2002 SCHEME

USN | | | | | | | | | | |

CHE12/22

First/Second Semester B.E. Degree Examination, December 2011
Engineering Chemistry

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Define liquid crystal. Explain thermotropic and lyotropic liquid crystals. **(06 Marks)**

b. Explain the molecular ordering in the following liquid crystal phases:
i) Smectic phase ii) Nematic phase iii) Cholesteric phase. **(06 Marks)**

c. How is ethanol manufactured by the fermentation of molasses? Explain. **(08 Marks)**

2 a. Explain the Bomb calorimetric method of determination of calorific value of a solid fuel. **(06 Marks)**

b. Calculate the gross and net calorific values of a coal sample, from the following data:
Weight of coal sample taken = 0.90 gm Weight if water in the calorimeter = 1250 kg
Water equivalent of calorimeter = 285 kg Rise in temperature of water = 4.9°C
Latent heat of steam = 2450 kJ/kg Specific heat of water = 4.187 kJ/kg/°C.
Percentage of hydrogen in coal = 4.5 **(06 Marks)**

c. Explain the following terms with suitable reactions :
i) Reforming ii) Knocking. **(08 Marks)**

3 a. Define single electrode potential. Derive the Nernst equation for electrode potential. **(06 Marks)**

b. A galvanic cell is formed by dipping a copper rod in 1 M $CuSO_4$ solution and a silver rod in 10 M Ag_2NO_3 solution. The standard electrode potentials of Cu and Ag are +0.34V and +0.80V respectively. Write cell representation, cell reactions and calculate the emf of the cell. **(06 Marks)**

c. Write brief notes on : i) Calomel electrode ii) Glass electrode. **(08 Marks)**

4 a. Explain the following characteristics of a battery:
i) Capacity ii) Power density iii) Cycle life. **(06 Marks)**

b. Explain the construction and working of a lead acid battery, with reactions. **(06 Marks)**

c. Write brief notes on:
i) Nickel-Metal hydride battery ii) Methanol-oxygen fuel cell. **(08 Marks)**

5 a. Discuss the sources, environmental effect and control of SO_2 pollution. **(06 Marks)**

b. Define the term BOD. Calculate the COD of an effluent sample when 25ml of this effluent sample required 17.3 ml of 0.025 M $K_2Cr_2O_7$ for the complete oxidation. **(06 Marks)**

c. Write brief notes on:
i) Ozone depletion ii) Global warming. **(08 Marks)**

6 a. What is meant by corrosion? Explain the rusting of iron, based on electrochemical theory. **(06 Marks)**

b. Explain how the following factors influence the corrosion rate:
i) Ratio of anodic to cathodic areas ii) pH. **(06 Marks)**

c. Write brief notes on:
i) Cathodic protection technique ii) Corrosion inhibitors. **(08 Marks)**

7 a. Explain the following terms:
i) Polarisation ii) Decomposition potential iii) Overpotential. **(06 Marks)**

b. Explain how the following factors affect the nature of electrodeposit:
i) Current density ii) Throwing power. **(06 Marks)**

c. What is electroplating? What are the advantages of electroless plating over electroplating? Explain the electroplating of chromium. **(08 Marks)**

8 a. Describe the technique of emulsion polymerization. **(06 Marks)**

b. Explain the manufacture and use of the following polymers:
i) Teflon ii) Plexiglass. **(06 Marks)**

c. Give the synthesis and applications of Butyl rubber and Epoxy resins. **(08 Marks)**

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