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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 CuSO4 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 115^{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 °C. Calculate the gross and net calorific value of the sample. Given, specific heat of water = 4.187 kJ/kg/ °C and latent heat of steam 2454 kl/kg. **(05 Marks)**

OR

6 a. What is Photovoltaic cell? Explain the construction and working of PV cell. **(06 Marks)**
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 polyanilinc. **(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)**
h. Define COD. 25cm^3 of an industrial effluent requires 12.5cm^3 0.5N K2Cr207 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)**
h. Write a note on Carbon nanotubes. **(05 Marks)**
c. Explain the desalination of water by electro — dialysis. **(05 Marks)**