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F.E. Semester-I (Revised Course 2016-17)
EXAMINATION FEBRUARY 2021
Applied Science (Chemistry)

[Duration : Two Hours] **[Total Marks : 60]**

Instructions:
1. Answer THREE FULL QUESTIONS with ONE QUESTION FROM EACH PART.
2. Draw diagrams wherever necessary.
3. Assume additional data if required.

PART-A

1. a) An electro chemical cell is formed from iron and silver electrodes having 0.01 M $FeSO_4$ and 0.1 M $AgNO_3$ electrolytes. The standard electrode potentials of Fe and Ag electrodes are -0.44 V and 0.80 V respectively. Write the cell representation, cell reaction and calculate EMF of the cell at 25°C. **(6mk)**

   b) Explain the following types of corrosion **(6mk)**
   i) Galvanic Corrosion ii) Pitting Corrosion

   c) Explain the construction (with suitable diagram) of Zinc Air Battery. **(4mk)**

   d) Discuss the basic components of Green Chemistry. **(4mk)**

2. a) Outline the construction of Calomel electrode and illustrate its use in determination of electrode potential of any unknown element. **(6mk)**

   b) Describe the mechanism of corrosion of a metal placed in a humid environment of acidic pH. **(6mk)**

   c) State and explain any four characteristics of battery system. **(4mk)**

   d) Discuss any two applications of Green Chemistry for achieving sustainable development. **(4mk)**

3. a) Define the term ion selective electrode. Illustrate its role in determination of an unknown species in a given sample of water by taking a suitable example. **(6mk)**

   b) Explain the construction and working of Hydrogen- Oxygen fuel cell. **(6mk)**

   c) Discuss any one example of use of alternative starting material in achieving goals of green chemistry. **(4mk)**

   d) Explain how corrosion can be controlled by sacrificial anodic protection and impressed **(4mk)**

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current cathodic protection.

PART-B

4. a) Discuss the following structure-property relationship in polymers: **(6mk)**
i) Solubility and swelling behavior ii) Diffusion and permeability

b) Define the term 'BOD' of water and determine the same in ppm units for the following sample of water: A 100 ml of the sample was tested by standard protocols and was found to require 2.0 ml of 0.01 N $Na_2S_2O_3$ on day one and 1.3 ml of analysis and 0.01N $Na_2S_2O_3$ on day five of the analysis. **(6mk)**

c) State the Basic principle involved in working of UV-Vis spectroscopy and draw the block diagram of the spectrophotometer. **(4mk)**

d) Briefly describe the particulate and layered composite materials. **(4mk)**

5. a) Explain the Bulk and Solution methods of Polymerization. **(6mk)**

b) Explain the different stages involved in the treatment of sewage water. **(6mk)**

c) Explain the working of Differential scanning Calorimeter with the help of a Block diagram. **(4mk)**

d) Discuss briefly Fibre reinforced Composites. **(4mk)**

6. a) A sample of water was tested for hardness alkalinity. The following data was obtained. The sample showed the presence of 5 ppm $CaSO_4$ and 2 ppm $MgCl_2$. A 10 ml of the sample upon titration to methyl Orange and point using 0.1 M HCl required 2 ml of the titrant. Calculate the hardness and alkalinity of the water sample in ppm $CaCO_3$ equivalents. (data: 1ml of 1M HCl $\equiv$ 50 mg $CaCO_3$ equivalent alkalinity; At. Wt. of Ca=40, S=32 O=32 O=16 Mg=24 Cl=35.5) **(6mk)**

b) Discuss the oxidation and thermal degradation of polymers by giving suitable example. **(6mk)**

c) Explain the various stages involved in Municipal treatment for Potable water. **(4mk)**

d) With the help of a block diagram explain the working of Gas Chromatography. **(4mk)**

PART-C

7. a) Define the term 'Electrode Potential'. Determine the electrode Potential of the following system; Ag^+ (0.01M)/Ag at 25°C, E° of Ag^+=0.8V. **(5mk)**

b) Explain the process of PCB preparation using Electroless Plating. **(5mk)**

c) Explain the processing of Natural Rubber and state any two advantages of synthetic rubber in comparison to Natural rubber. **(5mk)**

d) Discuss the experimental methods for determination of Hardness and Alkalinity of water. **(5mk)**

8. a) Explain how pH can be determined by use of an electrochemical cell. **(5mk)**

b) Outline the classification of polymers based on i) Structure ii) Response to heat and pressure **(5mk)**

c) Explain the working of Li-ion Battery. **(5mk)**

d) Explain the Electro dialysis method for desalination of water. **(5mk)**