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F.E. (Sem – I/II) (Revised Course 2016-17)
EXAMINATION NOV/DEC 2019
Applied Science (Chemistry)

[Time: Three Hours]

[Max. Marks: 100]

Instructions:

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

Part – A

(Answer Any **Two** Questions)

- | | | |
|------------|--|---|
| Q.1 | a) A galvanic cell to be operated at 25°C is set up. Write the cell representation and chemical reactions involved in the cell. Also find the e.m.f. of the cell assuming that Ni was dipped in 0.02M Ni salt solution and Ag rod was dipped in 0.05 M Ag salt solution. (Given $E_{Ni}^0 = -0.23V$ and $E_{Ag}^0 = 0.80V$) | 6 |
| | b) Describe the type of corrosion taking place in a metal with an example when the metal is placed in i) acidic medium ii) neutral medium | 6 |
| | c) Define the terms:
i) Galvanic cell
ii) Fuel Cell
iii) Calorific value
iv) H.C.V. | 4 |
| | d) Discuss any two application of Green Chemistry for achieving sustainable development. | 4 |
| Q.2 | a) Construct a cell using the metal strips of Magnesium, one dipping in a solution of 0.04M $MgSO_4$ and the other in 0.004M $MgSO_4$. Write the cell reactions, working principle and calculate the E.M.F. of the cell. Given $E_{Mg}^0 = -2.37V$ | 6 |
| | b) Explain the phenomenon of differential aeration corrosion with regard to Pitting and waterline corrosion. | 6 |
| | c) With the help of neat labelled diagram explain mining of petroleum. | 4 |
| | d) Outline the objectives of Green Chemistry. | 4 |
| Q.3 | a) Explain the different stages involved in the purification of crude oil and name the different fractions obtained from crude oil along with their carbon content. | 6 |
| | b) Explain in brief factors affecting the rate of corrosion. | 6 |
| | c) With the help of a neat diagram, explain the working of Zn – air Battery. | 4 |
| | d) Discuss the basic components of Green Chemistry. | 4 |

PART – B

(Answer Any **Two** Questions)

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|------------|---|---|
| Q.4 | a) Give the classification of Polymers based on i) Structure ii) Number of monomers and their arrangements iii) Types of Polymerization | 6 |
| | b) Calculate the temporary hardness and total hardness of sample of water containing | 6 |



$\text{Mg}(\text{HCO}_3)_2 = 73\text{mg/L}$, $\text{Ca}(\text{HCO}_3)_2 = 162\text{mg/L}$, $\text{MgCl}_2 = 95\text{mg/L}$, $\text{CaSO}_4 = 136\text{mg/L}$.

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|------------|--|---|
| | c) State the basic principle involved in the working of UV – visible spectrophotometry and draw the block diagram of the spectrophotometer. | 4 |
| | d) Discuss the role of particulates as dispersed phase in composites. | 4 |
| Q.5 | a) Explain the various stages involved in the treatment of sewage in typical municipal sewage treatment plant. | 6 |
| | b) State and explain the role of different ingredients involved in compounding of polymers to yield plastics. | 6 |
| | c) Explain the working of Gas Chromatography with the help of a block diagram. | 4 |
| | d) Briefly describe the layered and particulate type of composite materials. | 4 |
| Q.6 | a) Explain the methods of Polymerization i) Bulk ii) Solution. | 6 |
| | b) A sample of water was tested for Hardness and Alkalinity. A 10 ml of the sample tested using the standard procedures gave the following observations. | 6 |
| | i) 2.5 ml of 0.1M EDTA required to achieve the Eriochrome Black T indicator endpoint | |
| | ii) 1.5 ml of 0.1N HCl required to achieve the methyl orange endpoint. Calculate the hardness and Alkalinity of the sample in ppm CaCO_3 equivalents. (1ml of 0.01M EDTA = 1mg CaCO_3 equivalents Hardness ; 1ml of 1M HCl = 50 mg CaCO_3 equivalents alkalinity) | |
| | c) State the principle and give the applications of the D.S.C. | 4 |
| | d) Briefly describe the constituents of composites. | 4 |

PART – C

(Answer Any One Questions)

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|------------|---|---|
| Q.7 | a) Sketch the electrochemical cell and write the cell reactions if Zn & Ag electrodes are dipped in their respective salt solution i.e. Zn dipped in 0.001M solution and Ag dipped in 0.01M solution. Find out the cell potential (given: $E^\circ_{\text{Zn}} = -0.76\text{ V}$ & $E^\circ_{\text{Ag}} = 0.80\text{ V}$) | 6 |
| | b) What is anodization. How does it protect the metal from corrosion. Explain with a suitable example. | 6 |
| | c) Define the term COD of water 20ml of sewage sample for COD is reacted with 25 ml of $\text{K}_2\text{Cr}_2\text{O}_7$ solution and the unreacted $\text{K}_2\text{Cr}_2\text{O}_7$ requires 10 ml of N/4 FAS solution. Under similar conditions, in Blank titration 16ml of FAS is used up. Calculate the COD of the sample. | 4 |
| | d) Give the advantages of Synthetic Rubber over Natural rubber. | 4 |
| Q.8 | a) With the help of flow sheet diagram explain the treatment carried out by the municipal plant to obtain potable water. | 6 |
| | b) Describe the characteristics of a Battery. | 6 |
| | c) Explain the basic set up of an electroplating bath with the help of a suitable example. | 4 |
| | d) Explain the use of D.M.C. in Green Chemistry as an alternative reagent. | 4 |