CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ **15CHE12/22**

First/Second Semester B.E. Degree Examination, June/July 2019
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. What is single electrode potential? Derive the Nernst equation for single electrode potential. **(06 Marks)**

   b. Define Electrolyte Concentration Cell. Two copper electrodes placed in $CuSO_4$ solutions of equal concentration are connected to form a concentration cell :
   i) What is the Cell Voltage?
   ii) If one of the solutions is diluted until the concentration of Cu^{2+} ions is $1/5^{th}$ of its original value, what will be the cell voltage after dilution? **(05 Marks)**

   c. Describe the construction, reactions and applications of Nickel metalhydride battery. **(05 Marks)**

OR

2 a. Describe the following battery characteristics :
   i) Voltage   ii) Capacity   iii) Cycle life. **(06 Marks)**

   b. Explain the construction and working of Calomel electrode. **(05 Marks)**

   c. Describe the construction, electrode reactions and applications of Methanol – oxygen fuel cell. **(05 Marks)**

Module-2

3 a. Explain the effects of following variables on the nature of electro deposit :
   i) Current density   ii) Metal ion concentration   iii) Complexing agents. **(06 Marks)**

   b. Explain the Electrochemical theory of corrosion with iron as an example. **(05 Marks)**

   c. Describe the Cathodic protection by Sacrificial Anode Method. **(05 Marks)**

OR

4 a. Describe the effects of following factors on the rate of corrosion :
   i) Nature of metal   ii) Nature of corrosion products   iii) Difference in potential between anodic and cathodic regions. **(06 Marks)**

   b. Define Electroless plating. Explain the Electroless plating of copper. **(05 Marks)**

   c. Describe Electro deposition of Hard Chromium. **(05 Marks)**

Module-3

5 a. Explain how calorific value of a solid fuel is determined using Bomb Calorimeter. **(06 Marks)**

   b. Explain the purification of silicon by zone refining process. **(05 Marks)**

   c. A 0.85g of coal sample (carbon 90%, H_2 5% and ash 5%) was subjected to combustion in a bomb calorimeter. Mass of water taken in the calorimeter was 2000g and the water equivalent of calorimeter was 600g. The rise in temperature was 3.5^0C. Calculate the gross and net calorific value of the sample. Given, specific heat of water = 4.187 $kJ/kg/^0C$ and latent heat of steam 2454 kJ/kg. **(05 Marks)**

OR

a. What is Photovoltaic cell? Explain the construction and working of PV cell. **(06 Marks)**

6 b. Describe Fluidized bed catalytic cracking. **(05 Marks)**

c. Explain the process of doping of silicon by diffusion technique. **(05 Marks)**

Module-4

7 a. Mention the preparation and applications of Poly methyl Methacrylate (PMMA) and poly carbonate. **(06 Marks)**

b. Define Glass transition temperature. Explain the following factors influencing the T_g value.
i) Flexibility   ii) Intermolecular forces. **(05 Marks)**

c. Explain the free radical mechanism of addition polymerization by taking vinyl chloride as an example. **(05 Marks)**

OR

8 a. What is Conducting polymer? Explain the synthesis of conducting polyaniline. **(06 Marks)**

b. Define Adhesive. Explain the preparation and applications of Epoxy resin. **(05 Marks)**

c. A polymer has following composition , 100 molecules of molecular mass 1000g/mol, 200 molecules of molecular mass 2000g/mol and 500 molecules of molecular mass 5000g/mol. Calculate the number and weight average molecular weight. **(05 Marks)**

Module-5

9 a. Explain Winkler's method of determining dissolved oxygen. Give the reactions involved. **(06 Marks)**

b. Define COD. $25cm^3$ of an industrial effluent requires $12.5cm^3$ $0.5N$ $K_2Cr_2O_7$ for the complete oxidation. Calculate COD of the sample. Assuming that the effluent contains only oxalic acid. Calculate the amount of oxalic acid present in 1 dm^3 (Eq.wt of oxalic acid = 45). **(05 Marks)**

c. Write a note on Dendrimer. **(05 Marks)**

OR

10 a. Explain the Synthesis of nano materials by Chemical vapour condensation and precipate methods. **(06 Marks)**

b. Write a note on Carbon nanotubes. **(05 Marks)**

c. Explain the desalination of water by electro – dialysis. **(05 Marks)**

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