21CHE12/22

USN

First/Second Semester B.E. Degree Examination, June/July 2023
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 single electrode potential. Derive Nernst equation for single electrode potential.
                                                                                                  (07 Marks)
    b. What are ion selective electrodes? Explain the determination of pH using Glass Electrode.
                                                                                                  (07 Marks)
    c. Distinguish between primary, secondary and reserve batteries.   **(06 Marks)**

OR

2   a. Describe the construction and working of Li-ion battery. Mention its applications. **(07 Marks)**
    b. What voltage will be generated by a cell that consists of iron electrode immersed in 0.1M $FeSO_4$ solution and a silver electrode immersed in 0.05M $AgNO_3$ solution at 298K. given standard electrode potentials of Fe and Ag are –0.44V and 0.80V respectively. Write the cell representation and cell reactions.   **(07 Marks)**
    c. What are reference electrodes? Explain the construction and working of calomel electrode.
                                                                                                  (06 Marks)

Module-2

3   a. What is corrosion? Describe the electrochemical theory of corrosion by taking iron metal as an example.   **(07 Marks)**
    b. Explain the factors affecting the rate of corrosion :
       i) Nature of corrosion product
       ii) Ratio of anode to cathodic areas
       iii)pH.   **(07 Marks)**
    c. What is electroless plating? Outline the electroless plating of copper.   **(06 Marks)**

OR

4   a. What is meant by metal finishing? Mention (any five) technological importance of metal finishing.   **(06 Marks)**
    b. What is electroplating? Discuss the electroplating of chromium.   **(07 Marks)**
    c. Explain the process of :
       i) Galvanizing process
       ii) Anodizing of Aluminium.   **(07 Marks)**

Module-3

5   a. What are polymer composites? Explain the synthesis and application of Kevlar fibre.
                                                                                                  (06 Marks)
    b. What are conducting polymers? Describe the mechanism of conduction in poly Aniline.
                                                                                                  (07 Marks)
    c. Briefly explain the carbon nanotubes with properties and applications.   **(07 Marks)**

OR

6 a. Describe the synthesis of nano-material by sol-gel technique. (07 Marks)
  b. Explain any three size dependent properties of nano material. (06 Marks)
  c. Explain the synthesis, properties and application of polyurethane. (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 are PV cells? Describe the construction and working of photovoltaic cells. (07 Marks)

OR

8 a. With a neat diagram, explain the production of hydrogen by photocatalytic method. (07 Marks)
  b. Explain the following with example :
    i) Solvent free reaction
    ii) Micro wave synthesis. (07 Marks)
  c. Describe the construction and working of methanol-oxygen fuel cell. (06 Marks)

Module-5

9 a. Explain the theory, instrumentation and application of colorimetry. (07 Marks)
  b. Explain the determination of hardness of water by EDTA method. (07 Marks)
  c. In c COD test $28.5cm^3$ and $13.5cm^3$ of 0.05N FAS solutions are required for blank and sample titration respectively. The volume of test sample used is $25cm^3$. Calculate the COD of the sample solution. (06 Marks)

OR

10 a. Define the following units of standard solution :
    i) Normality
    ii) Molarity
    iii) PPM. (06 Marks)
  b. Define COD. Explain the determination of COD of waste water sample. (07 Marks)
  c. Explain the theory, instrumentation and application of flame photometry. (07 Marks)

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