CBCS SCHEME

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18CHE12/22

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 and derive Nernst equation for single electrode potential. **(07 Marks)**

b. Two silver electrodes separately placed in $AgNO_3$ solutions of equal concentrations to form a cell.
   i) What is the cell voltage?
   ii) What is the voltage of the cell if one of the solutions concentrations is 100 times more than the other? **(06 Marks)**

c. What are reference electrodes? Describe the construction and working of calomel electrode. Mention its advantages. **(07 Marks)**

OR

2 a. Describe the construction and working principle of Li-ion battery. Mention its applications. **(07 Marks)**

b. Calculate the emf of a cell formed by coupling of zinc electrode in 0.05M Z_nSO_4 solution and cadmium electrode in 0.25M $CdSO_4$ solutions. Write the cell representation and reactions. Given standard electrode potential Z_n and C_d are –0.76 and – 0.40V respectively. **(06 Marks)**

c. Explain how P^H of the given solution measured using a glass electrode. Mention the advantages of glass electrode. **(07 Marks)**

Module-2

3 a. What is Corrosion? Explain electro chemical theory of corrosion taking iron as an example. **(07 Marks)**

b. What is Cathodic protection? Explain sacrificial anode and impressed current methods. **(06 Marks)**

c. What is electroless plating? Explain electroless plating of Nickel. **(07 Marks)**

OR

4 a. Explain the type of corrosion taking place in the following case
   i) Copper bolt in iron vessel
   ii) Dust deposition on a metal surface for a long time. **(07 Marks)**

b. What is metal finishing? Mention the technological importance of metal finishing. **(06 Marks)**

c. Explain the effect of the following factor on the rate of corrosion.
   i) Nature of corrosion product
   ii) Relative area of anode and cathode
   iii) Temperature. **(07 Marks)**

Module-3

5 a. How is Calorific value of a solid fuel measured using a Bomb calorimeter. **(07 Marks)**

b. What are fuel cells? Explain the construction and working of solid oxide fuel cell. **(06 Marks)**

c. What is Biodiesel? Explain the synthesis of Biodiesel. Mention the advantages of Biodiesel. **(07 Marks)**

OR

6 a. Define GCV and NCV.
0.75g of a coal sample containing 70%C 5% H_2 and 6% ash was burst in a Bomb calorimeter. The rise in temperature of 2500g of water was 3°C. Find GCV and NCV if water equivalent of calorimeter is 500g, specific heat of water is 4.187 kJ/Kg°C and Latent heat of steam is 2454 kJ/Kg. **(07 Marks)**

b. What is knocking in IC engine? Explain the mechanism of knocking and mention its ill effects. **(06 Marks)**

c. Describe the synthesis of solar grade silicon by union-carbide process. **(07 Marks)**

Module-4

7 a. Explain the mechanism of ozone depletion. Mention its ill effects. **(07 Marks)**

b. What are scales and Sludges? Mention their ill effects and explain the method of prevention. **(06 Marks)**

c. What are the sources, effects and control methods of oxides of sulphur. **(07 Marks)**

OR

8 a. Write a note on Fluride estimation in drinking water. Mention its ill effect. **(07 Marks)**

b. What is desalination of water? Explain reverse osmosis method of desalination. **(06 Marks)**

c. Define BOD and COD.
25cm^3 of waste water with 10mℓ of 0.1N $K_2Cr_2O_7$ under acidic conditions required 15mℓ of 0.05N FAS solution, under similar conditions, 10mℓ of same $K_2Cr_2O_7$ and 20mℓ distilled water required 35mℓ of 0.05N FAS solution. Calculate COD. **(07 Marks)**

Module-5

9 a. Explain the theory, instrumentation of flame photometry and its application in the estimation of Na. **(07 Marks)**

b. What are nano-materials? Explain the synthesis of nano-materials by Sol-gel method. **(06 Marks)**

c. Explain the theory of conductometry for the estimation of a mixture of strong acid and a weak acid against a strong base. **(07 Marks)**

OR

10 a. Explain the theory of calorimetry and its application in the estimation of Cu in $CuSO_4$ solution. **(07 Marks)**

b. Write a note on fullerenes. **(06 Marks)**

c. Explain the theory and instrumentation of potentiometry. **(07 Marks)**

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