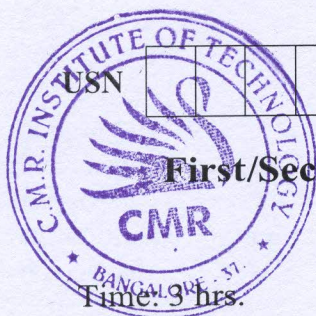


# CBCS SCHEME



18CHE12/22

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

Max. Marks: 100

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

### Module-1

- 1 a. What are ion-selective electrodes? Explain the construction and principle of glass electrode. (06 Marks)
- b. Describe the construction and working of Lithium-ion battery. Mention its applications. (07 Marks)
- c. An electrochemical cell consists of iron electrode dipped in 0.1 FeSO<sub>4</sub> and silver electrode dipped in 0.05M AgNO<sub>3</sub> solution. Write cell representation, cell reactions and calculate emf of the cell at 298 K. Given that the standard electrode potential of iron and silver electrodes are -0.44V and 0.8V respectively. (07 Marks)

OR

- 2 a. What is battery? Explain secondary and reserve battery with examples. (06 Marks)
- b. Describe the construction and working of Nickel – metal hydride battery. Give its applications. (07 Marks)
- c. What are electrolyte concentration cells? The emf of the cell  
$$\text{Cu} \mid \text{CuSO}_4 \parallel \text{CuSO}_4 \mid \text{Cu}$$
 is 0.0595 V at 298K. Find the value of X.  
(0.001M) (X M) (07 Marks)

### Module-2

- 3 a. Define Corrosion. Explain the electrochemical theory of corrosion by taking iron as an example. (07 Marks)
- b. Explain how the following factors affecting rate of corrosion :  
i) Ratio of anodic to cathodic area ii) pH of the medium (06 Marks)
- c. What is electroless plating? Explain the process of electroless plating of Nickel. (07 Marks)

OR

- 4 a. What is cathodic protection? Explain sacrificial anode and impressed current methods. (07 Marks)
- b. Explain briefly the following factors:  
i) Polarization of electrode ii) Over voltage. (06 Marks)
- c. What is electroplating? Explain the process of electroplating of chromium. (07 Marks)

### Module-3

- 5 a. Define HCV. Explain the experimental determination of calorific value of solid fuel using Bomb calorimeter. (07 Marks)
- b. What are fuel cells? Describe the construction and working of solid oxide fuel cell. Give its applications. (06 Marks)
- c. On burning  $0.76 \times 10^{-3}$  kg of solid fuel in a Bomb calorimeter, the temperature of 2.5kg of water is increased from 25°C to 28°C. The water equivalent of calorimeter and latent heat of steam are 0.486 kg and 2457 kJ/kg respectively. Calculate its HCV and LCV. Given specific heat of water = 4.187 kJ/kg/°C and percentage of hydrogen is 2.5. (07 Marks)



OR

- 6 a. Explain the preparation of solar grade silicon by union carbide process. (07 Marks)  
 b. Illustrate the construction and working of PV cell. Mention its advantages and disadvantages. (07 Marks)  
 c. What is Biodiesel? Explain the synthesis of Biodiesel with reaction and mention its advantages. (06 Marks)

**Module-4**

- 7 a. What are the main sources, effects and control of carbon monoxide pollution? (07 Marks)  
 b. Define Biomedical waste. Mention its sources, characteristics and disposal methods. (07 Marks)  
 c. Define COD. 25cm<sup>3</sup> of waste water mixed with 10 cm<sup>3</sup> of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>, acidified and refluxed. The unreacted K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> require 15.2 cm<sup>3</sup> of 0.3N FAS. In a blank titration 10 cm<sup>3</sup> of acidified K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> require 19.4cm<sup>3</sup> of same 0.3N FAS. Calculate COD if waste water. (06 Marks)

OR

- 8 a. What is secondary air pollutant? Explain ozone depletion with reactions mention its effects and control measures. (08 Marks)  
 b. What is desalination? Describe the purification of sea water by reverse osmosis process. (06 Marks)  
 c. Explain the secondary and tertiary treatment of sewage. (06 Marks)

**Module-5**

- 9 a. Explain the theory and instrumentation of potentiometry. (07 Marks)  
 b. Explain the instrumentation and applications of conductometry by taking following examples:  
 i) Strong acid with strong base ii) Weak acid with a strong base (07 Marks)  
 c. Write a note on carbon nanotubes. Mention its applications. (06 Marks)

OR

- 10 a. What are nanomaterials? Explain the synthesis of nanomaterial by precipitation method. (07 Marks)  
 b. Write a note on fullerenes. Mention its properties and applications. (07 Marks)  
 c. Explain the theory and instrumentation of colorimetry. (06 Marks)

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