

CBCS SCHEME

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21CHE12/22

First/Second Semester B.E./B.Tech. Degree Examination, June/July 2025 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. Explain the construction, working and applications of Li-ion batteries. (06 Marks)
b. Define 'Ion selective electrodes'. Explain the construction, working of glass electrode. (07 Marks)
c. For the cell $\text{Li}|\text{Li}^+(0.2\text{m})||\text{Zn}^{2+}(0.45\text{m})|\text{Zn}$, write the cell reactions and calculate the emf of the cell at 298 K, if standard electrode potentials of Zn and Li electrodes are -0.76 and -3.04V respectively. (07 Marks)

OR

- 2 a. Briefly explain the direct recycling of Li-ion batteries. (06 Marks)
b. What is a 'reference electrode' Describe the construction, working and applications of calomel electrode. (07 Marks)
c. Define 'Single Electrode Potential'. Calculate the electrode potential of Zn electrode at 28°C , dipped in ZnSO_4 solution of 0.055m . Given that standard electrode potential of Zn is -0.76V . (07 Marks)

Module-2

- 3 a. Distinguish between electroplating and electroless plating. (06 Marks)
b. Define 'corrosion'. Explain the electro-chemical theory of corrosion taking iron metal as an example. (07 Marks)
c. What is 'Cathodic protection'? Briefly explain the sacrificial Anode method of cathodic protection. (07 Marks)

OR

- 4 a. What is 'Metal finishing'? mention any five technological importance. (06 Marks)
b. Explain the following factors affecting rate of corrosion :
i) Nature of corrosion product
ii) Ratio of anodic to cathodic areas
iii) Temperature. (07 Marks)
c. What is 'electroless plating'? explain the electroless plating of copper. (07 Marks)

Module-3

- 5 a. Explain the fullerenes with properties and applications. (06 Marks)
b. Write a note on synthesis, properties and applications of polyurethanes. (07 Marks)
c. What is a 'conducting polymer'? Explain the factors influencing the conduction in organic polymers. (07 Marks)

OR

- 6 a. Briefly explain the following size dependant properties of nano materials :
 i) Surface area
 ii) Catalytic properties. (06 Marks)
 b. Define 'Biodegradable polymer'. Explain the synthesis and applications of polylactic acid. (07 Marks)
 c. What are 'Polymer composites'? Explain the synthesis and properties of Kevlar fibre. (07 Marks)

Module-4

- 7 a. Briefly explain any six basic principles of green chemistry. (06 Marks)
 b. Explain the production of hydrogen by photocatalytic water splitting method. (07 Marks)
 c. What are 'photovoltaic cells'? Brief on the construction, working and applications of photovoltaic cells. (07 Marks)

OR

- 8 a. Describe the construction and working of methanol – oxygen fuel cell with H_2SO_4 as electrolyte. (06 Marks)
 b. Explain the microwave synthesis with examples. (07 Marks)
 c. Describe the synthesis of paracetamol by conventional and green route from phenol. (07 Marks)

Module-5

- 9 a. In a COD experiment, 28.5cm^3 and 17.5cm^3 of 0.025N FAS solutions were required for blank and sample titration respectively. The volume of test sample used was 25cm^3 , calculate the COD of the sample. (06 Marks)
 b. Explain the theory, instrumentation and applications of colorimetry. (07 Marks)
 c. Describe the principles and requirements of titrimetric analysis. (07 Marks)

OR

- 10 a. Define the following units of a standard solution :
 i) ppm
 ii) Molarity
 iii) Normality. (06 Marks)
 b. Explain the method of determination of hardness of water by EDTA titration. (07 Marks)
 c. Explain the theory, instrumentation and applications of potentiometry. (07 Marks)

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