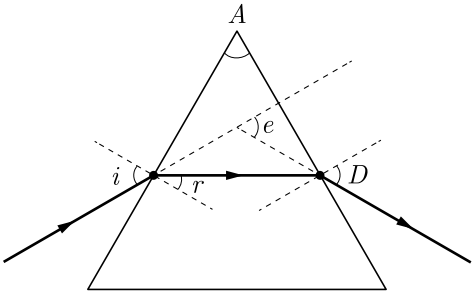
(a) Red light moves the fastest.

(b) Blue light moves faster than green light.

(c) All the colours of the white light travel with the same speed.

(d) Yellow light moves with the mean speed as that of red and the violet light.

26. In the following diagram, the correctly marked angles are



(a) All

(b) Only $\angle i$ and $\angle A$

(c) $\angle i$, $\angle r$ and $\angle A$

(d) $\angle i$, $\angle A$ and $\angle D$

27. During the experiment, to trace the path of ray of light through the glass prism, students reported at the following observations:

1. The ray of light from air to glass at the first refracting surface bends away from the normal after refraction.
2. At the second refracting surface, light rays entered from air to glass.
3. Light ray suffers two refractions on passing through a prism and in each refraction it bends towards the base of the prism.
4. Light ray suffers two refractions on passing through a prism. In first refraction it bends away from the normal while in the second refraction it bends towards the normal.

The correct observation(s) is/are:

(a) 1 and 2 only

(b) 3 only

(c) 2 and 4 only

(d) 1 and 4 only

28. In an experiment to trace the path of a ray of light through a triangular glass prism, a student would observe that the emergent ray

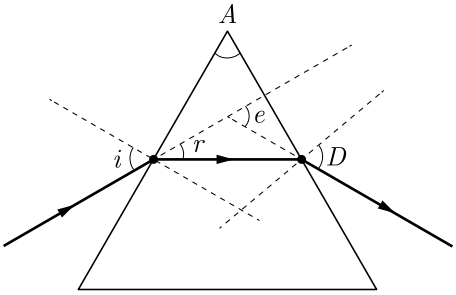
(a) is parallel to the incident ray.

(b) is along the same direction of incident ray.

(c) gets deviated and bends towards the thinner part of the prism.

(d) gets deviated and bends towards the thicker part (base) of the prism.

29. Study the following figure in which a student has marked the angle of incidence $\angle i$, angle of refraction $\angle r$, angle of emergence $\angle e$, angle of prism $\angle A$ and the angle of deviation $\angle D$. The correctly marked angles are:



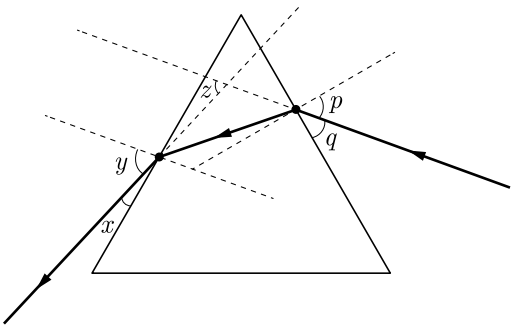
(a) $\angle A$ and $\angle i$

(b) $\angle A$, $\angle i$ and $\angle r$

(c) $\angle A$, $\angle i$, $\angle e$ and $\angle D$

(d) $\angle A$, $\angle i$, $\angle r$ and $\angle D$

30. Study the following ray diagram:



In this diagram, the angle of incidence, the angle of emergence and the angle of deviation respectively have been represented by

(a) y, p, z
(b) x, q, z
(c) p, y, z
(d) p, z, y

31. **Assertion :** Planets do not twinkle.
Reason : Planets do not show the phenomenon of scattering.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

32. **Assertion :** A rainbow is a natural spectrum appearing in the sky after a rain shower.
Reason : It is caused by reflection of sunlight by tiny water droplets present in the atmosphere.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

33. **Assertion :** A prism deviates a ray of light towards its base.
Reason : Both refracting sides scatter the light.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

34. **Assertion :** Blue colour of sky appears due to scattering of blue colour.
Reason : Blue colour has longest wave length in visible spectrum.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Both Assertion and Reason are false.

35. **Assertion :** In case of rainbow, light at the inner surface of the water drop gets internally reflected.
Reason : The angle between the refracted ray and normal to the drop surface is greater than the critical angle.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

Direction For Questions (36-40)

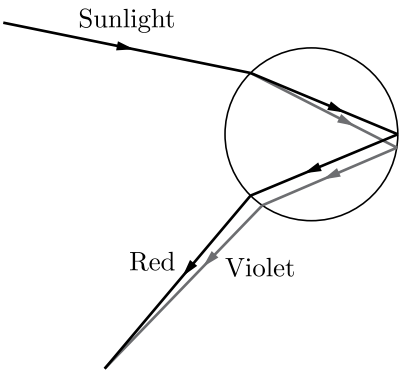
A beautiful atmospheric phenomenon

commonly seen after rain is the rainbow. The colourful arc of a rainbow across the sky is the result of several optical effects: refraction, internal reflection and dispersion. But the conditions must be just right. As we all know, a rainbow is seen after a rain but not after every rain.

Following a rain, there are many tiny water droplets in the air. Sunlight incident on the droplets in air produces a rainbow. But whether a rainbow is seen depends on the relative positions of the Sun and the observer. As you may have noticed, the Sun is generally behind you when you see a rainbow.

To understand the formation and observation of a rainbow, consider what happens when sunlight is incident on a water droplet. On entering the droplet, the light is first refracted and then dispersed into component colours as it travels in the water.

These seven colours strike the inner surface of the water drop and get internally reflected. The reflected light is refracted again as it comes out of the drop as shown in figure.



36. Which of the following phenomena of light are involved in the formation of a rainbow?
(a) Reflection, refraction and dispersion
(b) Refraction, dispersion and total internal reflection
(c) Refraction, dispersion and internal reflection
(d) Dispersion, scattering and total internal reflection

37. Which phenomenon does not occur during rainbow formation?
(a) Refraction
(b) Induction
(c) Dispersion
(d) Reflection

38. The order of wavelength of red, yellow and orange is
(a) yellow $<$ orange $<$ red
(b) yellow $>$ orange $>$ red
(c) orange $>$ red $>$ yellow
(d) none of these

39. The order of frequency of the seven colours of rainbow is
(a) V = I = B = G = Y = O = R
(b) V $>$ I $>$ B $>$ G $>$ Y $>$ O $>$ R
(c) I $<$ B $<$ Y $<$ G $<$ O $<$ R $<$ V
(d) none of the above

40. Which of the seven colours travels fastest in a medium?
(a) Red
(b) Yellow
(c) Green
(d) Orange

Answer Key

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
(c)	(b)	(c)	(b)	(c)	(d)	(b)	(d)	(b)	(d)
11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
(a)	(d)	(a)	(d)	(c)	(a)	(c)	(b)	(d)	(a)
21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
(b)	(d)	(a)	(b)	(c)	(c)	(b)	(d)	(a)	(c)
31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
(c)	(c)	(c)	(c)	(a)	(c)	(b)	(a)	(a)	(a)

□□□□□□□

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