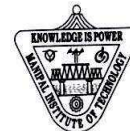




MANIPAL UNIVERSITY
FIRST SEMESTER B.E. DEGREE EXAMINATIONS
NOVEMBER 2008
SUBJECT: ENGINEERING CHEMISTRY (CHM 101)



Time:3hrs.

Date:24-11-2008

Max. Marks: 50

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

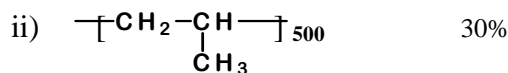
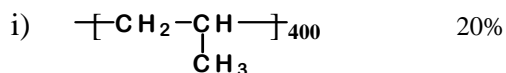
- 1A. Explain the concept of free energy changes in electrochemical cells and derive expressions for free energy, enthalpy and entropy relating to the e.m.f of the cell.
- 1B. i) Give the cell representation and electrode reactions of a Standard cell.
 ii) Describe the construction and give the reactions during discharge of the Ni-Cd cell. Mention two important applications of the cell.
- 1C. Give reasons:
 i) Chromium anodes are not used in electroplating.
 ii) Pin holes on tin coated iron are more prone to corrosion of iron than those on zinc coated iron

[4 + 4 + 2 =10M]

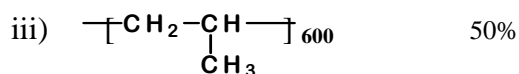
- 2A. Give an account of the following:
 i) Differences between natural and synthetic rubber. (Any four)
 ii) Factors affecting the glass transition temperature of polymers.
- 2B. What are adhesives? Give the method of synthesis, properties and any two applications of Epoxy resin.
- 2C. The following data were obtained in a Boy's gas calorimeter experiment.
 Volume of gas used = 0.1 m³ at STP
 Wt. of cooling water = 25 Kg
 Temp. of inlet water = 20°C
 Temp. of outlet water = 33°C
 Wt. of steam condensed = 0.025 Kg
 Calculate HCV and LCV per m³ at STP. Take the heat liberated in condensing water vapour and cooling the condensate as 580 KCals / Kg

[4 + 4+ 2 = 10M]

- 3A. Describe the manufacture of water gas and mention its two important uses.
- 3B. Give an account of the following:
 i) Effect of current density and temperature on electroplating.
 ii)Electroless plating of copper.
- 3C. A polymer of polypropylene is found to have the following composition.



P.T.O



Calculate the number average and weight average molecular masses of the polymer.
(Atomic masses of C =12 & H =1).

[4 + 4 + 2 = 10]

- 4A. Explain the following.
i) Caustic embrittlement.
ii) Waterline corrosion.
- 4B. Discuss the following.
i) Effect of structure of polymer on crystallinity & chemical resistance.
ii) Technique of emulsion polymerization.
- 4C. A sample of coal was analysed as follows. Exactly 2.5g was weighed into a silica crucible. After heating for 1 hr. at 110°C, the residue weighed 2.415g. The crucible next was covered with a vented lid & strongly heated for exactly seven minutes at $950 \pm 20^\circ\text{C}$. The residue weighed 1.528g. The crucible was then heated without cover, until a constant weight was obtained. The last residue was found to weigh 0.245g. Calculate percentage of moisture, volatile matter, ash & fixed carbon in the sample.
- [4 + 4 + 2 = 10]
- 5A . What are fuel cells? Explain the construction and working of H₂-O₂ fuel cell. Mention any two advantages of fuel cell.
- 5B. Give reasons for the following.
i) Bakelite is hard and rigid while PVC is soft and flexible.
ii) Natural rubber needs vulcanization.
iii) Rusting of Iron is prevented if the article is connected by a wire to Mg.
iv) Salt bridge is used in the construction of galvanic cell.
- 5C Calculate the e.m.f of a Cadmium-Copper cell in which Cadmium is in contact with 0.003M CdSO₄ and Copper in contact with 0.03M CuSO₄ solution. The standard e.m.f. of the cell is 0.86V at 298K.
- [4 + 4 + 2 = 10]
- 6A. Describe the various reforming reactions with one example in each case.
- 6B. Discuss the following.
i) Prevention of corrosion by proper selection of material and designing.
ii) Methods of cleaning the metal surface before electroplating.
- 6C. Give reasons for the following.
i) Addition of amines, thiourea etc. to corrosive environment reduces corrosion of metals.
ii) Tetraethyl lead mixed with ethylene dibromide is added to gasoline used in vehicles.
- [4 + 4 + 2 = 10]

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