MANIPAL UNIVERSITY
CHEMISTRY DEPARTMENT –M.I.T. MANIPAL.
I SEMESTER B.E. END SEMESTER EXAMINATION

SUBJECT: ENGG. CHEMISTRY (CHM 101)

Time: 3 hrs   Date: 20-11- 2009   Max. Marks: 50

NOTE: Answer any FIVE full questions.

1.A.   i) Explain the construction and working of methanol-oxygen fuel cell.
       ii) Define metallic corrosion. Explain the electrochemical theory of corrosion taking iron as an example.

1.B.   i) Discuss the method of determining the potential of a single electrode using hydrogen electrode.
       ii) Write any four advantages of electroless plating over electroplating.

1.C.   Give reasons:
       i) Teflon is an addition polymer but it behaves like thermosetting polymer.
       ii) Iron in contact with copper undergoes corrosion faster than the iron in contact with tin.

$$[4 + 4 + 2 = 10M]$$

2.A.   i) Describe the use of inhibitors in corrosion control.
       ii) Discuss the mechanism of free radical addition polymerisation with an example.

2.B.   i) Explain the fluidised catalytic cracking process. What are its merits?
       ii) Calculate $E^o_{Zn^{2+}/Zn}$, if the emf of Zn/Zn^{2+} (1M) // Ni^{2+} (1M) /Ni is 0.51V and Ni/Ni^{2+} (1M) // SCE is 0.49 V. Given E_{SCE} = 0.24 V.

2.C.   Give reasons:
       i) Water formed in the hydrogen-oxygen fuel cell should be continuously removed.
       ii) A secondary cell can operate both as an electrochemical cell and electrolytic cell.

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3.A.   i) Describe the construction and working of Dry cell with reactions.
       ii) Calculate the gross and net calorific value of a gaseous fuel at STP from the following data:
       Volume of gas burnt = 0.0188 m^3 at STP
       Mass of water passing through the calorimeter = 4.5 Kg
       Rise in temperature = 18.5 K
       Amount of water collected = 7.5 cm^3
       Latent heat of steam = 587kcal/kg

3.B.   i)Derive an equation which relates electrode potential and concentration of electrolyte in a half cell.
       ii) Give the method of synthesis and any two properties of phenol-formaldehyde resin.

3.C.   How do the following factors affect the rate of corrosion?
       i) nature of the corrosion product   (ii) relative area of anode and cathode.

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4.A. i) Describe the manufacture of producer gas and mention its two important uses.
      ii) Explain the electroplating of decorative chromium.
4.B. Discuss the followings
      i) Caustic embrittlement. (ii) Corrosion control by cathodic protection.
4. C.   Give reason:
      i) Salt bridge or porous plate is not required in lead acid batteries.
      ii) Calomel electrode should not be used above $50^{o}C$.

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5.A. i) What are ion selective electrodes? Derive an expression for electrode potential of a glass electrode.
      ii) What is a standard cell? Explain the construction and working of Weston standard cadmium cell.
5.B. i) Write an explanatory note on the compounding of rubber.
      ii) Define knocking. With an example explain the importance of adding antiknocking reagent to petrol.
5.C. i) 28g of ethene was polymerised by radical polymerisation and degree of polymerisation was found to be 1000. Calculate the number of molecules of polythene produced.
      ii) How much rust ($Fe_2O_3 . 3H_2O$) is formed when 100kg iron have completely rusted away. (At. Weight: Fe =56, O =16, H =1)

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6.A. Distinguish (any two points) between each of the following pairs of terms.
      i) Galvanic corrosion and waterline corrosion. (ii) number average molecular weight and weight average molecular weight (iii) Concentration polarisation and activation polarisation. (iv) Solution polymerisation and emulsion polymerisation technique.
6.B. i) EMF of the Weston cadmium cell is 1.0183 V at 293 K and 1.0181 at 298K. Calculate change in free energy, change in enthalpy and change in entropy at 298K.
      ii) Explain the effect of structure of polymer on chemical resistance and tensile strength.
6.C. Give an account of thermal reforming of petroleum.

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