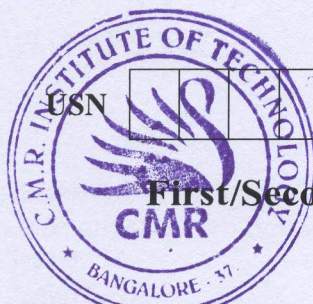


# CBCS SCHEME

21CHE12/22



Time: 3 hrs.

Max. Marks: 100

## First/Second Semester B.E. Degree Examination, June/July 2024 Engineering Chemistry

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

### Module-1

- 1 a. Define Single Electrode Potential. Derive Nernst's equation for single electrode potential. (07 Marks)  
b. What are ion selective electrodes? Explain construction and working of glass electrode. (07 Marks)  
c. Write brief note on recycling of Lithium ion batteries by direct recycling method. (06 Marks)

OR

- 2 a. Distinguish between primary, secondary and reserve batteries. (06 Marks)  
b. Describe the construction and working principle of calomel electrode. (07 Marks)  
c. For the cell,  $\text{Fe} | \text{Fe}^{+2} (0.01) || \text{Ag}^+ (0.1) | \text{Ag}$   
Write the cell reaction and calculate the emf of the cell at 298 K. If standard electrode potential of Fe and Ag electrodes are  $-0.44 \text{ V}$  and  $+0.8 \text{ V}$  respectively. (07 Marks)

### Module-2

- 3 a. Explain the following factors which affecting the rate of corrosion:  
i) Ratio of anodic and cathodic areas  
ii) Nature of the corrosion product (07 Marks)  
b. Explain the following :  
i) Differential Metal Corrosion (06 Marks)  
ii) Waterline corrosion (07 Marks)  
c. What is Electroplating? Explain the electroplating of chromium. (07 Marks)

OR

- 4 a. What is meant by metal finishing? Mention (any five) technological importance of metal finishing. (06 Marks)  
b. A thick steel sheet of Area  $800 \text{ cm}^2$  is exposed to air near the ocean. After a year period it was found to experience a weight loss of  $7.6 \text{ kg}$  due to corrosion. If the density of the brass is  $7.9 \text{ g/cm}^3$ . Calculate the corrosion penetrating rate in mpy and mm/y (given  $k = 534$  in mpy and  $87.6$  in mm/y). (07 Marks)  
c. What is electroless plating? Explain the electroless plating of copper. (07 Marks)

### Module-3

- 5 a. What are polymer composites? Explain the synthesis and application of Kevlar fibre. (07 Marks)  
b. What are conducting polymers? Explain the various factors influencing the conduction in organic polymers. (07 Marks)  
c. Explain any two size dependent properties of nanomaterials. (06 Marks)



OR

- 6 a. What are nanomaterials? Explain the synthesis of nanomaterial by sol-gel process. (07 Marks)  
b. What are biodegradable polymers? Explain the properties and application of polylactic acid. (07 Marks)  
c. Write a note on Carbon nanotubes properties and its application. (06 Marks)

**Module-4**

- 7 a. Explain briefly any 6 basic principles of green chemistry. (06 Marks)  
b. Explain the synthesis of Adipic acid by conventional route from Benzene and Green route from glucose. (07 Marks)  
c. Describe the hydrogen production by photo catalytic water splitting method. (07 Marks)

OR

- 8 a. Explain the construction and working of methanol-oxygen fuel cell. (06 Marks)  
b. Explain the synthesis of paracetamol by conventional and green route from phenol. (07 Marks)  
c. Describe the hydrogen production by photo electrocatalytic method. (07 Marks)

**Module-5**

- 9 a. Explain the theory, instrumentation and applications of calorimetry. (07 Marks)  
b. Write the principles and requirements of titrimetric analysis. (07 Marks)  
c. In COD test  $25.5 \text{ cm}^3$  and  $12.5 \text{ cm}^3$  of 0.05 N FAS solution are required for blank and sample titration respectively. The volume of the test sample used is  $26 \text{ cm}^3$ . Calculate the COD of the sample. (06 Marks)

OR

CMRIT LIBRARY  
BANGALORE - 560 037

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

\*\*\*\*\*