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14CHE12/22

First/Second Semester B.E. Degree Examination, Dec.2015/Jan.2016
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. Explain redox and gas electrodes with example. **(05 Marks)**
   b. What are reference electrodes? Explain the construction and working of Ag-AgCℓ electrode. Mention any two applications. **(05 Marks)**
   c. Explain the following battery characteristics :
      i) Voltage   ii) Energy efficiency   iii) Shelf life. **(05 Marks)**
   d. Discuss the construction and working of Li-MnO$_2$ battery. **(05 Marks)**

2 a. Discuss the construction and working of Zinc – Air battery. **(05 Marks)**
   b. What are Fuel cells? Give the classification of fuel cells on the basis of temperature and electrolyte. **(05 Marks)**
   c. What are Electrode concentration cells? Give example. These spontaneous galvanic cell Tin | Tin ion(0.02m) || Tin ion (0.06m) | Tin develops an emf of 0.0141V at 298K. Calculate the valency of tin. **(05 Marks)**
   d. Explain the construction and working of glass electrode. **(05 Marks)**

MODULE – 2

3 a. Discuss the rusting of iron based on electro – chemical theory of corrosion. **(05 Marks)**
   b. How does the following factors affect the rate of corrosion?
      i) Nature of metal   ii) Anodic and Cathodic polarization. **(05 Marks)**
   c. Define Metal finishing. Mention any four technological importance of metal finishing. **(05 Marks)**
   d. Write a note on : i) Polarization and   ii) Overvoltage. **(05 Marks)**

4 a. Explain the influence of the following in electro deposition :
      i) Current density and   ii) pH. **(05 Marks)**
   b. Discuss the electroplating of chromium with reactions. **(05 Marks)**
   c. What is Stress Corrosion? Explain caustic embrittlement in boilers. **(05 Marks)**
   d. What is Metallic coating? Explain the process of galvanization. **(05 Marks)**

MODULE – 3

5 a. 0.7g of chemical fuel containing 5% hydrogen, when burnt in a bomb calorimeter raises the temperature of water from 291K to 295K. The weight of water is 1.3kg and water equivalent of calorimeter is 0.35kg. The specific heat of water is 4.187kJ kg^{-1} k^{-1}. The latent of steam is 2454kJ/kg. Calculate GCV and NCV of fuel. **(05 Marks)**
   b. Explain the terms 'Octane' and 'Cetane' numbers. **(05 Marks)**
   c. Discuss the diffusion technique for p- and n- doping of silicon. **(05 Marks)**
   d. Explain the design of solar module, panel and arrays. **(05 Marks)**

6 a. Explain the construction and working of Photovoltaic cell. **(05 Marks)**
b. Describe the physical and chemical properties of silicon relevant to photovoltaics. **(05 Marks)**
c. What is reforming of petrol? Mention any three reactions involved in reforming process. **(05 Marks)**
d. What is Knocking? Explain the mechanism of Knocking in IC engine. **(05 Marks)**

MODULE – 4

7 a. What is Polymerization? Describe addition and condensation polymerization with example. **(05 Marks)**
b. Explain three radical mechanism for addition polymerization taking Vinyle chloride as an example. **(05 Marks)**
c. Write the synthesis and applications of the following polymers :
i) polyurethane and ii) Polycarbonate. **(05 Marks)**
d. What are Polymer composites? Explain the synthesis of carbon fibre. **(05 Marks)**

8 a. What is Glass transition temperature? How is it influenced by
i) Molecular mass and ii) Stereo regularity. **(05 Marks)**
b. Discuss Structure – Property relationship of polymers with respect to
i) Elasticity and ii) Chemical resistivity. **(05 Marks)**
c. A polymer sample containing 50, 100 and 150 molecules having molar mass 1000, 2000 and 3000 respectively. Calculate the number average and weight average molecular mass of polymer. **(05 Marks)**
d. What are Adhesives? Give the synthesis and application of epoxy resin. **(05 Marks)**

MODULE – 5

9 a. Explain boiler corrosion due to oxygen, carbon dioxide and magnesium chloride with reactions. **(05 Marks)**
b. What is COD? Explain the estimation of COD of waste water. **(05 Marks)**
c. Write a note on nanowires and nanorods. **(05 Marks)**
d. What are Dendrimers? How are they prepared? **(05 Marks)**

10 a. What are Nanomaterials? Explain the size dependent properties of nanomaterials. **(05 Marks)**
b. Discuss the synthesis of nanomaterial by chemical vapour condensation method. **(05 Marks)**
c. 50 mℓ of sewage water sample was diluted to 500mℓ and equal volumes were taken in two BOD bottles. During blank titration 100mℓ of the sample required 9.8mℓ of 0.025N $Na_2S_2O_3$ solution. Another 100mℓ of incubated sample required 6.9mℓ of 0.025N $Na_2S_2O_3$ solution. Calculate BOD of sewage water sample. **(05 Marks)**
d. What is Desalination? Explain desalination of sea water by reverse osmosis with neat labeled diagram. **(05 Marks)**

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