CBCS SCHEME

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21CHE12/22

First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024
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. Define standard electrode potential. Obtain the expression for single electrode potential. **(07 Marks)**

b. What are ion-selective electrodes? Describe the construction and working of glass electrodes. **(07 Marks)**

c. Explain the construction and working of Lithium-ion battery. Mention its applications. **(06 Marks)**

OR

2 a. Define battery. Give the classification of batteries with suitable examples. **(07 Marks)**

b. What are reference electrodes? Explain the construction and working of Calomel electrode. Mention its applications. **(07 Marks)**

c. Define cell potential. Calculate the standard electrode potential of copper at 25 °C when the potential of copper electrode is 0.296 V and $[Cu^{2+}] = 0.015M$. **(06 Marks)**

Module-2

3 a. Define corrosion. Explain the electrochemical theory of corrosion by taking iron as an example. **(07 Marks)**

b. Explain with suitable example :
(i) Differential metal corrosion
(ii) Differential aeration corrosion **(06 Marks)**

c. What is electrolessplating? Explain the electroless plating of copper. **(07 Marks)**

OR

4 a. What is meant by metal finishing? Mention any six technological importance of metal finishing. **(06 Marks)**

b. Distinguish between electroplating and electrolessplating. **(07 Marks)**

c. What is cathodic protection? Explain sacrificial anode and impressed current methods. **(07 Marks)**

Module-3

5 a. What are conducting polymers? Explain the mechanism of conduction in polyaniline. **(07 Marks)**

b. Explain the synthesis and applications of polyurethane. **(06 Marks)**

c. What are nanomaterials? Explain the synthesis of nanomaterial by precipitation method. **(07 Marks)**

OR

6 a. Explain any two size dependent properties of nano-materials. **(06 Marks)**

b. Write a note on carbon nanotubes. Mention its properties and applications. **(07 Marks)**

c. What are polymer composites? Explain the synthesis and applications of Kevlar fibre. **(07 Marks)**

Module-4

7 a. Briefly explain any six basic principles of green chemistry. (06 Marks)

b. Explain the synthesis of paracetamol by conventional and green route from phenol. (07 Marks)

c. What is photovoltaic cell? Explain the construction and working of photo voltaic cell. Mention its applications. (07 Marks)

OR

8 a. Describe the hydrogen production by photocatalytic water splitting method. (07 Marks)

b. Explain microwave synthesis and Biocatalyzed reactions with suitable examples. (07 Marks)

c. What is fuel cell? Explain construction and working of methanol-oxygen fuel cell. (06 Marks)

Module-5

9 a. Explain the theory, instrumentation and applications of potentiometry. (07 Marks)

b. What is hardness of water? Explain the determination of hardness of water by EDTA method. (07 Marks)

c. Define BOD. In a COD test 30.5 cm^3 and 19.3 cm^3 of 0.05 N FAS solution arc required for blank and sample titration respectively. The volume of test sample is 30.0 cm^3. Calculate the COD of the waste water sample. (06 Marks)

OR

10 a. Define the following units of standard solution :

(i) Normality
(ii) Molarity
(iii) Mole fraction (06 Marks)

b. What is COD? Explain the experimental determination of COD. (07 Marks)

c. Explain the theory, instrumentation and applications of calorimetry. (07 Marks)

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