

CBCS SCHEME

USN

18CHE12/22

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First/Second Semester B.E. Degree Examination, Dec.2024/Jan.2025

Engineering Chemistry

Max. Marks: 100

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

Module-1

- 1 a. What is single electrode potential? Derive Nernst equation for single electrode potential. (06 Marks)
- b. An electrochemical cell consists of an iron electrode, dipped in 0.1 M FeSO_4 and silver electrode dipped in 0.5 M AgNO_3 solution write the cell representation and cell reaction. Calculate the emf of the cell at 298 K. Given that the standard reduction potentials of iron and silver electrodes are -0.44 V and $+0.80\text{ V}$ respectively. (07 Marks)
- c. Explain the construction and working of Ni – MH battery. Mention its applications. (07 Marks)

OR

- 2 a. Explain the construction and working of calomel electrode. Mention its applications. (07 Marks)
- b. Explain the construction and working of Li – ion battery. Mention their applications. (07 Marks)
- c. Define the terms :
(i) Free energy (ii) Entropy and (iii) Cell Potential. (06 Marks)

Module-2

- 3 a. Define Corrosion. Explain electrochemical theory of corrosion taking iron as corroding metal. (07 Marks)
- b. What is galvanization? Describe the galvanization process for iron. (07 Marks)
- c. Explain the process of electroplating of chromium. (06 Marks)

OR

- 4 a. What is cathodic protection? Explain (i) Sacrificial anodic (ii) Impressed current methods. (07 Marks)
- b. What is electrolessplating? Explain the electrolessplating of copper and mention the applications. (07 Marks)
- c. Write note on : (i) Polarization (ii) Decomposition potential (06 Marks)

Module-3

- 5 a. Explain the determination of calorific value of the solid fuel using bomb calorimeter. (07 Marks)
- b. What are fuel cells? How does a fuel cell differ from a conventional cell? (07 Marks)
- c. Explain the preparation of solar grade silicon by union carbide process. (06 Marks)

OR

- 6 a. Calculate the gross and net calorific value of a sample of coal, 0.5 g of which when burnt in a bomb calorimeter raised the temperature of water from 293 K to 296.4 K. The mass water is 1000 g and water equivalent of calorimeter is 350 g. The sp. heat of water is 4.187 KJ/kg/K. Latent heat of steam is 587 cal/g. The coal sample contains 93% carbon, 5% hydrogen and 2% ash. (06 Marks)
- b. Write a note on :
(i) Power alcohol and (ii) Biodiesel (08 Marks)
- c. Explain construction and working of a photovoltaic cell. (06 Marks)

Module-4

- 7 a. Write a note on sources, ill effects of primary air pollutants CO and SO_2 . Mention the methods of control. (07 Marks)
- b. Calculate COD of effluent sample when 25 cm^3 of effluent requires 8.9 cm^3 of 0.001 M $\text{K}_2\text{Cr}_2\text{O}_7$ for complete oxidation. (06 Marks)
- c. Define BOD. Explain the activated sludge treatment of sewage water. (07 Marks)

OR

- 8 a. What is biomedical waste? Explain the disposal methods of biomedical waste. (07 Marks)
- b. What is desalination? Explain the desalination of water by reverse osmosis. (07 Marks)
- c. Write a note on sources, ill effects of lead and mercury as pollutants. (06 Marks)

Module-5

- 9 a. Explain theory and instrumentation of calorimetry. (07 Marks)
- b. Write the synthesis of nanomaterials by precipitation method. (07 Marks)
- c. Write note on fullerenes. Mention its applications. (06 Marks)

OR

- 10 a. Explain the synthesis of nano-material by sol-gel technique. (07 Marks)
- b. Explain theory, instrumentation and any one application of conductometry. (07 Marks)
- c. Discuss the theory, instrumentation and applications of atomic absorption spectroscopy. (06 Marks)
