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15CHE12

First Semester B.E. Degree Examination, Dec.2015/Jan.2016

Engineering Chemistry

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.**Module-1**

- 1 a. Derive Nernst equation for single electrode potential. (05 Marks)
 b. What is electrolyte concentration cell? The emf of the cell $\text{Cu}/\text{CuSO}_4(0.001\text{M})||\text{CuSO}_4(X\text{M})/\text{Cu}$ is 0.0595V at 25°C. Find the value of X. (05 Marks)
 c. Explain the following battery characteristics :
 i) Cell potential
 ii) Capacity
 iii) Shelf life. (06 Marks)

OR

- 2 a. Define reference electrode. Discuss the construction and working of calomel electrode. (05 Marks)
 b. Describe the construction and working of Ni-MH battery. Mention its applications. (05 Marks)
 c. What is fuel cell? Distinguish between conventional cell and fuel cell. (06 Marks)

Module-2

- 3 a. Define corrosion. Explain the electro-chemical theory of corrosion by taking iron as an example. (06 Marks)
 b. Explain the following factors affecting corrosion. (05 Marks)
 i) Ratio of anodic to cathodic areas
 ii) Nature of corrosion product
 iii) Temperature.
 c. Describe electroplating of nickel using Watt's bath. Mention its applications. (05 Marks)

OR

- 4 a. Explain differential aeration corrosion with one example. (05 Marks)
 b. What is metal finishing? Mention the technological importance of metal finishing. (06 Marks)
 c. Define electroless plating. Distinguish between electroplating and electroless plating. (05 Marks)

Module-3

- 5 a. Explain the determination of calorific value of a solid fuel using bomb calorimeter. (06 Marks)
 b. What is reforming of petroleum? Give any three reactions involved in reforming. (05 Marks)
 c. What is photovoltaic cell? Explain the construction and working of photovoltaic cell. (05 Marks)

OR

- 6 a. 0.75g of coal sample (carbon-90%), hydrogen-6% and ash 4%) was subjected to combustion in a bomb calorimeter. Mass of water taken in the calorimeter was 3500g and the water equivalent of the calorimeter was 750g. The rise in temperature was found to be 3.2°C. Calculate the gross and net calorific values of a sample (Specific heat of water = 4.187kJ/Kg/°C ; Latent heat of steam = 2454kJ/Kg) (05 Marks)
- b. Explain the modules, panels and arrays of PV cells. (06 Marks)
- c. Explain the production of solar grade silicon by Union – Carbide process. (05 Marks)

Module-4

- 7 a. Explain the types of polymerization with example. (04 Marks)
- b. What is glass transition temperature? Discuss any two factors affecting the glass transition temperature. (06 Marks)
- c. Explain the synthesis and applications of the following ;
- Plexi glass
 - Polycarbonate
- (06 Marks)

OR

- 8 a. In a polymer sample, 20% of molecules have molecular mass 15000g/mol, 45% molecules have molecular mass 25000g/mol remaining molecules have molecular mass 27000g/mol, calculate the number average, weight average molecular mass of the polymer. (06 Marks)
- b. Explain the synthesis, properties and applications of silicone rubber. (05 Marks)
- c. Explain the mechanism of conduction in polyaniline (05 Marks)

Module-5

- 9 a. Explain the scale and sludge formation in boiler. (05 Marks)
- b. Define COD. Discuss the experimental determination of COD of waste water. (06 Marks)
- c. Write a note on fullerenes. (05 Marks)

OR

- 10 a. Explain desalination of sea water by ion selective electrodialysis process. (05 Marks)
- b. Explain the synthesis of nano materials by Sol-Gel process. Mention its advantages. (06 Marks)
- c. Write a note on carbon nano tubes. (05 Marks)
