F.E. (Semester - I/II) (RC 16 – 17) Examination, Nov./Dec. 2018
APPLIED SCIENCE – I
(Chemistry)

Duration : 3 Hours | Total Marks : 100

Instructions *: 1) Answer **any two** questions **each** from Part – **A** and Part – **B**.*
*Answer **any one** question from Part – **C**.*
*2) Draw diagrams **wherever** necessary.*
*3) Assume additional data, if **required**.*

PART – A

Answer **any two** questions.

1. a) An electro chemical cell is formed from Mg and Cu electrodes having 0.01 M $ZnSO_4$ and 0.05 M $CuSO_4$ electrolytes. The standard electrode potentials of Mg and Cu electrodes are –2.37 V and 0.34 V respectively. Write the cell representation, cell reaction and calculate EMF of the cell at 298 K. **6**

   b) Explain the following types of corrosion : **6**
   i) Galvanic corrosion
   ii) Stress corrosion.

   c) Define the terms : **4**
   i) Galvanic cell
   ii) Fuel cell
   iii) Crude oil
   iv) Galvanization.

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

2. a) The following cell Cd/$CdSO_4$ (0.01M)//$CdSO_4$(0.05 M)/Cd was used to obtain electrical energy. Explain the working of the cell with the help of neat diagram and also find is EMF. Given, E° Cd = –0.40 V. **6**

   b) How fuels are classified ? Define the terms G.C.V. and N.C.V. **6**

   c) What is waterline corrosion ? Illustrate with an example. **4**

   d) Describe the use of Dimethyl Carbonate (DMC) as an alternate reagent to achieve the goals of green chemistry. **4**

P.T.O.

3. a) Write the Nernst equation for the following electrode system : 6
   i) Zn/Zn^{2+} (0.05 M) and
   ii) Au^{3+}(0.1 M)/Au determine its electrode potential at 25°C.
   (E° Zn = –0.76 V) and (E° Au = 1.5 V)
   b) Outline the construction and working of Li-ion battery. 6
   c) Explain the process of corrosion protection by metal coatings. 4
   d) Define the term "Green chemistry" and mention the objectives of green chemistry. 4

PART – B

Answer **any two** questions.

4. a) Outline the classification of polymers based on 6
   i) Structure
   ii) Number of monomers and their arrangement
   iii) Response to heat.
   b) What is potable water ? With the help of neat labeled diagram explain the flash evaporation method for desalination of water. 6
   c) Briefly explain the working and applications of Differential Scanning Calorimeter (DSC). 4
   d) Briefly describe the particulate and layered composite materials. 4

5. a) The water sample was analyzed for
   i) DO
   ii) Hardness. 6
   The test analysis as per standard protocols gave the following data :
   i) 100 ml of the water sample upon titration with 0.01 N $Na_2S_2O_3$ required 1.5 ml of the titrant.
   ii) The sample showed the presence of $CaSO_4$ (10.1 ppm), $CaCl_2$ (0.5 ppm) and $Ca(HCO_3)_2$ (6.2 ppm). Find the DO (in ppm) and hardness (in ppm $CaCO_3$ eq.)

(data given : At. Wt. Ca = 40, C = 12, O = 16, Mg = 24, S = 32, Cl = 35.5, H = 1)

b) Explain the various processes involved in sewage treatment. 6

c) State and explain the role of different ingredients involved in compounding of polymers to yield plastic material. 4

d) Define the term polymerization. Explain the types of polymerization process with suitable examples. 4

6. a) Define the term BOD of water. A 100 ml of the sample tested using the standard procedures gave the following observations : i) 3.0 ml of 0.01 M $Na_2S_2O_3$ required to achieve the end point on Day 1 and 2.5 ml of 0.01 M $Na_2S_2O_3$ required to achieve the end point on Day 5. Calculate the BOD of the sample in ppm. 6

b) Discuss municipal treatment for large scale production of potable water. 6

c) Briefly explain the working and applications of UV-visible spectroscopy. 4

d) Explain the Bulk method of polymerization. 4

PART – C

Answer **any one** question.

7. a) A concentration cell was constructed by immersing two silver electrodes in 0.05 M and 1.0 M $AgNO_3$ solutions. Write the cell reactions and calculate the EMF of the concentration cell. 5

b) Explain any one suitable method for protection against corrosion of underground pipeline made up of iron material. 5

c) Explain the process of achieving electrical conductivity in polyacetylene. 5

d) With the help of neat labeled diagram explain the Reverse Osmosis method for desalination of water. 5

8. a) Discuss wet electrochemical theory of corrosion with suitable example. 5

b) Explain any five important characteristics of batteries. 5

c) Discuss the structure and chemical properties of polymers. 5

d) Define the term composites. Outline the various applications of composite materials. 5
