



ISARADDI'S CLASSES

SSLC study material

June - 2021

PART - A

PHYSICS

UNITS :

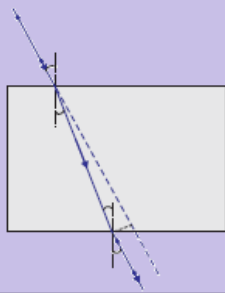
- Light-Reflection and Refraction
- Electricity
- Magnetic effects of Electric current
- Sources of Energy

TOTAL = 28 Marks

SANJEEVKUMAR ISARADDI

9448245781

isaraddiclasses.com



CHAPTER 10

Light – Reflection and Refraction



Previous questions from SSLC Board

April 2019

1. The focal length of a concave lens is 30 cm. At what distance should the object be placed from the lens so that it forms an image at 20 cm from the lens ? (2Marks)

Ans. :

Focal length of a lens $f = -30\text{cm}$

Image distance $u = -20\text{cm}$

Lens formula $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$ OR $\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$

$$\frac{1}{u} = \frac{1}{-20} - \frac{1}{(-30)}$$

$$\frac{1}{u} = -\frac{1}{20} + \frac{1}{30}$$

$$\frac{1}{u} = \frac{-3 + 2}{60}$$

$$\frac{1}{u} = \frac{-1}{60}$$

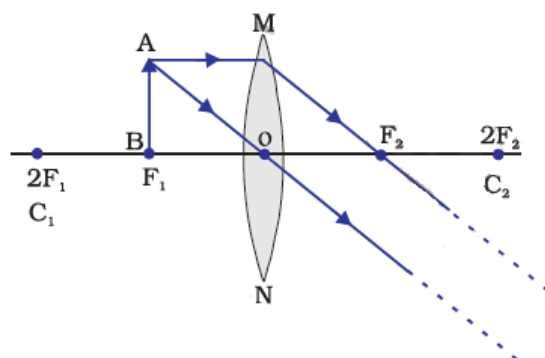
$$u = -60\text{ cm}$$

2. Draw the ray diagrams for the image formation in a convex lens when an object is placed (3Marks)

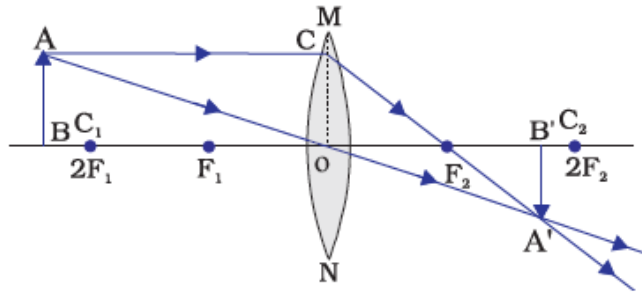
(i) at focus F_1

(ii) beyond $2F_1$.

Ans. : (i) at focus F_1

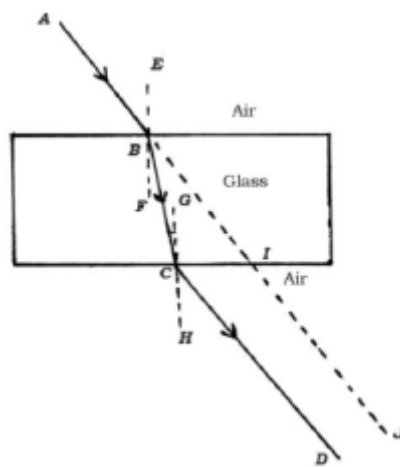


(ii) beyond $2F_1$.



June 2019

1. Identify the emergent ray in the given figure. (1Mark)



(A) CD

(B) BC

(C) AB

(D) IJ.

Ans. :

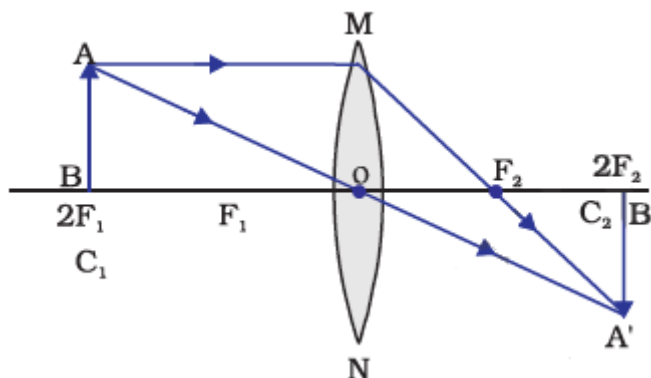
(A) CD

2. Draw the ray diagram to show the formation of image by a convex lens when the object is at $2F_1$.

[F_1 : Principal focus]

(2Marks)

Ans. :



3. A concave lens has focal length 30 cm. At what distance should the object be placed from the lens so that it forms an image at 20 cm from the lens ? Also, find the magnification produced by the lens.

(3Marks)

Ans. :

Focal length of a lens $f = -30\text{cm}$

Image distance $v = -20\text{cm}$

Lens formula $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$ OR $\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$

$$\frac{1}{u} = \frac{1}{-20} - \frac{1}{(-30)}$$

$$\frac{1}{u} = \frac{1}{-20} + \frac{1}{30}$$

$$\frac{1}{u} = \frac{-3 + 2}{60}$$

$$\frac{1}{u} = \frac{-1}{60}$$

$$u = -60\text{ cm}$$

Magnification : $m = \frac{v}{u} \quad m = \frac{-20}{-60} = \frac{1}{3}$

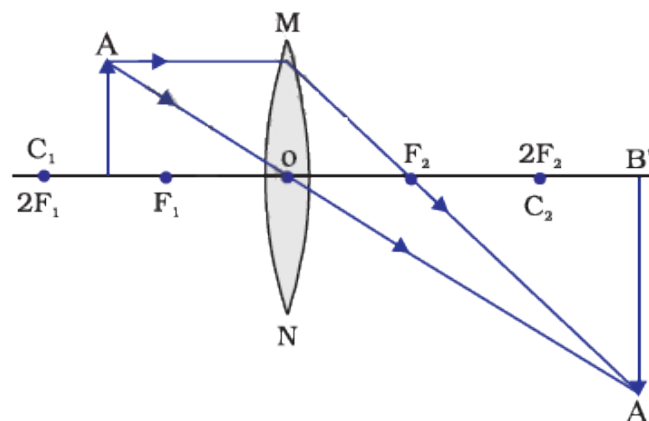
$$m = 0.33$$

April 2020

1. Draw the ray diagram when the object is kept between F_1 and $2F_1$ of the convex lens. With the help of the diagram mention the position and nature of the image formed. [F_1 : Principal focus of the lens]

(3Marks)

Ans. :

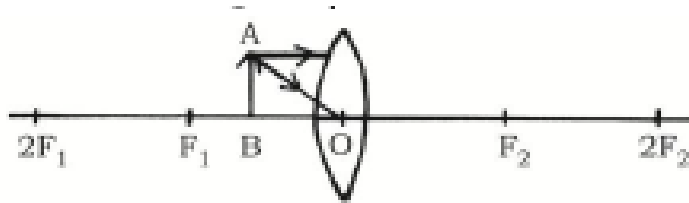


Position of the image-beyond $2F_2$

Nature of the image - real inverted and enlarged.

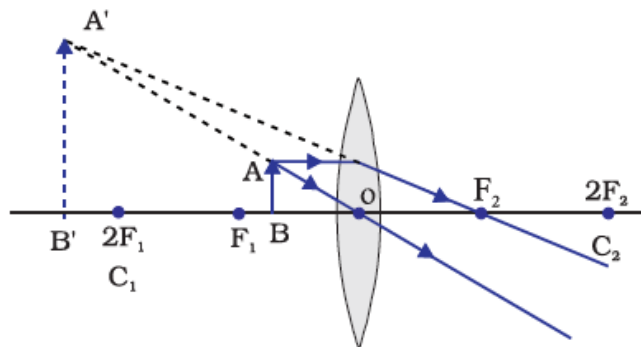
September 2020

1. Observe the given incomplete diagram. (1Mark)



Complete the diagram by drawing refracted rays and show the image formed

Ans :



2. Object distance and image distance of a lens are -30 cm and -10 cm respectively. Find the magnification and decide the type of lens used and nature of the image. (2Marks)

Ans. :

Here, object distance $u = -30$ cm

image distance $v = -10$ cm

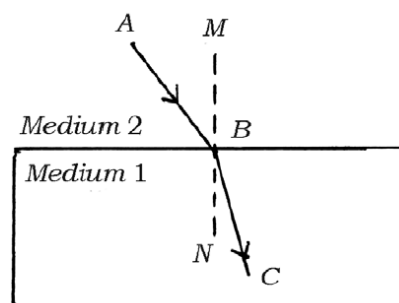
$$\therefore \text{Magnification, } m = \frac{v}{u} \quad m = \frac{-10}{-30} = \frac{1}{3}$$

$$m = 0.33$$

- Here, as v is negative, the used lens is concave lens.
- As the magnification is positive and less than one [having positive sign] the image formed is erect, virtual and diminished.

3. a) State the laws of refraction of light. (3Marks)

b) In the given figure, AB is the incident ray, BC is the refracted ray and MN is the normal at the point of incidence. Which medium is more denser ? Why ?



Ans :

a) *Laws of refraction of light :*

- 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.
- The ratio of sine of angle of incidence to the sine of angle of refraction is a constant for the light of a given colour and for the given pair of media.

b) Medium 1 is more denser.

When a ray of light travels from rarer medium to denser medium, it always bends towards the normal.

MOST LIKELY QUESTIONS FOR 2021(Including previous year questions)

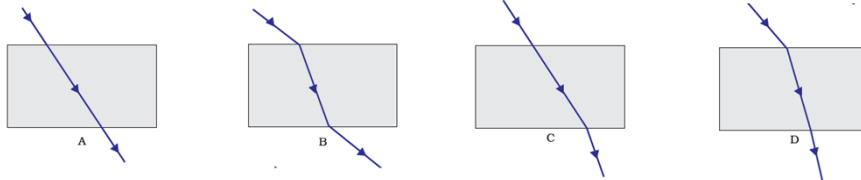
1. Four objects A , B , C and D have refractive index 1.50 , 1.36 , 1.77 and 1.31 respectively. Which object will shine more ?

- a) Object A b) Object B c) Object C d) Object D

Ans : c) Object C

Explanation : As the refractive index of an object increases it shines more

2. The path of a ray of light coming from air passing through a rectangular glass slab traced by four students are shown as A, B, C and D in Figure. Which one of them is correct?



- a] A b] B c] C d] D

Ans : b] B

3. An object is placed between f and $2f$ of a convex lens. Correct statement for the image formed here is

- a] real and larger than object b] erect and smaller than object
c] inverted and equal size d] virtual and larger than object

Ans : a] real and larger than object

4. Four convex lens P , Q , R and S have focal length 20cm , 15cm, 5cm and 10cm respectively. The power of lens is more in -

- a] P b] Q c] R d] S

Ans : c] R

Explanation : Power of lens is inversely proportional to focal length

5. An object was kept at any distance from concave lens , the nature of the image is

- a] virtual , erect and larger than object b] virtual , inverted and smaller than object
c] virtual , erect and smaller than object d] virtual , erect and equal size

Ans :

c] virtual , erect and smaller than object

6. Mention the conditions when a ray of light travels from one media to another, refraction does not take place.

Ans :

- If the angle of incidence is equal to 90° or 0°
- If the refractive indexes of both media are same.

7. A ray of light travelling in air enters obliquely into water. Does the light ray bend towards the normal or away from the normal? Why?

Ans :

- The light-ray bends towards the normal
- Because the ray of light goes from a rarer medium to a denser medium.

8. Light enters from air to glass having refractive index 1.50. What is the speed of light in the glass ? The speed of light in vacuum is $3 \times 10^8 \text{ ms}^{-1}$.

Ans :

Refractive index of glass $n_m = 1.50$

Speed of light in vacuum $c = 3 \times 10^8 \text{ ms}^{-1}$.

Speed of light in glass
$$v = \frac{c}{n_m} = \frac{3 \times 10^8}{1.50}$$
$$= 2 \times 10^8 \text{ ms}^{-1}$$

9. The refractive index of diamond is 2.42. What is the meaning of this statement?

Ans :

The refractive index of diamond is 2.42, It mean that the speed of light in diamond is lower by a factor of 2.42 relative to that in vacuum.

10. Observe the information given in Table

Media	Refractive index
Kerosene	1.44
Turpentine	1.47
Water	1.33

In which of these does the light travel fastest? Give reason to your answer.

Ans :

- In water light travels faster.
- Because water has the lowest refractive index, therefore light travels fastest in this optically rarer medium than kerosene and turpentine oil.

11. Observe the information given in Table

Media	Refractive index
Fused glass	1.46
Crown glass	1.52
Diamond	2.42
Flint glass	1.65

Find out the medium having highest optical density. Give reason to your answer

Ans :

- Diamond has highest optical density
- As the refractive index of a media increases , its optical density also increases.

12. The magnification produced by a lens is +1. What does this mean ?

Ans :

- (i) $m = 1$ indicates the size of image is same as that of object.
- (ii) positive sign of m indicates that an erect image is formed.

13. Define power of lens. What is its SI unit

Ans :

Power of lens is defined as the reciprocal of its focal length. If P is the power of a lens of focal length 'f' in metres, then

$$P = 1/f$$

The S.I. unit of power of a lens is Diopetre. It is denoted by D.

14. Find the focal length of a lens of power -2.0 D. What type of lens is this ?

Ans:

Here, $P = -2.0$ D

Focal of length of lens $f = \frac{1}{P} = \frac{1}{-2} = -0.5m \text{ or } -50cm$

The type of lens is concave because the focal length is negative.



Previous questions from SSLC Board

April 2019

1. The resistance of a conductor is $27\ \Omega$. If it is cut into three equal parts and connected in parallel, then its total resistance is (1Mark)

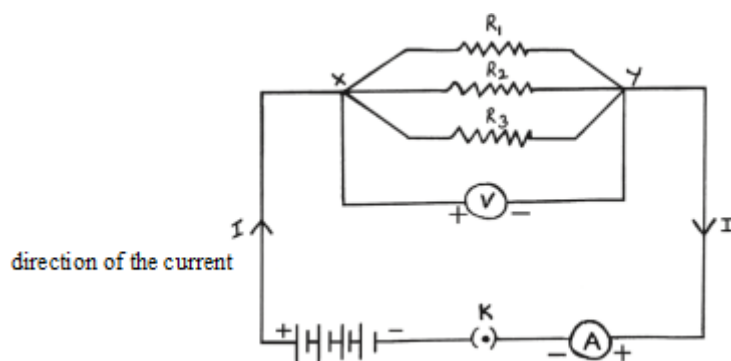
- (A) $6\ \Omega$ (B) $3\ \Omega$
 (C) $9\ \Omega$ (D) $27\ \Omega$

Ans. :

(B) $3\ \Omega$

2. Draw the diagram of an electric circuit in which the resistors R_1 , R_2 and R_3 are connected in parallel including an ammeter and a voltmeter and mark the direction of the current. (2Marks)

Ans. :



3. It is advantageous to connect electric devices in parallel instead of connecting them in series. Why ? (2Marks)

Ans :

- The appliances connected in series need currents of widely different values to operate properly.
- In a series circuit, if one component fails, the circuit is broken and none of the components work.
- But in a parallel circuit current divides through the electrical gadgets.
- This is helpful particularly when each gadget has different resistance and requires different current to operate properly

OR

According to Joule's law of heating, mention the factors on which heat produced in a resistor depends. According to this law write the formula used to calculate the heat produced.

Ans : Heat produced in a resistor is,

(i) directly proportional to the square of current for a given resistance

(ii) directly proportional to resistance for a given current,

(iii) directly proportional to the time for which the current flows through the resistor

(iv) $H = I^2 R t$

4. An electric refrigerator rated 400 W is used for 8 hours a day. An electric iron box rated 750 W is used for 2 hours a day. Calculate the cost of using these appliances for 30 days, if the cost of 1 kWh is Rs. 3/-. (3Marks)

Ans. :

The total energy consumed by the refrigerator in 30 days

$$= 400 \times 8 \times 30 = 96000 \text{ Wh} = 96 \text{ kWh}$$

The total energy consumed by the iron box in 30 days

$$= 750 \times 2 \times 30 = 45000 \text{ Wh} = 45 \text{ kWh}$$

The total energy consumed by the refrigerator and iron box is

$$= 96 \text{ kWh} + 45 \text{ kWh} = 141 \text{ kWh}$$

The sum of bill amount for 141 kWh at rate of Rs. 3 per 1 kWh is

$$= 141 \times 3$$

$$= \text{Rs. } 423.$$

June 2019

1. A piece of metallic wire of resistance R is cut into 3 equal parts. These parts are then connected in parallel. If the total resistance of this combination is R' , then the value of $R : R'$ is (1Mark)

(A) 1 : 3

(B) 9 : 1

(C) 1 : 9

(D) 3 : 1.

Ans. :

(B) 9 : 1

2. A bulb is marked 220 V and 40 W. Calculate the current flowing through the bulb and its resistance. (2Mark)

Ans. :

Current flowing through the bulb $I = \frac{P}{V} = \frac{40}{220} = 0.18 \text{ A}$

Resistance of a bulb $R = \frac{V}{I} = \frac{220}{0.18} = 1222 \Omega$

3. (i) Define electric potential difference. How is ammeter connected in an electric circuit ?

(ii) Explain the application of heating effect of electric current in an electric bulb and the fuse used in an electric circuit. (4Mark)

Ans :

(i) Electric potential difference between two points in an electric circuit is defined as the work done to move a unit charge from one point to the other.

An ammeter is always connected in series in a circuit through which the current is to be measured

(ii) A strong metal with high melting point like tungsten which gets very hot and emits light is used in an electric bulb.

If a current larger than the specified value flows through the circuit then the fuse melts and breaks the circuit.

OR

(i) State Ohm's law

(ii) Explain the factors on which the resistance of a conductor depend.

Ans :

(i) *Ohm's law* : The potential difference V , across the ends of a given metallic wire in an electric circuit is directly proportional to the current flowing through it, provided its temperature remains the same.

(ii) The resistance of a conductor depends on the following factors :

- length of the conductor
- area of cross-section
- nature of the material
- temperature.

Resistance is directly proportional to length of the conductor.

Resistance is inversely proportional to the area of cross-section.

April 2020

1. What is the SI unit of potential difference ? Name the device used to measure the potential difference. (1Marks)

Ans. :

- Volt
- Volt meter

2. The resistivity of manganese wire of length 1 m is $1.84 \times 10^{-6} \Omega \text{ m}$ at 20°C . If the diameter of the wire is $3 \times 10^{-4} \text{ m}$, what will be the resistance of the wire at that temperature ? (2Marks)

Ans. :

Resistivity $\rho = 1.84 \times 10^{-6} \Omega \text{ m}$ Length $l = 1 \text{ m}$

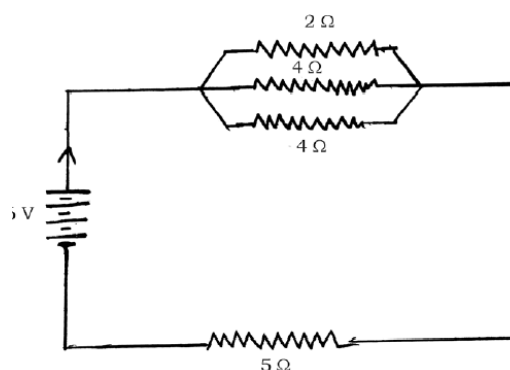
Diameter $d = 3 \times 10^{-4} \text{ m}$

$$\begin{aligned}\text{Area of cross-section } A &= \frac{\pi d^2}{4} \\ &= \frac{3.142 \times 3 \times 10^{-4} \times 3 \times 10^{-4}}{4} = \frac{28.2 \times 10^{-8}}{4} \\ &= 7.06 \times 10^{-8}\end{aligned}$$

$$\begin{aligned}\text{Resistance } R &= \frac{\rho l}{A} \\ &= \frac{1.84 \times 10^{-6} \times 1}{7.06 \times 10^{-8}} = 0.2606 \times 10^2 \\ &= 26.06 \Omega\end{aligned}$$

OR

Observe the given circuit :



Calculate the total resistance in the circuit and the total current flowing in the circuit.

Ans :

$$\text{In parallel connection, } \frac{1}{R_p} = \frac{1}{2} + \frac{1}{4} + \frac{1}{4}$$

$$\frac{1}{R_p} = \frac{2 + 1 + 1}{4}$$

$$\frac{1}{R_p} = \frac{4}{4} = \frac{1}{1} \quad R_p = 1 \Omega$$

$$\text{Total resistance in the circuit } R = R_p + R_4 = 1 + 5 = 6 \Omega$$

Total current in the circuit

$$I = \frac{V}{R} \quad I = \frac{6}{6} \quad I = 1A$$

3. State Joule's law of heating. Explain the working of electric filament bulb. (3Marks)

Ans : **Joule's law of heating :**

The heat produced in a resistor is

i) directly proportional to the square of the current for a given resistance.

ii) directly proportional to the resistance for a given circuit.

iii) directly proportional to the time for which the current flows through the resistor.

Working of electric filament bulb :

- A strong metal with high melting point such as tungsten is used for making bulb filaments.
- Most of the power consumed by the filament appears as heat, but a small part of it is in the form of light radiated.

OR

State Ohm's law. How ammeter and voltmeter should be connected in electric circuit ? What is the use of these instruments, in the circuit ?

Ans :

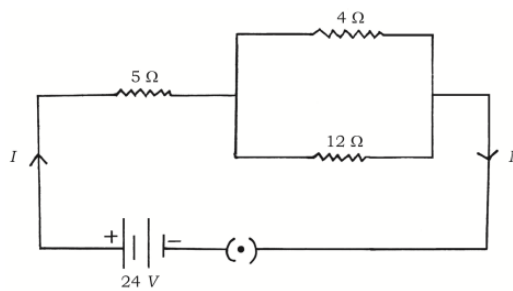
Ohm's law : The potential difference V across the ends of a given metallic wire in an electric circuit is directly proportional to the current flowing through it at constant temperature.

- Ammeter should be connected in series.
- Voltmeter should be connected in parallel in the circuit.
- Ammeter is used to measure current.
- Voltmeter is used to measure potential difference.

September 2020

1. Observe the given circuit diagram.

(2Marks)



Calculate the total resistance and the total current flowing through the circuit.

Ans :

Here, $R_1 = 5\ \Omega$, $R_2 = 4\ \Omega$, $R_3 = 12\ \Omega$, $V = 24V$

- Total resistance of a circuit :
$$R_T = R_1 + \left[\frac{1}{R_2} + \frac{1}{R_3} \right]$$

$$R_T = 5 + \left[\frac{1}{4} + \frac{1}{12} \right] \quad , \quad R_T = 5 + \left[\frac{3+1}{12} \right]$$

$$R_T = 5 + \left[\frac{4}{12} \right] \quad , \quad R_T = 5 + \left[\frac{1}{3} \right] \quad , \quad R_T = 5 + 3 = 8\ \Omega$$

- Total current in the circuit

$$I = \frac{V}{R} \quad I = \frac{24}{8} \quad I = 3A$$

2. What is the meaning of the statement “The potential difference between two points is 1 V” ? Name the device used to measure potential difference. What is resistance of a conductor ? What is electric power ? Write three formulae used to find it. (5Marks)

Ans :

- If 1 Joule (1J) of work is done to move a charge of 1 Coulomb (1 C) from one point to another point in a current carrying conductor, the potential difference between the two points is 1 volt .
- The device used to measure it is voltmeter.
- The property of a conductor to restrain or to retard the motion of electric charges flowing through it is called resistance of a conductor.
- The rate at which electric energy is dissipated or consumed in an electric circuit is called electric power.
- Three formulae used to find electric power are

MOST LIKELY QUESTIONS FOR 2021(Including previous year questions)

1. What is an electric current ? Define the unit of current.

Ans :

The rate of flow of electric charges is called electric current

Its SI unit is Ampere (A)

The flow of one coulomb of charge per second, that is, 1 A

2. Why are coils of electric toasters and electric irons made of an alloy rather than a pure metal?

Ans :

- (i) the resistivity of an alloy is much higher than that of a pure metal,
- (ii) an alloy does not undergo oxidation (or burn) easily even at high temperature, when it is red hot.

3. Will current flow more easily through a thick wire or a thin wire of the same material, when connected to the same source ? Why ?

Ans:

The current will flow more easily through a thick wire than a thin wire of the same material.

The area of cross-section of a conductor, is inversely proportional to resistance

Therefore, thick wire has least resistance, so current will flow more easily

4. Use the data in table to answer the following :

Metal	Resistivity ($\Omega \text{ m}$)
Iron	10.0×10^{-8}
Mercury	94.0×10^{-8}
Silver	1.60×10^{-8}
Copper	1.62×10^{-8}

(i) Which among iron and mercury is a better conductor ?

(ii) Which material is the best conductor ?

Ans:

(i) Iron is a better conductor because it has lower resistivity than mercury.

(ii) Silver has the lowest resistivity ($= 1.60 \times 10^{-8} \Omega \text{ m}$), therefore silver is the best conductor.

5. How can three resistors of resistances 2Ω , 3Ω , and 6Ω be connected to give a total resistance of

(a) 4Ω ,

(b) 1Ω ?

Ans :

$$\text{Let } R_1 = 2\Omega, R_2 = 3\Omega, R_3 = 6\Omega.$$

(i) We can get a total resistance of 4Ω by connecting the 2Ω resistance in series with the parallel combination of 3Ω and 6Ω .

$$\text{Total resistance } R = R_1 + \frac{R_2 R_3}{R_2 + R_1}$$

$$R = 2 + \frac{3 \times 6}{3 + 6}$$

$$R = 4\Omega$$

(ii) We can obtain a total resistance of 1Ω by connecting all resistors in parallel.

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{2} + \frac{1}{3} + \frac{1}{6}$$

$$\frac{1}{R} = \frac{3 + 2 + 1}{6} = \frac{6}{6}$$

$$R = 1\Omega$$

6. What is (i) the highest, (ii) the lowest total resistance that can be secured by combinations of four coils of resistance 4Ω , 8Ω , 12Ω , 24Ω ?

Ans :

(i) Highest resistance can be obtained by connecting the four coils in series.

$$\text{Then, } R = 4\Omega + 8\Omega + 12\Omega + 24\Omega = 48\Omega$$

(ii) Lowest resistance can be obtained by connecting the four coils in parallel.

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} = \frac{1}{4} + \frac{1}{8} + \frac{1}{12} + \frac{1}{24} = \frac{6 + 3 + 2 + 1}{24} = \frac{12}{24} = \frac{1}{2}$$

$$R = 2 \Omega$$

7. When a 12 V battery is connected across an unknown resistor, there is a current of 2.5 mA in the circuit. Find the value of the resistance of the resistor.

Ans:

Here, $V = 12 \text{ V}$ and $I = 2.5 \text{ mA} = 2.5 \times 10^{-3} \text{ A}$

$$\therefore \text{Resistance, } R = \frac{V}{I} = \frac{12}{2.5 \times 10^{-3}} = 4.8 \times 10^3$$

$$R = 4800 \Omega$$

8. How many 176 Ω resistors (in parallel) are required to carry 5 A on a 220 V line?

Ans : Suppose 'n' resistors of 176 Ω are connected in parallel.

$$\frac{1}{R} = \frac{n}{176} \quad \text{OR} \quad R = \frac{176}{n}$$

According to Ohm's law $R = \frac{V}{I}$

$$\frac{176}{n} = \frac{220}{5}$$

$$n = \frac{176 \times 5}{220} = 4$$

Thus 4 resistors are needed to be connect.

9. An electric iron of resistance 20 Ω takes a current of 5 A. Calculate the heat developed in 30 s.

Ans:

Here, $R = 20 \Omega$, $i = 5 \text{ A}$, $t = 30\text{s}$

Heat developed, $H = I^2 R t$

$$= 5^2 \times 20 \times 30 = 25 \times 20 \times 30$$

$$= 15,000 \text{ J}$$

$$= 1.5 \times 10^4 \text{ J}$$

10. Let the resistance of an electrical component remains constant while the potential difference across the two ends of the component decreases to half of its former value. What change will occur in the current through it?

Ans:

We know that $V = IR$

$$\text{When Potential difference halved } \frac{V}{2} = IR \quad I = \frac{V}{2R} = \frac{1}{2} \times I \quad (\text{because } I = \frac{V}{R})$$

Hence, the current through an electrical component also becomes half of its previous value.

11. An electric motor takes 5 A from a 220 V line. Determine the power of the motor and the energy consumed in 2 h.

Ans:

Given $I = 5 \text{ A}$, $V = 220 \text{ V}$, $t = 2 \text{ h}$

$$\begin{aligned}\text{Power, } P &= VI = 220 \times 5 \\ &= 1100 \text{ W}\end{aligned}$$

$$\begin{aligned}\text{Energy consumed} &= P \times t \\ &= 1100 \times 2 = 2200 \text{ Wh}\end{aligned}$$

12. A piece of metallic wire has resistance 6Ω . If this wire is cut in to three equal parts, then what would be the total resistance when they are connected (i) in series and (ii) in parallel

Ans : When wire cut in to three equal parts the resistance of each piece will be $\frac{6\Omega}{3} = 2 \Omega$,

(i) If they are connected in series

$$\begin{aligned}\text{Total resistance } R_s &= R_1 + R_2 + R_3 \\ R_s &= 2 \Omega + 2 \Omega + 2 \Omega = 6 \Omega\end{aligned}$$

(ii) If they are connected in parallel

$$\begin{aligned}\text{Total resistance} \quad \frac{1}{R} &= \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{2} + \frac{1}{2} + \frac{1}{2} \\ \frac{1}{R} &= \frac{3}{2} \\ R &= \frac{2}{3} \\ \mathbf{R} &= \mathbf{0.66 \Omega}\end{aligned}$$

CHAPTER 13

Magnetic Effects of Electric Current



Previous questions from SSLC Board

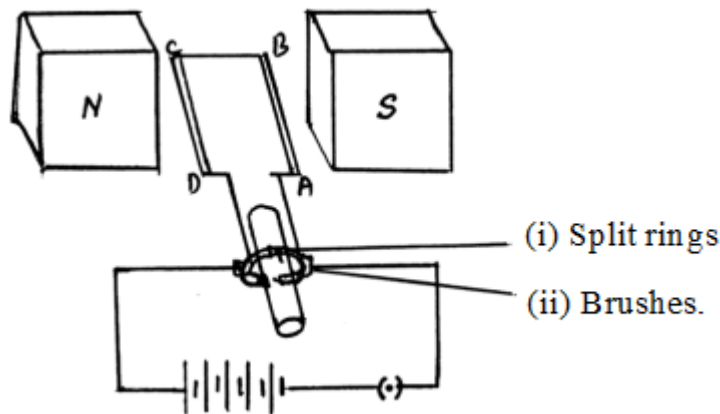
April 2019

1. Draw the diagram of a simple electric motor. Label the following parts : (2Marks)

(i) Split rings

(ii) Brushes.

Ans. :



2. (i) How does overload and short-circuit occur in an electric circuit ? Explain. What is the function of fuse during this situation ?

(ii) Mention two properties of magnetic field lines.

(3Marks)

Ans : (i)

- Overloading can occur when the live wire and the neutral wire come into direct contact.
- This occurs when the insulation of wires is damaged or there is a fault in the appliance or When many electrical appliances are connected to one circuit simultaneously.
- In such a situation, the current in the circuit abruptly increases and short circuit occurs.
- The joule heating that takes place in the fuse melts it to break the electric circuit, and prevents the electric appliances from possible damage

(ii) *Properties of magnetic field lines :*

- No two field lines are found to cross each other.
- The density of the magnetic field lines are more in their poles.
- The magnetic field lines emerge from north pole and merge at south pole.
- Inside the magnet, the direction of field lines is from its south pole to its north pole.
- Thus the magnetic field lines are closed curves. (any two)

June 2019

1. The names of devices are given in **Column-A** and corresponding functions are given in **Column-B**. Match them and write the answer along with its letters : (4Marks)

Column - A

- (A) Commutator
- (B) Fuse
- (C) Galvanometer
- (D) Electric generator

Column - B

- (i) detects the presence of electric current in a circuit
- (ii) converts mechanical energy into electrical energy
- (iii) measures the potential difference
- (iv) shows the direction of the motion of the conductor
- (v) protects the electrical appliances
- (vi) reverses the direction of current
- (vii) converts electrical energy into mechanical energy

Ans. :

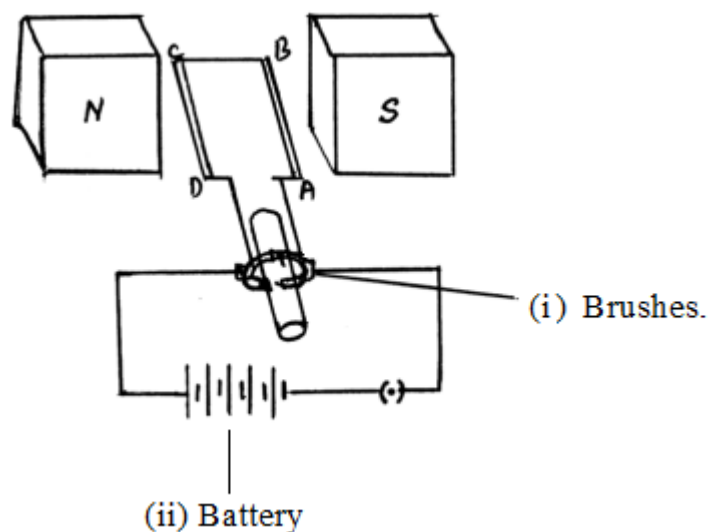
- (A) — (vi) reverses the direction of current
- (B) — (v) protects the electrical appliances
- (C) — (i) detects the presence of electric current in a circuit
- (D) — (ii) converts mechanical energy into electrical energy

(There is no Match the following type question in present question paper pattern)

2. Draw the diagram of a simple electric motor. Label the following parts : (2Marks)

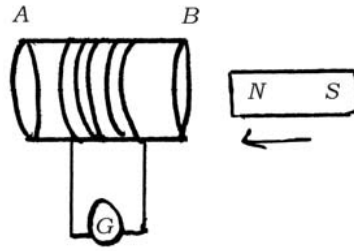
- (i) Brushes
- (ii) Battery.

Ans :



April 2020

1. Observe the given figure.
(1Mark)



What type of current is induced in the coil by doing the experiment related to this figure ? Give reason for your answer.

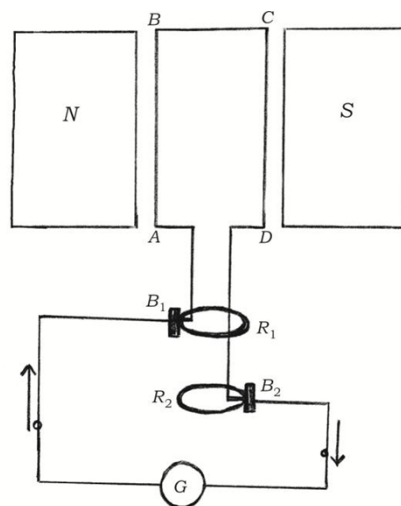
Ans. :

- Alternating current
- Because , galvanometer deflections are in opposite directions

2. Draw the diagram of a simple electric generator. Label the following parts : (2Marks)

- i) Brushes
ii) Rings.

Ans:



B_1, B_2 — brushes , R_1, R_2 — rings

3. How do you trace the magnetic field lines around a bar magnet using compass needle ? Explain. Write the properties of magnetic field lines. (3Marks)

Ans. :

- Take a small compass and a bar magnet. Place a magnet on a sheet of white paper fixed on a drawing board.
- Place the compass near the north pole of the magnet mark the position of two ends of the needle.
- Now move the needle to a new position such that the south pole occupies the position previously occupied by its north pole.
- In this way proceed step by step till we reach the south pole of the magnet. Join the points marked on the paper by a smooth curve. This represents field line.
- Repeating above procedure we can draw as many lines as possible.

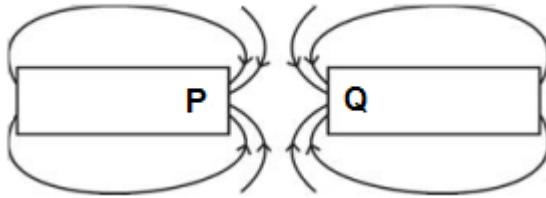
Properties of magnetic field lines :

- Field lines emerge from north pole and merge at the south pole.
- At the poles field lines are crowded.
- No two field lines intersect each other.

September 2020

1.

Observe the diagram.
(1Mark)



The magnetic poles represented by P and Q respectively are

(A) south (S) and south (S)

(B) north (N) and south (S)

(C) north (N) and north (N)

(D) south (S) and north (N).

Ans. :

(A) south (S) and south (S)

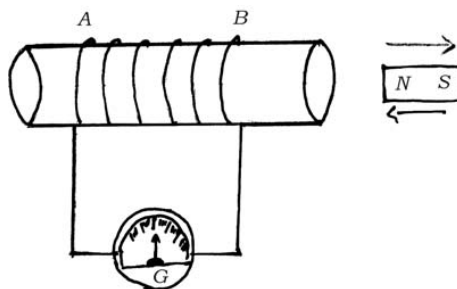
2. Suggest any two measures to avoid overloading in domestic circuits.

(1Mark)

Ans. :

- Live and neutral wires should not come into direct contact.
- Too many appliances should not be connected to a single socket.

3. Observe the given diagram. Explain the experiment related to this diagram. What conclusions can be drawn from this experiment ?
(4Marks)



Ans. :

- The ends of the copper coil (AB) are connected to a galvanometer. The north pole of the bar magnet (NS) is moved inside the coil. The needle of the galvanometer shows momentary deflection in one direction.
- When the north pole of the magnet is withdrawn from the coil, the needle of the galvanometer is deflected in the opposite direction.
- When the magnet is held stationary inside the coil, the deflection of the galvanometer is zero.
- When the magnet is moved inside the coil with greater force, the galvanometer shows greater deflection and when the magnet is moved with smaller force, the galvanometer shows smaller deflection.

Conclusions that can be drawn from this experiment :

- Motion of the magnet with respect to the coil produces an induced electric current in the circuit.
- The direction of the induced current depends on the direction of the movement of the magnet inside the coil.
- The amount of induced current is directly proportional to the force with which the magnet is moved into or withdrawn from the coil.

MOST LIKELY QUESTIONS FOR 2021(Including previous year questions)

1. Why two magnetic field lines do not intersect each other?

Ans :

At the point of intersection needle has to show two direction , which is not possible practically.

2. State Fleming's left hand rule.

Answer:

Fleming's left hand rule : Stretch the first finger, the middle finger and the thumb of your left hand mutually perpendicular to each other in such a way that the index finger represents the direction of the magnetic field, the middle finger represents the direction of the current in the conductor, then the thumb will represent the direction of motion of the conductor.

3. What is the role of the split ring in an electric motor ?

Answer:

- The split ring reverses the direction of current in the armature coil after every half rotation,
- This allow the armature coil to rotate continuously in the same direction.

4. Explain different ways to induce current in a coil.

Answer:

Different ways to induce current in a coil are :

1. moving a magnet towards or away from the coil or vice-versa, and
2. changing current in the neighbouring coil.

5. Name two safety measures commonly used in electric circuits and appliances.

Answer:

- (i) Earthing (ii) Electric fuse.

6. What precautions should be taken to avoid the overloading of domestic electric circuits ?

Ans :

- (i) The wires used in the circuit must be coated with good insulating materials
- (ii) The circuit must be divided into different sections and a safety fuse must be used in each section.

(iii) High power appliances like air-conditioner, refrigerator, a water heater, etc. should not be used simultaneously.

7. An electric oven of 2 kW power rating is operated in a domestic electric circuit (220 V) that has a current rating of 5 A. What result do you expect ? Explain.

Answer:

The electric oven draws a current given by

$$I = \frac{P}{V} = \frac{2 \text{ kW}}{220 \text{ V}} = \frac{2000 \text{ W}}{220 \text{ V}} = \mathbf{9.09 \text{ A}}$$

Thus the electric oven draws current much more than the current rating 5 A. That is the circuit is overloaded. Due to excessive current, the fuse wire will blow and the circuit will break.

8. A coil of insulated copper wire is connected to a galvanometer. What will happen if a bar magnet is
(i) pushed into the coil (ii) withdrawn from inside the coil (iii) held stationary inside the coil

Ans:

(i) As a bar magnet is pushed into the coil, a momentary deflection is observed in the galvanometer indicating the production of a momentary current in the coil.

(ii) When the bar magnet is withdrawn from the coil, the deflection of galvanometer is in opposite direction showing the production of an opposite current.

(iii) When the bar magnet is held stationary inside the coil, there is no deflection in galvanometer indicating that no current is produced in the coil.

9. Two circular coils A and B are placed closed to each other. If the current in the coil A is changed, will some current be induced in the coil B ? Give reason.

Ans:

Yes, some current will be induced in the coil B.

When the current in coil A is changed, some current is induced in the coil B.

Due to change in current in coil A, the magnetic field lines linked with coil A and with coil B get changed.

This sets up induced current in coil B.

10. What is the function of an earth wire ? Why is it necessary to earth metallic appliances ?

Ans:

Earth wire is a safety measure that controls the sudden hike in electric potential (Voltage)

It ensures that if there is any current leakage in the metallic cover, the potential of the appliance becomes equal to that of the earth.

It is necessary to earth metallic appliances because, the person handling the appliance will not get an electric shock.

11. What is solenoid ? Can you compare it with magnet ? Justify your answer.

Ans :

A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called a solenoid.

A solenoid behaves like a magnet in the following ways.

- The magnetic field produced by a current carrying solenoid is very much similar to that of a bar magnet.
- Like a bar magnet, one end of the solenoid has N-polarity while the other end has S-polarity.

12. How are commercial motors different from simple electric motor.?

Ans :

The commercial motors use -

- (i) an electromagnet in place of permanent magnet
- (ii) large number of turns of the conducting wire in the current carrying coil
- (iii) a soft iron core on which the coil is wound.

The soft iron core, on which the coil is wound, plus the coils, is called an armature.

This enhances the power of the motor.

13. Explain the following with reference to the magnetic field around a straight conductor carrying current.

- (i) Tracing the pattern of magnetic field
- (ii) increasing the intensity of magnetic field
- (iii) Reversing the direction of electric current.

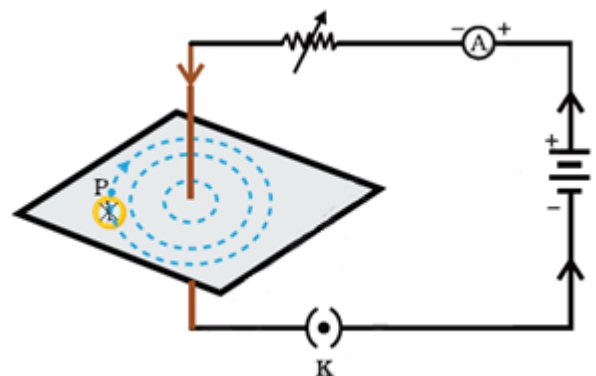
Ans :

- (i) Tracing the pattern of magnetic field

Set the instruments as shown in figure .

Place some iron filings on card board.

Then close the key so that current flows through the wire.



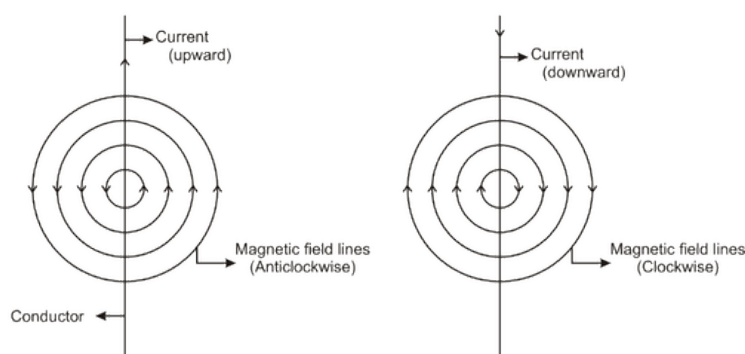
Gently tap the card board , then we will find that the iron filings align themselves showing a pattern of concentric circles around the wire

- (ii) increasing the intensity of magnetic field

If we change the intensity of current by using variable rheostat , the intensity of magnetic field also changes.

- (iii) Reversing the direction of electric current.

If the direction of current through the straight wire is reversed the direction of magnetic field lines also get reversed





CHAPTER 14

Sources of Energy



Previous questions from SSLC Board

April 2019

1. (i) Name the major constituent of biogas. Write the properties of biogas which make it a good fuel.

(ii) Name the two devices that work using heat energy of the sun. (3Marks)

Ans :

(i) The major constituent of biogas is - Methane / CH_4 .

Properties of biogas which make it a good fuel.-

- Leaves no residue like ash.
- It burns without smoke / ecofriendly.
- Its heating capacity is high.

(ii) Devices that work using heat energy of the sun

- Solar water heater
- Solar cooker.
- Solar furnace

OR

(i) Write the advantages of solar cells.

(ii) Write any two hazards of nuclear power generation.

Ans :

(i) The advantages of solar cells :

- They have no moving parts.
- Require little maintenance and work quite satisfactorily without the use of any focusing device
- They can be set up in remote and inaccessible hamlets or
- Very sparsely inhabited areas in which laying of a power transmission line may be expensive and not commercially viable.

(ii) Improper nuclear waste storage and disposal result in environmental contamination

There is a risk of accidental leakage of nuclear radiation.

June 2019

1. Which of the following is ecofriendly ? (1Mark)
- (A) Thermal power plant (B) Hydropower plant
(C) Biogas plant (D) Nuclear power station.

Ans. :

(C) — Biogas plant

2. List the characteristics of a good source of energy. (2Marks)

Ans. :

- (i) It would do a large amount of work per unit volume or mass.
- (ii) It should be easily available.
- (iii) It should be easy to store.
- (iv) It should be easy to transport.
- (v) It should be economical.

April 2020

1. The inner surface of solar cooker is coated with black paint to (1Mark)
- (A) absorb more heat (B) reflect light
(C) prevent rusting (D) converge the light rays.

Ans. :

(A) absorb more heat

2. The power plant in which natural source of energy is directly used to rotate turbines is (1Mark)

- (A) thermal power plant (B) hydro-electric power plant
(C) nuclear power plant (D) solar power plant.

Ans. :

(B) hydro electric power plant

3. “Biogas plant is a boon to farmers.” Why ? (1Mark)

Ans. :

- The slurry left behind is used as excellent manure, rich in nitrogen and phosphorous
- It provides a safe and efficient method of waste disposal besides supplying energy and manure.

September 2020

1. a) Explain how is nuclear energy generated in power reactors. How is electricity produced from nuclear energy ?

b) Mention two hazards of nuclear power reactor. (3Marks)

Ans :

- a)
- Nuclear fission reaction is carried out in nuclear power reactors. The nucleus of heavy atom (such as uranium, plutonium or thorium) when bombarded with low-energy neutrons, can be split apart into lighter nuclei.
 - When this is done, a tremendous amount of energy is released at a controlled rate.
 - The released energy is used to produce steam and further generate electricity.

b) *Hazards of nuclear power reactor :*

- Improper / unscientific storage and disposal of spent or used fuels.
- Accidental leakage of nuclear radiations.
- High cost of installation of nuclear power reactor.
- Limited availability of uranium.
- High risk of environmental contamination (Any two points)

OR

a) Explain why we are looking at the alternative sources of energy.

b) Mention the advantages and disadvantages associated with solar cells.

Ans :

a) The reasons for our looking at alternative sources of energy are ;

- The conventional sources of energy like fossil fuels are in danger of getting exhausted soon.
- Unlimited use of conventional sources of energy has led to the problem of energy crisis
- Uncontrolled use of conventional sources of energy has created many problems of environmental pollution.

b) *Advantages associated with solar cells :*

- They have no moving parts
- They require little maintenance
- They can be set up in remote and inaccessible hamlets

Disadvantages associated with solar cells :

- Availability of special grade silicon for making solar cells is limited.
- The process of manufacture of solar cells is very expensive.
- Their efficiency is low.

MOST LIKELY QUESTIONS FOR 2021(Including previous year questions)

1. Energy from various sources is considered to have been derived from the sun. Do you agree? Justify your answer.

Ans : Yes, sun is the ultimate source of energy. Directly or indirectly, all the forms of energy are derived from solar energy.

(i) Clouds are formed when water in lakes, rivers, seas etc. evaporates due to solar energy. They bring rainfall. This flowing water can be used for getting hydroelectricity.

(ii) Wind energy arises due to uneven heating of the earth's surface by the sun. Due to this, wind possesses kinetic energy.

(iii) Plants in the process of photosynthesis convert the solar energy into food (chemical energy). This food is consumed by animals. Thus, the animal wastes and remains of the plants constitute biomass which can be utilised as a source of energy.

2. There is a need to harness non-conventional sources of energy. Give two main reasons.

Ans.: There is a need to harness non-conventional sources of energy because:

- (i) Our demand for energy is increasing to improve quality of life and growth of population.
- (ii) fossil fuels are limited sources and are depleting fast.
- (iii) burning of fossil fuels causes a lot of pollution.

3. What are the limitations in obtaining energy from wind?

Ans :

- Solar energy is not available in night or when the sun is hidden under clouds.
- The domestic use of solar cells for production of electricity is not possible due to high cost.

4. What are the limitations in obtaining energy from wind ?

Ans :

- Wind energy is available only when air is in motion.
- The minimum speed of wind to operate generator to produce electricity is about 15 km/h. As soon as the speed of the wind becomes less than 15 km/h, the generator stops working.
- Wind energy is limited to certain places where wind is in plenty and blows most of the time.
- Machines used to produce wind energy are very costly.
- Wind mills are usually broken during storms and hence a lot of money is spent for the maintenance of a wind energy form.

5. Can any source of energy be pollution-free? Why or why not?

Ans :

- Some energy sources like wind energy, solar energy are pollution free.
- Some energy sources like fossil fuels, biomass cause pollution.

6. What is the role of a plane mirror and a glass sheet in a solar cooker ?

Ans :

- Plane mirror reflects the sunlight inside the solar cooker
- A solar cooker covered by a plane glass slab will be more efficient. This is because glass slab does not allow the heat radiation to escape from the solar cooker and hence the temperature of the solar cooker covered with glass slab increases more than the temperature of the solar cooker which is left open.

7. What steps would you suggest to minimise environmental pollution caused by burning of fossile fuel ?

Ans :

- By using public transport instead of private vehicles
- Growing more and more trees,
- Using smokeless chulahs and
- Using smokeless chimneys in thermal power plants.