Total No. of Printed Pages:3

FE Semester –II (Revised Course 2016-17)
EXAMINATION AUGUST 2021
Applied Science (Chemistry)

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

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

PART-A

Q.1 a) Construct an electrochemical cell with tin and silver electrodes. The concentration of electrolyte at the anode is fixed at 0.01 M and at cathode is fixed at 0.1 M. Draw the relevant diagram, write the representation and calculate the EMF of the cell at $25°C$. ($E°Sn = -0.14$ v and $E°Ag = 0.8$ v) **(6mks)**

b) Explain how corrosion can be controlled by use of metal coating and sacrificial anodic protection by giving suitable example. **(6mks)**

c) Explain the construction and working of Photovoltaic cell. **(4mks)**

d) Explain with example the use of alternative solvent in achieving the goals of Green Chemistry. **(4mks)**

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

b) Explain Galvanic and Stress Corrosion by taking suitable examples. **(6mks)**

c) Outline the various stages of purification of Crude oil. **(4mks)**

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

Q.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 **(6mks)**

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

c) Define the term Fuel Cell. State any three most important characteristics of the electrodes used in the fuel cell setup. **(4mks)**

d) Define the term 'Atom Economy' and illustrate with the help of suitable example **(4mks)**

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importance of achieving better atom economy in synthesis.

PART-B

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

b) Explain the Electro dialysis process for desalination of water. **(6mks)**

c) Draw the block diagram for UV-Vis spectrophotometer and Gas Chromatograph **(4mks)**

d) Briefly describe the constituents of Composites. **(4mks)**

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

b) Explain the Municipal treatment of raw water for preparing Potable water. **(6mks)**

c) A sample of water was tested for hardness and alkalinity. The following data was obtained. The sample showed the presence of 10 ppm $CaSO_4$ and 20 ppm $MgCl_2$. A 10 ml of the sample upon titration to methyl Orange end point using 0.1 M HCI required 5 ml of the titrant. Calculate the hardness and alkalinity of the water sample in ppm $CaCO_3$ equivalents. (data: 1ml of 1M HCI ≡ 50 mg $CaCO_3$ equivalent alkalinity; At. Wt. of Ca=40, S=32 O=16 Mg=24 CI=35.5) **(4mks)**

d) Outline the various applications of Composites. **(4mks)**

Q.6 a) Define the terms BOD and COD. A sample of water was tested for BOD and COD levels and the following observations were recorded. DO for the sample on day one of sampling was found to be 2.7 ppm and after five days was found to be 1.5 ppm. When 10 ml of the sample was titrated against 0.25 N FAS solution the end point of the titration was found to be 8.5 ml and under similar conditions when 10 ml of Distilled water sample was titrated is was found to be 9.5 ml. Calculate the BOD and COD of the sample in ppm. **(6mks)**

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

c) With help of a block diagram explain the working of Differential Scanning Calorimeter. **(4mks)**

d) Define the term 'Composites' and discuss the Fibre reinforced Composites. **(4mks)**

PART-C

Q.7 a) Define the term 'Electrode Potential'. Determine the electrode Potential of the following system; Cu^{2+} (0.01M)/Cu at 25°C E° of Cu^{2+}= 0.34V. **(5mks)**

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

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

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

Q.8 a) Mention any five proper design and choice of material principles to be followed for corrosion control. **(5mks)**

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

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

d) Briefly explain the process of sewage water treatment. **(5mks)**

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