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FE (Sem - II) (Revised Course 2016-17) EXAMINATION MAY/JUNE 2019  
Applied Science (Chemistry)

[Duration: 3 Hours]

[Max.Marks:100]

**Instructions:**

1. Answer **any two** questions each from **Part-A** and **Part-B**.  
Answer **anyone** questions from **Part-C**.
2. Draw diagram **wherever** necessary.
3. **Assume** additional data, if required.

**PART – A**

**Q.1 (Answer Any Two Questions)**

- a) An electro chemical cell is formed from Ag and Cd electrodes having 0.5 M  $\text{AgNO}_3$  and 0.25 M  $\text{CdSO}_4$  electrolytes. The standard electrode potentials of Ag and Cd electrodes are 0.80 V and -0.40 V respectively. Write the cell representation, cell reaction and calculate EMF of the cell at 298K. 06
- b) Explain the following types of corrosion 06
  - i) Waterline Corrosion
  - ii) Pitting Corrosion
- c) Define the terms: 04
  - i) Corrosion
  - ii) Fuel
  - iii) Calorific value
  - iv) Green Chemistry
- d) Discuss the various applications of green chemistry for achieving sustainable development. 04

**Q.2**

- a) The following cell  $\text{Cu}/\text{CuSO}_4(0.05\text{M})//\text{CuSO}_4(0.5\text{M})/\text{Cu}$  was used to obtain electrical energy. Explain the working of the cell with the help of neat diagram and also find its EMF. Given,  $E^\circ_{\text{Cu}} = 0.34 \text{ V}$ . 06
- b) Discuss wet electrochemical theory of corrosion with suitable examples and reactions. 06
- c) Outline the construction and working of Zn-Air battery. 04
- d) Discuss the objectives and significance of Green chemistry. 04



- Q.3
- Write the Nernst equation for the following electrode system: 06
    - $Al/Al^{3+} (0.05M)$  and  $Ag^+ (0.1M)/Ag$   
Also determine their electrode potential at  $25^{\circ}C$ .  
( $E^{\circ} Al = -1.66V$ )( $E^{\circ} Ag = 0.8V$ )
  - Explain the construction and working of Hydrogen-Oxygen fuel cell. 06
  - Explain the method of corrosion protection by using metallic coatings. 04
  - Explain with example the use of alternate feedstock in achieving the goals of green chemistry. 04

### PART – B

- Q.4 (Answer Any Two Questions) 06
- Describe the following methods of polymerization.
    - Bulk polymerization
    - Suspension polymerization
  - Explain the various processes involved in Sewages treatment. 06
  - Briefly explain the working and applications of Gas Chromatography 04
  - Briefly explain fibre reinforced composites. 04

- Q.5
- The water sample was analyzed for 06
    - Hardness
    - Alkalinity

The test analysis as per standard protocols gave the following data:

- 20 ml of the water sample upon titration with 0.1 M EDTA required 3.5 ml of the titrant.
- 20 ml of the water sample upon titration with 0.1M HCl required 1.5 ml of the titrant.

Determine the Hardness and Alkalinity of the sample in ppm  $CaCO_3$  equivalents.  
(data given: 1 ml of 0.01M EDTA  $\equiv$  1mg  $CaCO_3$  equivalent Hardness; 1 ml of 1 M HCl  $\equiv$  50 mg  $CaCO_3$  equivalent Alkalinity)

- Explain the following: 06
  - Glass Transition Temperature
  - Electrical Conduction in Polymers
- Briefly explain the working and applications of Differential Scanning Calorimeter (DSC) 04
- Briefly describe the particulate and layered composite materials. 04



- Q.6
- 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 unreacted  $K_2Cr_2O_7$  required 16.0 ml of N/4 FAS solution. Under similar conditions, in blank titration 19.0 ml of FAS is used up. Calculate COD of the sample. 06
  - What is potable water? With the help of neat labeled diagram explain the reverse Osmosis method for desalination of water. 06
  - Define the term polymerization. Explain the types of polymerization process with suitable examples. 04
  - Explain the process of achieving electrical conductivity in polyacetylene. 04

PART – C

Q.7 (Answer Any Two Questions)

- Explain how pH can be determined by use of an electrochemical cell. 05
- How nature of the metal and environment affect the rate of corrosion. 05
- State and explain the role of different ingredients involved in compounding of polymers to yield plastic material. 05
- With the help of neat labeled diagram explain the Electro Dialysis method for desalination of water. 05

- Q.8
- What is reference electrode? Explain the construction of Silver/Silver chloride electrode. Write its representation and reaction involved. 05
  - Explain any one suitable method for protection against corrosion of underground pipeline made up of iron material. 05
  - Outline the degradation of polymers due to Oxidation. 05
  - Define the term composites. Outline the various applications of composite materials. 05