

Total No. of Printed Pages:3

F.E. Semester- II (Revised Course 2016-17)
EXAMINATION OCTOBER 2020
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

- Q.1
- a) Outline the construction of Ion selective electrode and illustrate how it can be used for (6mk)
determination of pH.
 - b) Describe the electrochemical theory of corrosion in neutral and acidic medium. (6mk)
 - c) Explain the term 'Biogas'. Draw a schematic diagram for the production of Biogas. (4mk)
 - d) Outline any two Industrial applications of Green Chemistry. (4mk)
- Q.2
- a) Write the Working principle, reactions and calculate the EMF of the following cell: (6mk)
 $Cd/Cd^{2+}(0.01M)//Cu^{2+}(0.1M)/Cu$. (Data: $E^\circ Cd = -0.40\text{ v}$; $E^\circ Cu = 0.34\text{ v}$)
 - b) An Article made up of Iron was exposed in the environment and was found to have (6mk)
undergone corrosion. Explain any two types of corrosion processes by which the article
can suffer corrosion.
 - c) Explain corrosion protection by using metal cladding and anodizing. (4mk)
 - d) Explain the use of alternate feedstock in the synthesis of Adipic acid. (4mk)
- Q.3
- a) Outline the construction and working of Zn-Air Battery. (6mk)
 - b) Explain the process of rusting of Iron with the help of chemical theory of Corrosion (6mk)
 - c) Define the terms 'Octane number' and 'Cetane number'. Explain their importance. (4mk)
 - d) Explain the various stages involved in the purification of Crude oil. (4mk)

Part B

- Q.4 a) Explain the process of degradation of Polymers due to oxidation and exposure to high temperature. (6mk)
- b) Explain the various stages involved in the treatment of sewage water. (6mk)
- c) Draw a block diagram of Gas Chromatography and state its working principle. (4mk)
- d) Discuss briefly Fibre reinforced Composites. (4mk)
- Q.5 a) Explain the Bulk and Solution methods of Polymerization. (6mk)
- b) A water sample was analyzed for i) DO ii) Hardness. The test analysis as per standard protocols gave the following data: i) 10 ml of the water sample upon titration with 0.01 M $\text{Na}_2\text{S}_2\text{O}_3$ required 2.0 ml of the titrant. ii) The sample showed the presence of MgCO_3 (50 ppm) and CaCl_2 (60 ppm). Find the DO (in ppm) & Hardness (in ppm CaCO_3 eq.) (data given At. Wt. Ca=40; C=12; O=16; Mg=24; S=32; Cl=35.5) (6mk)
- c) Briefly explain the types of Dispersed phases used in composite materials. (4mk)
- d) State the basic principle involved in working of Differential Scanning Calorimetry and UV-Visible Spectroscopy. (4mk)
- Q.6 a) Outline the classification of polymers based on i) Structure ii) Number and arrangement of monomeric units iii) Response to heat and Pressure. (6mk)
- b) A sample of water was tested for BOD and Alkalinity. A 100 ml of the sample tested using the standard procedures gave the following observations: i) 2.0 ml of 0.01 M $\text{Na}_2\text{S}_2\text{O}_3$ required to achieve the end point on Day 1 and 1.5 ml of 0.01M $\text{Na}_2\text{S}_2\text{O}_3$ required to achieve the end point on Day 5 ii) 1.5 ml of 0.1 N HCl required to achieve the methyl orange end point. Calculate the BOD and Alkalinity of the sample in ppm (Given: 1 ml of 1M HCl \equiv 50 mg CaCO_3 equivalents. alkalinity.) (6mk)
- c) Define the terms COD and BOD. State their importance in water quality assessment. (4mk)
- d) Briefly describe the layered and particulate type of Composite materials. (4mk)

Part C

- Q.7 a) Write the Nernst equation for the following electrode system $\text{Ag}^+(0.01\text{M})/\text{Ag}$ and determine its electrode potential at 25°C. ($E^\circ_{\text{Ag}}=0.80\text{ v}$) (5mk)
- b) Describe a method for preparing a conducting surface on plastic body using Electroless plating process. (5mk)

- c) What are conducting polymers? Explain the mechanism of conduction in polymers with suitable example. (5mk)
- d) Explain any one method for large scale desalination of water. (5mk)
- Q.8 a) With the help of a neat labeled diagram explain the working of Li-ion Polymer battery. (5mk)
- b) Explain the measure that can be undertaken by modifying the environment for corrosion control. (5mk)
- c) The sample showed the presence of CaCO_3 (10 ppm), MgCl_2 (20 ppm) & CaCl_2 (20 ppm). Find the Temporary, Permanent and Total Hardness (in ppm CaCO_3 eq.) of the sample. (5mk)
(data given At. Wt. Ca=40; C=12; O=16; Mg=24; S=32; Cl=35.5)
- d) State and explain the role of different ingredients involved in compounding of polymers to yield plastic material. (5mk)

