



SEM 1 – 3 (RC 16 – 17)

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

Duration : 3 Hours

Total Marks : 100

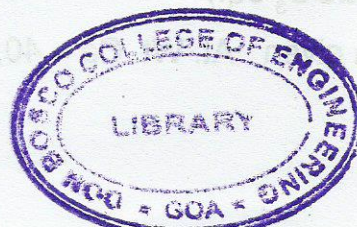
- Instructions :** 1) Answer **any two** questions **each** from Part – A and Part – B.
Answer **any one** question from Part – C.
2) Draw diagrams **wherever** necessary.
3) Assume additional data, if **required**.

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 $\text{Cd}/\text{CdSO}_4(0.01\text{M})//\text{CdSO}_4(0.05\text{M})/\text{Cd}$ was used to obtain electrical energy. Explain the working of the cell with the help of neat diagram and also find its EMF. Given, $E^\circ \text{ Cd} = -0.40\text{ V}$. 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

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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 .
($E^\circ \text{Zn} = -0.76 \text{ V}$) and ($E^\circ \text{Au} = 1.5 \text{ V}$)
- 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 $\text{Na}_2\text{S}_2\text{O}_3$ 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 $\text{Ca}(\text{HCO}_3)_2$ (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 $\text{Na}_2\text{S}_2\text{O}_3$ required to achieve the end point on Day 1 and 2.5 ml of 0.01 M $\text{Na}_2\text{S}_2\text{O}_3$ 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