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14CHE12/22

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BANGALORE - 560 037

First/Second Semester B.E. Degree Examination, June/July 2018
Engineering Chemistry

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting ONE full question from each module.

Module – 1

- 1 a. Derive Nernst's equation for the electrode potential. (04 Marks)
 b. Describe the construction and working of Calomel electrode. (06 Marks)
 c. Explain construction and working of Zinc-air battery. (05 Marks)
 d. What is electrolyte concentration cell? Explain with an example. Calculate the emf of the following concentration cell at 25°C.
 $\text{Ag} | \text{AgNO}_3(0.05\text{M}) || \text{AgNO}_3(1\text{M}) | \text{Ag}$ (05 Marks)

OR

- 2 a. How do you determine the pH of a solution using glass electrode? (04 Marks)
 b. Discuss the construction and working of nickel-metal hydride battery. (05 Marks)
 c. Explain the construction and working of methanol oxygen fuel cell. (05 Marks)
 d. Discuss any three battery characteristics. (06 Marks)

Module – 2

- 3 a. Discuss the electro chemical theory of corrosion taking iron as an example. (04 Marks)
 b. Discuss the following factors affecting the rate of corrosion:
 (i) Nature of corrosion product.
 (ii) Ratio of anodic to cathodic ratio.
 (iii) Temperature. (06 Marks)
 c. What is electroless plating? Mention any four differences between the electroplating and electroless plating. (05 Marks)
 d. Discuss the electroplating of decorative chromium. Why chromium anodes are not used? Give reason. (05 Marks)

OR

- 4 a. Explain differential aeration corrosion with a suitable example. (06 Marks)
 b. Discuss the sacrificial anodic and impressed current protection methods. (04 Marks)
 c. Explain the electroless plating of copper and manufacture of double sided printed circuit board with copper. (06 Marks)
 d. Discuss any two factors influencing the nature of electrodeposits. (04 Marks)

Module – 3

- 5 a. Explain the determination of calorific value of a fuel using Bomb calorimeter with a neat diagram. (06 Marks)
 b. What is petroleum cracking? Explain the fluidised catalytic cracking process. (05 Marks)
 c. Discuss the construction and working of photovoltaic cell. (05 Marks)
 d. Discuss the purification of silicon by zone refining. (04 Marks)

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OR

- 6 a. Write a note on octane number and cetane number. (05 Marks)
b. What is reformation of petrol? Write the reactions involved in reformation. (05 Marks)
c. Define gross calorific value of a fuel. Calculate gross and net calorific value of coal sample from the following data obtained from Bomb calorimetric experiment:
Weight of coal sample = 0.75 g; % Hydrogen = 5 %;
Weight of water taken in calorimeter = 600 g;
Raise in temperature = 3.5°C, Specific heat of water = 4.187 KJ/kg/K;
Latent heat of condensation of water = 3457 KJ/kg. (06 Marks)
d. Explain the production of solar grade silicon by union carbide process. (04 Marks)

Module – 4

- 7 a. What are polymers? Explain the addition and condensation polymerization with a suitable example. (05 Marks)
b. Discuss the synthesis and applications of the following :
(i) Plexi glass (ii) Polyurethane (05 Marks)
c. What is glass transition temperature? Discuss any two factors influencing the T_g value. (05 Marks)
d. What are polymer composites? Write a brief note on Kevlar fibre. (05 Marks)

OR

- 8 a. Discuss the following structure-property relationship of polymers:
(i) Chemical resistivity
(ii) Plastic deformation
(iii) Crystallinity. (06 Marks)
b. A polymer sample contains 5 molecules having a molecular weight of 2000, 4 molecules having a molecular weight of 3000 and 3 molecules having a molecular weight of 4000. Calculate number average and weight average molecular weight. (04 Marks)
c. Write synthesis and application of silicone rubber and Teflon. (05 Marks)
d. Explain the free radical mechanism of polymerization taking vinyl chloride as monomer. (05 Marks)

Module – 5

- 9 a. Explain ion-exchange process of water softening. (06 Marks)
b. Write a note on boiler corrosion. (04 Marks)
c. Write a note on fullerenes and nanowires. (05 Marks)
d. Explain the synthesis of nanomaterials by gas condensation and precipitation methods. (05 Marks)

OR

- 10 a. Write a note on boiler scales and sludges. (05 Marks)
b. Explain the experimental determination of COD of waste water sample. (05 Marks)
c. Write a note on Carbon nanotubes and dendrimers. (05 Marks)
d. Explain the synthesis of nanomaterials by sol-gel method. (05 Marks)