



CBCS SCHEME

17CHE12/22

First/Second Semester B.E. Degree Examination, Feb./Mar. 2022 Engineering Chemistry

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Derive Nernst equation for single electrode potential. (06 Marks)
- b. Define electrolyte concentration cell. Two identical Cu-rods are dipped in 0.01M CuSO₄ and 0.001N CuSO₄ solution respectively and combined to form a concentration cell. Write cell representation, cell reaction and calculate e.m.f of cell at 298K. (06 Marks)
- c. Explain the following Battery characteristics : (08 Marks)
i) Cell potential ii) Capacity iii) Cycle life iv) Self life.

OR

- 2 a. What are reference electrodes? Describe the construction and working of calomel electrode with reactions. (06 Marks)
- b. Describe the construction, working and application of Lithium-ion battery. Mention its advantage. (06 Marks)
- c. Write the reaction involved in working of the following : (08 Marks)
i) Ni – metal hydride battery
ii) Zn – Air battery
iii) Methanol oxygen fuel cell.

Module-2

- 3 a. Define Metallic corrosion and explain electrochemical theory and mechanism of electrochemical corrosion taking iron as an example. (07 Marks)
- b. Explain the following factors affecting rate of corrosion. (07 Marks)
i) Nature of corrosion product
ii) Ratio of anodic and cathodic area
iii) pH of the corrosive medium.
- c. Describe electroplating of chromium (decorative or hard). Mention the reason for not using chromium anode in electroplating of chromium. (06 Marks)

OR

- 4 a. Describe waterline and pitting corrosion. (06 Marks)
- b. Explain the term decomposition potential and overvoltage and its significance to electroplating process. (07 Marks)
- c. Describe the electroless plating of copper with plating reaction. (07 Marks)

Module-3

- 5 a. Define cracking explain the fluidized bed catalytic cracking method with a neat diagram. (06 Marks)
- b. What is reforming of petroleum? Write any four reaction involved in reforming process. (07 Marks)
- c. What is Photovoltaic Cell? Explain the construction and working of photovoltaic cell. Mention any two advantage of photovoltaic. (07 Marks)

OR

- 6 a. Calculate the gross and net calorific value of a coal sample from the following data obtained from bomb-calorimetric experiment.
- i) Weight of coal = 0.65kg
 - ii) Weight of water taken in calorimeter = 1200kg
 - iii) Water equivalent of calorimeter = 400gm
 - iv) Latent heat of steam = $587 \times 4.2 \text{ kJ/kg}$
 - v) Hydrogen in coal sample = 2%
 - vi) Sp. Heat of water = 4.18 J kg/kg
 - vii) Rise in term = 1.8°C. (07 Marks)
- b. Explain production of solar grade silicon by union carbide process. (07 Marks)
- c. Explain purification of silicon by zone – reeving technique. (06 Marks)

Module-4

- 7 a. Explain free radical mechanism for addition polymerization taking Vinyl chloride as an example. (07 Marks)
- b. Explain the synthesis and application of the following polymer
i) Plexiglass (PMMA) ii) Polyurethane. (06 Marks)
- c. What do you mean by Glass transition temperature? How the factors, flexibility of polymer chain and intermolecular forces of attraction affected T_g values. (07 Marks)

OR

- 8 a. Calculate number average and weight average molecular weight of a polymer which contains 200 molecular of 2000 molecular mass, 300 molecular of 3000 molecular mass and 500 molecule of 5000 molecular mass respectively. (06 Marks)
- b. Define elastomers explain synthesis, properties and application of silicon rubber. (07 Marks)
- c. What are polymer composites? Describe the synthesis and application of Kevlar fibre. (07 Marks)

Module-5

- 9 a. Explain scale and sludge formation in the boiler. Mention disadvantage of scale formation. (07 Marks)
- b. Explain determination of dissolve O_2 (DO) by Winkler's method. (07 Marks)
- c. Write a note on fullerene. (06 Marks)

OR

- 10 a. What do you mean by desalination of water? Explain desalination of water by electro dialysis method. (07 Marks)
- b. Explain the synthesis of nanomaterial by sol-gel process. (07 Marks)
- c. Write short notes on carbon nanotubes and dendrimers. (06 Marks)
