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F.E. Semester-II (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 $FeSO_4$ **(6mk)**
       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.

    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   **(6mk)**
       electrode potential of any unknown element.

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

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

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

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

    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   **(4mk)**
       green chemistry.

    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 (6mk)
       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.

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

    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 (4mk)
       diagram.

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

6. a) A sample of water was tested for hardness alkalinity. The following data was obtained. (6mk)
       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)

    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 (5mk)
       system; Ag^+ (0.01M)/Ag at 25°C, E° of Ag^+=0.8V.

    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)**