CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐

17CHE12/22

First/Second Semester B.E. Degree Examination, Feb./Mar. 2022
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. Derive Nernst equation for single electrode potential. **(06 Marks)**
    b. Define electrolyte concentration cell. Two identical cu-rods are dipped in 0.01M $CuSO_4$ and 0.001N $CuSO_4$ solution respectively and combined to form a concentration cell. Write cell representation, cell reaction and calculate e.m.f of cell at 298K. **(06 Marks)**
    c. Explain the following Battery characteristics :
       i) Cell potential   ii) Capacity   iii) Cycle life   iv) Self life. **(08 Marks)**

OR

2   a. What are reference electrodes? Describe the construction and working of calomel electrode with reactions. **(06 Marks)**
    b. Describe the construction, working and application of Lithium-ion battery. Mention its advantage. **(06 Marks)**
    c. Write the reaction involved in working of the following :
       i)   Ni – metal hydride battery
       ii) Zn – Air battery
       iii) Methanol oxygen fuel cell. **(08 Marks)**

Module-2

3   a. Define Metallic corrosion and explain electrochemical theory and mechanism of electrochemical theory and mechanism of electrochemical corrosion taking iron as an example. **(07 Marks)**
    b. Explain the following factors affecting rate of corrosion.
       i)   Nature of corrosion product
       ii) Ratio of anodoc and cathodic area
       iii) pH of the corrosive medium. **(07 Marks)**
    c. Describe electroplating of chromium (decorative or hard). Mention the reason for not using chromium anode in electroplating of chromium. **(06 Marks)**

OR

4   a. Describe waterline and pitting corrosion. **(06 Marks)**
    b. Explain the term decomposition potential and overvoltage and its significance to electroplating process. **(07 Marks)**
    c. Describe the electroless plating of copper with plating reaction. **(07 Marks)**

Module-3

5   a. Define cracking explain the fluidized bed catalytic cracking method with a neat diagram. **(06 Marks)**
    b. What is reforming of petroleum? Write any four reaction involved in reforming process. **(07 Marks)**
    c. What is Photovoltaic Cell? Explain the construction and working of photovoltaic cell. Mention any two advantage of photovoltaic. **(07 Marks)**

OR

6 a. Calculate the gross and net calorific value of a coal sample from the following data obtained from bomb-calorimetric experiment.
   i)   Weight of coal   = 0.65kg
   ii) Weight of water taken in calorimeter   = 1200kg
   iii) Water equivalent of calorimeter   = 400gm
   iv) Latent heat of steam   = 587×4.2kj/kg
   v)   Hydrogen in coal sample   = 2%
   vi) Sp. Heat of water   = 4.18 J kg/kg
   vii) Rise in term   = 1.8°C.   (07 Marks)

   b. Explain production of solar grade silicon by union carbide process.   (07 Marks)
   c. Explain purification of silicon by zone – reefing technique.   (06 Marks)

Module-4

7 a. Explain free radical mechanism for addition polymerization taking Vinyl chloride as an example.   (07 Marks)
   b. Explain the synthesis and application of the following polymer
      i) Plexiglass (PMMA)   ii) Polyurethane.   (06 Marks)
   c. What do you mean by Glass transition temperature? How the factors, flexibility of polymer chain and intermolecular forces of attraction affected T_g values.   (07 Marks)

OR

8 a. Calculate number average and weight average molecular weight of a polymer which contains 200 molecular of 2000 molecular mass, 300 molecular of 3000 molecular mass and 500 molecule of 5000 molecular mass respectively.   (06 Marks)
   b. Define elastomers explain synthesis, properties and application of silicon rubber.   (07 Marks)
   c. What are polymer composites? Describe the synthesis and application of Kevlar fibre.
                                                                                 (07 Marks)

Module-5

9 a. Explain scale and sludge formation in the boiler. Mention disadvantage of scale formation.
                                                                                 (07 Marks)
   b. Explain determination of dissolve O_2 (DO) by Winkler's method.   (07 Marks)
   c. Write a note on fullerene.   (06 Marks)

OR

10 a. What do you mean by desalination of water? Explain desalination of water by electro dialysis method.   (07 Marks)
   b. Explain the synthesis of nanomateiral by sol-gel process.   (07 Marks)
   c. Write short notes on carbon nanotubes and dendrimers.   (06 Marks)

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