First / Second Semester B.E. Degree Examination, January 2006

Time : 3 hours   **CHE 12 / 22 Engineering Chemistry**   Maximum Marks 10(

Note : Answer any Five questions

1   a) Mention two characteristics of the mesophase state of matter. Define a director. Draw relevant figures to represen
the director in a crystalline solid and also in a liquid crystal.   **(8 marks**

   b) Explain the principle of a biosensor.   **(6 marks**

   c) Calculate the mass of oxygen required by acetobacter to manufacture 100 kg of vinegar containing 1 % acetic aci(
by the acrobic oxidation of excess of dilute alcohol solution. (Atomic weights: H = 1, C = 12, O = 16) **(6 marks**

2   a) Define the following : Gross calorific value, net calorific value.   **(4 marks**

   b) The gross calorific value of a sample of bituminous coal is 36000 kJ kg^{-1}. In an experiment, 0.83 g of this coal wa:
burnt under 1.2 kg of water in a bomb calorimeter. Due to combustion, the temperature of water rose by 3.92° C
Calculate the water equivalent of the calorimeter. Specific heat of water = 4.2 kJ kg^{-1} per$^{\circ}$ C.   **(8 marks**

   c) Explain the process of fluidized bed catalytic cracking of petroleum fractions.   **(8 marks**

3   a) Explain the construction of calomel electrode. Explain how this electrode is used to determine the potential of ar
unknown electrode.   **(8 marks**

   b) The spontaneous galvanic cell Tin/tin ion (0.024 m)|| tin ion (0.064 m) / Tin develops an EMF of 0.0126 V a
25° C. Calculate the valency of tin.   **(4 marks**

   c) Explain the principles of a membrane electrode. Mention the different types of membranes available.   **(8 marks**

4   a) What are the special properties of lithium that make it advantageous to use as an electrode material ? Write th
electrode reactions that accur in the Li-MnO_2 cell.   **(4 marks**

   b) What are the factors that affect the voltage of a battery ? Explain the techniques involved in increasing the voltage c
a battery.   **(8 marks**

   c) Explain the construction and working of a lead acid battery.   **(8 marks**

5. (a) What are the sources of carbon monoxide and particulate matter ? Mention their harmful effects. Indicate th
measures to control carbon monoxide.   **(8 marks)**

   (b) 20 cm^3 of a sample of COD analysis was reacted with 10 cm^3 of 0.25 N $K_2Cr_2O_7$ and the unreacted $K_2Cr_2O_7$ require(
6.5 cm^3 of 0.10 N Ferrous ammonium sulphate(FAS). 10 cm^3 of same $K_2Cr_2O_7$ and 20cm^3 of distilled water under th
same condition as the sample requires 26.0 cm^3 of 0.10 N FAS. What is the COD of the sample   **(4 marks**

   (c) Write brief notes on
i) Secondary Treatment of Sewage   ii) BOD and COD   **(8 marks**

6. (a) Explain the electrochemical theory of corrosion with reference to iron   **(6 marks**

   (b) Discuss the following corrosion control methods
i) Cathodic Protection   ii) Anodic Protection System   **(10 marks**

   (c) Explain why pinholes on tin coated iron are more prone to corrosion than pinholes on zinc coated iron **(4 marks**

7. (a) What are the main objectives of metal finishing ? Explain the electroplating of nickel   **(8 marks**

   (b) What is throwing power of the plating bath ? Describe the experimental determination of throwing power of th
plating bath by using Haring Blum Cell .   **(8 marks**

   (c) What is electroless plating ? Mention any two advantages of electroless plating over electroplating.   **(4 marks**

8. (a) What are high polymers ? Explain emulsion polymerisation process.   **(6 marks**

   (b) Explain the manufacture of the following polymers and mention their applications :
i) Polymethylmethacrylate   ii) Low Density Polyethylene   **(8 marks**

   (c) What are polymer matrix composites ? Mention their applications.   **(6 marks**