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 $\underset{(0.005m)}{Zn/Zn^{2+}}//\underset{(0.05m)}{Zn^{2+}/Zn}$ 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, $\in^0 Zn = -0.76$ v. 6

   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 colorific 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 $H_2 - O_2$ 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.

a) Chemical properties.

b) Electrical properties. 6

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 $Na_2S_2O_3$ 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 $Ca(HCO_3)_2$ (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) **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 $\in^0 Ag = 0.80$ 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**