

Reg.NO



MANIPAL UNIVERSITY, MANIPAL  
DEPARTMENT OF CHEMISTRY, MIT, MANIPAL  
II SEMESTER B.E. MAKE UP EXAMINATION  
JULY 2010



SUBJECT: ENGINEERING CHEMISTRY (CHM 101/102)  
Revised Credit System

Time : 3 hr

Max.Marks: 50

Note : Answer any FIVE full questions. Draw neat and labelled diagram wherever necessary.

- 1.A. (i) What is corrosion? Explain the electrochemical theory of corrosion by taking an example.  
(ii) What are fuel cells? Explain the construction and working of methanol - oxygen fuel cell.
- B. (i) What is single electrode potential? Discuss the origin of single electrode potential.  
(ii) What are the advantages of electroless plating? Discuss the electroplating of chromium.
- C. Give reasons:  
(i) Thermoplastics undergo reversible deformation but thermosets do not.  
(ii) Impure metals corrode faster than pure metals under identical conditions.  
(4 + 4 + 2)
- 2.A. (i) What is cathodic protection? Explain the cathodic protection methods.  
(ii) What is knocking? Discuss the mechanism of knocking. Mention the limitations of knocking and its prevention methods.
- B. (i) Discuss the method of determining the G.C.V and N.C.V of a gaseous fuel.  
(ii) A galvanic cell consists of an iron electrode dipped in 1.0 M solution of  $\text{FeSO}_4$  and a manganese electrode dipped in 0.1 M solution of  $\text{MnSO}_4$ . Calculate the change in free energy of the cell at 298 K. Given that the standard reduction potential of iron and manganese electrode are  $-0.44 \text{ V}$  and  $-1.18 \text{ V}$  respectively.
- C. (i) Give reason: Lead acid battery fails to start a vehicle at a very low temperature.  
(ii) Explain the tacticity of polymers with PVC as an example.  
(4 + 4 + 2)
- 3.A. (i) Describe the construction and working of dry cell with reactions. What are the disadvantages of this battery?  
(ii) What is cracking of petroleum? Describe the fluidized catalytic cracking process.
- B. (i) What is a standard cell? Explain the potentiometric method of measurement of emf of a cell.  
(ii) Give the method of synthesis and properties of silicon rubber.  
(iii) Why is a slight warming effect observed in a stretched rubber band?
- C. Explain how the following factors affect the rate of corrosion.  
(i) Anodic and cathodic area (ii) Polarization  
(4 + 4 + 2)

- 4.A. (i) Describe the manufacture of producer gas and mention its two important uses.  
(ii) Discuss the effect of organic additives on the nature of electrodeposits.
- B. Distinguish the followings.  
(a) Galvanization and tinning process (b) Concentration and kinetic polarization  
(c) Bulk and solution polymerisation (d) Galvanic and electrochemical series
- C. What is vulcanization? Explain the process of vulcanization of rubber.  
( 4 + 4 + 2)
- 5.A. (i) What are concentration cells? Give an example. Deduce an expression to determine the emf of a concentration cell.  
(ii) Explain the following types of corrosion with examples.  
a) Galvanic corrosion b) Differential aeration corrosion
- B. (i) Explain addition and condensation polymerisation with examples. Give any four differences between them.  
(ii) How is the percentage of carbon and hydrogen determined in a solid fuel?
- C. Polymer molecules with different degree of polymerization such as 500, 750, 850 and 1100 are mixed in molecular ratio 1: 2: 3: 4 in a sample of high polymer of propene. Calculate the number average and weight average molecular weights.  
( 4 + 4 + 2)
- 6.A. Deduce the mathematical expressions for  $\Delta G$ ,  $\Delta H$  and  $\Delta S$  for a galvanic cell.
- B. (i) 2.0 g of a coal sample was used for nitrogen estimation by Kjeldahl method. The evolved ammonia was collected in 50 mL of 0.2 N sulphuric acid. To neutralize excess acid 22 mL of 0.1 N NaOH was required. Determine the percentage of nitrogen in the sample.  
(ii) Briefly explain the effect of structure of polymer on chemical resistance and tensile strength.
- C. Give reasons for the followings:  
(i) Electrolyte concentration is invariant in Nickel- Cadmium battery.  
(ii) Hydrogen electrode is not generally used in pH measurement.  
( 4 + 4 + 2)