MANIPAL UNIVERSITY
I SEMESTER B.E. END SEMESTER EXAMINATION
SUBJECT: ENGG. CHEMISTRY (CHM 101)

Time: 3 Hours   Date: 11-12-2009   Max .Marks :50

NOTE : Answer any FIVE full questions.

1.A   Account for the following:
   i)Salt bridge of KCl cannot be used for a cell made up of Ag and Pb half- cells.
   ii)A dry cell becomes dead after a long time, even if it has not been used.

1.B   What are ion selective electrodes? Give the construction of glass electrode. Derive an expression for electrode potential of glass electrode and explain the experimental method for the determination of pH using glass electrode.

1.C   i) Explain the mechanism of galvanic corrosion. How can it be controlled?
   ii)How is vulcanization of rubber carried out? How does it improve the property of natural rubber.

[2+ 4+4 = 10M]

2.A   Write a note on LPG.

2B.   i) Explain free radical addition polymerization mechanism of styrene.
   ii)Why can not Teflon be moulded by conventional methods
   iii) Thermal control is difficult in bulk polymerization.-Justify.

2C.   i)The emf of an electrochemical cell consists of iron electrode dipped in 0.1M $FeSO_4$ and silver electrode in $AgNO_{3(x)}$ is 1.1926V. Write the cell reaction and calculate the strength of $AgNO_3$. Given that the standard electrode potentials of iron and silver electrodes are –0.44V and +0.80V respectively.
   ii) Discuss the following factors influencing the rate of corrosion.
   a) Temperature   b) Nature of the electrolyte.

[2+ 4+4 = 10M]

3A.   i) Why nylon 6,6 exhibits higher Tg than that of polyethylene?
   ii) Why a polymer membrane is used at the cathode in methanol-oxygen fuel cell.

3B.   i) Discuss the effect of structure of polymer on the following properties.
        a) crystallinity   b) plastic deformation.
   ii)Explain the experimental determination of decomposition potential of an electrolyte.

3C.   i) Write two differences between the following:
   a) Addition and condensation polymer.
   b) E.m.f series and galvanic series.
   ii) Write the main reactions that occur during reforming of petroleum.

[2+ 4 +4 =10M]

4A. i)What is the principle of Boys' gas calorimeter used in the determination of calorific value of a gaseous fuel.

ii) The gross calorific value of a sample of bituminuous coal is 30,000 kJkg^{-1}.In an experiment, 0.8 g of this coal was burnt under 1.2 kg of water rose by 3.92^{o}C.Calculate the water equivalent of the calorimeter. Specific heat of water=4.2kJkg^{-1}/^{o}C.

4B i)With a neat diagram explain the manufacture of water gas. Mention any two of its applications.

ii) Explain with examples how cathodic inhibitors provide protection against corrosion.

4C. i) What is meant by critical micelle concentration (CMC) of a surfactant? Discuss the role of surfactants in an emulsion polymerization technique.

ii) Give reasons for the following:

a) Presence of ash and volatile matter is undesirable in coal.

b) Absolute electrode potentials cannot be measured.

[2+4+4 = 10M]

5A. Justify the following statements.

i) Lead acid batteries should not be overcharged.

ii) Concentration polarization can be eliminated.

5B. i) Give the construction and working of Nickel- Cadmium cell during discharging process. What are its advantages?

ii) Explain the construction, working and applications of a Calomel electrode.

5C. i)The emf of the cell: $Cd_{(s)}$/ $CdCl_{2(aq)}$ / $AgCl_{(aq)}$/Ag is 0.7653V at 298K and 0.6915V at 273K. Calculate ΔG, ΔH, and ΔS for the reaction at 298K.

ii) Explain the main objectives and uses of Chromium plating. Why Chromium plating has nickel undercoat?

[2 +4+4 =10M]

6A.   Describe the Pogendorff's method of determination of e.m.f of a cell.

6B. i) The emf of the following concentration cell is 0.101V. Find the concentration of anolyte. $Ag/Ag^{+}(x)$ // $Ag^{+}(0.5)$ / Ag.

ii)Discuss the preparation and any two properties of the following polymers.

a) Epoxy resin   b) Silicone rubber.   c) Nylon 6,6

6C. i) Write a note on reclaimed rubber.

ii)1.55 g of the coal sample in a quantitative analysis gave 0.1675 g of $BaSO_4$. Calulate the % of S in the coal sample.

iii)0.125 g of coal on combustion gave 0.3960 g of CO_2 and 0.0195 g of H_2O. Calculate the % of C and H in the coal sample.

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