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14CHE12

First Semester B.E. Degree Examination, Dec.2014/Jan.2015
Engineering Chemistry

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast ONE question from each part.***

PART – 1

1 a. Derive Nernst's equation for single electrode potential. **(05 Marks)**

b. Describe the construction and working of calomel electrode. **(05 Marks)**

c. What are batteries? Explain the following battery characteristics :
i) Capacity ii) Cycle life. **(05 Marks)**

d. Describe the construction and working of nickel metal hydride battery. **(05 Marks)**

2 a. What are Reference electrodes? Explain the determination of electrode potential of an unknown electrode using calomel electrode. **(05 Marks)**

b. What are concentration cells? The emf of the cell Ag | $AgNO_3$ (0.0083M) || $AgNO_3$ (x M) | Ag was found to be 0.074V at 298K. Calculate the value of x and write cell reaction. **(05 Marks)**

c. Define fuel cell. Explain the construction and working of methanol oxygen fuel cell. **(05 Marks)**

d. Explain the construction and working of lithium ion battery. **(05 Marks)**

PART – 2

3 a. Explain the electrochemical theory of corrosion by taking iron as an example. **(05 Marks)**

b. What is Corrosion? Explain the following factors affecting the rate of corrosion :
i) Nature of corrosion product ii) Anodic and Cathodic areas . **(05 Marks)**

c. What is Electro less plating? Write the difference between electroplating and electroless plating. **(05 Marks)**

d. Discuss the electroplating of gold using Acidic Cyanide bath. **(05 Marks)**

4 a. What is Anodising? Explain the anodizing of aluminium. **(05 Marks)**

b. What is Cathodic protection? Explain sacrificial anodic method and impressed current method. **(05 Marks)**

c. Explain the effect of any two factors on the nature of electro deposit. **(05 Marks)**

d. Explain the process of electroless plating of copper with relevant reactions. **(05 Marks)**

PART – 3

5 a. What is Cracking? Explain the fluidized catalytic cracking process. **(05 Marks)**

b. On burning 0.76×10^{-3}kg of a solid fuel in a bomb calorimeter, the temperature of 2.5kg of water is increased from 25^0C to 28^0C. The water equivalent of calorimeter and latent heat of steam are 0.486kg and 2457 kJ/kg respectively. Calculate its GCV and NCV. Given Sp. Heat = 4.187 kJ / kg / ^{0}C and % of H_2 is 2.5. **(05 Marks)**

c. Discuss the production of solar grade silicon by Union – Carbide process. **(05 Marks)**

d. What are the advantages and disadvantages of PV – cells? **(05 Marks)**

6 a. Explain the determination of calorific value of a solid fuel using bomb calorimeter. **(05 Marks)**

b. Define the following terms :
i) Chemical fuel ii) Calorific value iii) Biodiesel iv) Octane number
v) Reforming of petrol. **(05 Marks)**

c. Discuss the construction and working of a PV – cell. **(05 Marks)**

d. What is doping? Discuss the purification of silicon of zone - refining. **(05 Marks)**

PART - 4

7 a. Explain the free radical mechanism of addition polymerization by taking Vinyl chloride as a monomer. **(05 Marks)**

b. What are adhesives? Explain the synthesis and applications of epoxy resin. **(05 Marks)**

c. Write the synthesis and applications of the following polymers :
i) Polymethyl methacrylate ii) Teflon. **(05 Marks)**

d. What are polymer composites? Explain the preparation and uses of Kevlar fiber. **(05 Marks)**

8 a. Calculate the number average and weight average molecular mass of a polymer with the following composition :

$\left(CH_2-\underset{C\ell}{\underset{|}{CH}}\right)_{200}$ is 40% ; $\left(CH_2-\underset{C\ell}{\underset{|}{CH}}\right)_{400}$ is 30 % ;

$\left(CH_2-\underset{C\ell}{\underset{|}{CH}}\right)_{500}$ is 30%. Given At. Wt. of C = 12 , Atomic weight of H = 1 ; and Atomic weight of $C\ell$ = 35.5. **(05 Marks)**

b. What is glass transition temperature? How is it affected by
i) Intermolecular forces ii) Flexibility. **(05 Marks)**

c. What is Conducting polymer? Explain the mechanism of conduction in polyaniline **(05 Marks)**

d. Give the synthesis and uses of the following polymers :
i) Silicon rubber ii) polycarbonates. **(05 Marks)**

PART - 5

9 a. What is boiler feed water? Explain the scale and sludge formation in boiler. Mention their ill effects. **(05 Marks)**

b. What is desalination? Explain the desalination of saline water by electro dialysis. **(05 Marks)**

c. What are nano materials? Explain the synthesis of nano material by Sol – gel method. **(05 Marks)**

d. Write a note on carbon nano tubes. **(05 Marks)**

10 a. Define COD. Calculate the COD of the effluent sample when $25cm^3$ of the effluent sample requires $8.5cm^3$ of 0.001 N $K_2Cr_2O_7$ solution for complete oxidation. **(05 Marks)**

b. Discuss in detail the softening of water by ion – exchange process. **(05 Marks)**

c. Explain the synthesis of nanomaterials by hydro thermal process. **(05 Marks)**

d. What are Fullerences? Explain the synthesis and uses of fullerenes. **(05 Marks)**

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