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CHE12/22

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NEW SCHEME

**First / Second Semester B.E. Degree Examination, July 2006
Common to All Branches
Engineering Chemistry**

Time: 3 hrs.]

[Max. Marks:100

Note: I. Answer any FIVE questions.

1. a. What are liquid crystals? Explain the molecular ordering in the following liquid crystal phases :
 - i) Nematic phase.
 - ii) Chiral nematic phase.
 - iii) Smectic phase. (08 Marks)
- b. Discuss the applications of liquid crystals in display system. (06 Marks)
- c. What is biotechnology? How is ethanol biosynthesized from molasses? (06 Marks)

2. a. What is cracking of petroleum? Explain the process of fluidized bed catalytic cracking of petroleum. (06 Marks)
- b. Define gross and net calorific value of a fuel. Explain bomb calorimetric method of determination of calorific value of a solid fuel. (08 Marks)
- c. On burning 0.75×10^{-3} kg of a solid fuel in a bomb calorimeter, the temperature of 2.5 kg of water is increased from 24°C to 28°C . The water equivalent of calorimeter and latent heat of steam are 0.485 kg and 4.2×587 KJ/kg respectively. Specific heat of water is $4.2 \text{ KJ/kg}^{\circ}\text{C}$. If the fuel contains 2.5% hydrogen, calculate its gross and net calorific values. (06 Marks)

3. a. Derive Nernst equation for single electrode. Explain the determination of single electrode potential using standard hydrogen electrode. (08 Marks)
- b. Explain the construction and working of the calomel electrode. (06 Marks)
- c. A concentration cell was constructed by immersing two silver electrodes in 0.05 M and 0.1 M AgNO_3 solution. Write cell representation, cell reactions and calculate the emf of the concentration cell. (06 Marks)

4. a. Discuss the following battery characteristics :
 - i) Capacity.
 - ii) Cycle-life. (06 Marks)
- b. Explain the construction, working and application of lead-acid battery along with the reactions involved during discharging and charging. (08 Marks)
- c. What are fuel cells? Explain the construction and working of MeOH-O_2 fuel cell. (06 Marks)

5. a. Explain the following types of corrosion :
 - i) Pitting corrosion.
 - ii) Water line corrosion. (06 Marks)
- b. What is cathodic protection? Explain sacrificial anode and impressed current techniques for prevention of corrosion. (06 Marks)
- c. What are the types of protective coatings? How do protective coatings help in controlling corrosion? (08 Marks)

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- 6 a. What is decomposition potential? How is it determined? What is its significance in electroplating? (06 Marks)
- b. Explain the principle involved in electroless plating. What are the advantages? Explain the electroless plating of copper. (08 Marks)
- c. Explain the role of the following factors on the nature of the electrodeposit.
- i) Current density.
 - ii) Throwing power.
 - iii) pH. (06 Marks)
- 7 a. Discuss the sources, ill effects and prevention of oxides of nitrogen. (08 Marks)
- b. Write notes on :
- i) Ozone depletion
 - ii) Green house effect. (06 Marks)
- c. Define COD. In a COD experiment, 29.5 cm³ and 20 cm³ of 0.025N FAS solution were required for blank and sample titration respectively. The volume of test sample used is 25 cm³. Calculate the COD of the sample solution. (06 Marks)
- 8 a. Discuss the mechanism involved in free radical polymerization of ethylene. (08 Marks)
- b. Explain the manufacture and applications of the following :
- i) Teflon.
 - ii) Phenol-formaldehyde. (06 Marks)
- c. What are conducting polymers? Explain the synthesis and applications of polyaniline. (06 Marks)