CBCS SCHEME

USN | | | | | | | | | | **18CHE12/22**

First/Second Semester B.E. Degree Examination, Aug./Sept.2020

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 reduction potential and derive Nernst equation for single electrode potential. **(06 Marks)**

b. What is a Reference electrode? Explain the construction and working of a Calomel electrode. **(07 Marks)**

c. Define Cell Potential. Give the cell representation , cell reactions and calculate the potential of the cell consists of Li and Cu electrodes dipped in 0.1 M Li Cℓ and 0.5M $CuSO_4$ solutions at 25^0C. Given E^0Li = -3.05V and E^0Cu = 0.34V. **(07 Marks)**

OR

2 a. Define Ion selective electrode. Explain the determination of pH using glass electrode. **(06 Marks)**

b. Derive an equation for potential of a concentration cell and calculate the potential of following cell at 25^0C. Ag/Ag NO_3 (0.005m) // Ag NO_3(0.5m)/Ag. **(07 Marks)**

c. Explain the construction and working of Li - ion cells. Mention its applications. **(07 Marks)**

Module-2

3 a. Briefly explain the effect of following factors on rate of corrosion :
i) The ratio of Anodic and Cathodic areas ii) Nature of corrosion product.
iii) pH of the medium. **(06 Marks)**

b. Define Corrosion of metals. Describe the electrochemical theory of rusting of iron. **(07 Marks)**

c. Define Electroless plating and explain electroless plating of copper. **(07 Marks)**

OR

4 a. Explain Electroplating of hard chromium and mention its applications. **(06 Marks)**

b. Discuss the following : i) Differential metal corrosion ii) Anodization of aluminum. **(07 Marks)**

c. Explain in brief : i) Sacrificial anode method ii) Decomposition potential. **(07 Marks)**

Module-3

5 a. Define Calorific value of a fuel and calculate the gross and net calorific value of a coal from the following data :
i) Mass of coal burnt = 0.85 gms.
ii) Water equivalent mass of copper calorimeter = 0.65kg.
iii) Mass of water taken in the copper calorimeter = 2.2kg.
iv) Rise in temperature of water = 3.0^0C.
v) Percentage of H_2 in the coal = 3.2.
vi) Latent heat of steam = 2457.76 kJ/kg. **(06 Marks)**

b. Define Fuel cell and explain the construction and working $CH_3OH - O_2$ fuel cell. **(07 Marks)**

c. Describe the preparation of solar grade silicon by Union carbide process. **(07 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

6 a. Explain the experimental determination of calorific value of a fuel using bomb calorimeter. **(07 Marks)**
b. What are Solar cells? Explain the construction and working of a Photo voltaic cell. **(06 Marks)**
c. Discuss : i) Knocking of petrol engine ii) Power alcohol. **(07 Marks)**

Module-4

7 a. Discuss the sources , effects and control measures of oxides of nitrogen. **(06 Marks)**
b. Explain the causes, effects and disposal methods of biomedical wastes. **(07 Marks)**
c. Explain Scale and Sludge formation in boilers. **(07 Marks)**

OR

8 a. Define BOD and COD. Calculate the COD of a wastewater if 25mℓ of which consumes 10.5mℓ of 0.02N $K_2Cr_2O_7$ for complete oxidation. **(06 Marks)**
b. Explain the softening of water by ion exchange method. **(07 Marks)**
c. Explain the following : i) Ozone depletions ii) Reverse osmosis. **(07 Marks)**

Module-5

9 a. Explain the theory and instrumentation of colorimetry. **(07 Marks)**
b. Discuss the theory of conductometric titration and explain the nature of graph for the following titrations :
i) Strong acid with strong base ii) Weak acid with strong base. **(07 Marks)**
c. Explain the synthesis of nanomaterials by Chemical Vapour Deposition method. **(06 Marks)**

OR

10 a. Explain Sol – gel method of synthesis of nanomaterials. **(06 Marks)**
b. Write a note on synthesis , properties and uses of Fullerenes. **(07 Marks)**
c. Explain 'Atomic Absorption Spectroscopy'. **(07 Marks)**

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