

SEM 1 – 3 (RC 16-17)

F.E. (Semester – I/II) (RC 2016 – 17) Examination, May/June 2018 APPLIED SCIENCE (Chemistry)

Duration : 3 Hours

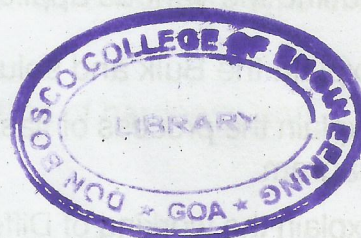
Total Marks : 100

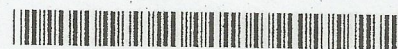
- Instructions :** 1) Answer **any two** questions **each** from Part **A** and Part **B**, answer **any one** question from Part **C**.
2) Draw diagrams **wherever** necessary.
3) Assume additional data if **required**.

PART – A

Answer **any two** questions :

1. a) The following cell $\text{Zn}/\text{Zn}^{2+} // \text{Zn}^{2+}/\text{Zn}$ was used in order to obtain electrical energy. Explain the working of the cell with the help of neat diagram and also find its emf. Given, $E^\circ_{\text{Zn}} = -0.76 \text{ v}$. 6
(0.005m) (0.05m)
- b) An article upon cleaning after a period of over a year, was found to have developed tiny pores of discoloration on its surface. Explain the type of corrosion the article has suffered with suitable example and relevant reactions. 6
- c) Define the terms : 4
 - i) Cetane number
 - ii) Lower calorific value
 - iii) Refining of petroleum
 - iv) Fuel cell.
- d) Define the term 'Green Chemistry' and mention the objectives of green chemistry. 4
2. a) Outline the construction and working of $\text{H}_2 - \text{O}_2$ fuel cell. 6
- b) Outline the mechanism involved in an electro chemical process of corrosion when the metal is in contact in a medium of acidic pH. 6
- c) Describe the synthesis of biogas from waste materials using anaerobic method. 4
- d) Discuss any two applications of green chemistry for achieving sustainable development. 4





3. a) With the help of neat labelled diagram, explain the construction and working of a calomel electrode and also mention the applications of calomel electrode. 6
- b) Describe 'Galvanic corrosion' with the help of a suitable example. 6
- c) With the help of a neat labeled diagram explain the fractional distillation of crude oil. 4
- d) Explain the role of alternative feedstock in the preparation of adipic acid in the achieving the goals of green chemistry. 4

PART – B

Answer **any two** questions.

4. a) Discuss the following structure-property relationship in polymers. 6
- a) Chemical properties.
- b) Electrical properties.
- b) Define the term COD of water. 20 ml of sewage sample for COD is reacted with 25 ml of $K_2Cr_2O_7$ solution and the unreacted $K_2Cr_2O_7$ required 10 ml of N/4 FAS solution. Under similar conditions, in blank titration 16.0 ml of FAS is used up. Calculate the COD of the sample. 6
- c) State the basic principle involved in working of uv-visible spectroscopy and draw the block diagram of the spectrophotometer. 4
- d) Outline the various applications of composite materials. 4
5. a) Explain the Bulk and solution methods of polymerization. 6
- b) Explain the process of flash evaporation for treating saline water with relevant diagram. 6
- c) Explain the working of Differential Scanning Calorimeter (DSC) with the help of a suitable block diagram. 4
- d) Discuss briefly fibre reinforced composites. 4
6. a) Explain the process of degradation of polymers due to oxidation and exposure to high temperature. 6
- b) A water sample was analysed 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 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 (4.1 ppm), MgCl_2 (5.0 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) 6
- c) With the help of a block diagram explain the working of Gas chromatography. 4
- d) Define the term composites and briefly mention the various constituents of composites. 4

PART – C

Answer **any one** question.

- 7. a) Write the Nernst equation for the electrode system Ag^+ / Ag (0.05m). Also find its single electrode potential. Given $\epsilon^\circ \text{Ag} = 0.80 \text{ V}$. 5
- b) Explain galvanic corrosion by giving suitable examples along with necessary diagrams and reactions involved. 5
- c) Explain the processing of natural rubber and state the advantages of synthetic rubber in comparison to natural rubber. 5
- d) Discuss the experimental methods for determination of hardness and Alkalinity. 5
- 8. a) Outline the construction and working of hydrogen oxygen fuel cell. 5
- b) State and explain the role of different ingredients involved in compounding of polymers to yield plastic material. 5
- c) Explain how nature of oxide layer affects the further rate of corrosion. 5
- d) Explain the municipal treatment of raw water for preparing potable water. 5

