CBCS SCHEME

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18CHE12/22

First/Second Semester B.E. Degree Examination, Dec.2019/Jan.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 Free Energy. Derive Nernst equation for single electrode potential. **(07 Marks)**

b. What are Reference Electrodes? Describe the construction and working of Calomel electrode. **(06 Marks)**

c. Explain the construction and working of Ni – Metal Hydride battery. Give the reaction during charging and discharging mode. Give any two applications. **(07 Marks)**

OR

2 a. Describe the construction and working of Lithium – ion battery. Give its applications. **(07 Marks)**

b. Write a note on Primary , Secondary and Reserve batteries. **(06 Marks)**

c. What are Concentration Cells? EMF of the cell $Ag/AgNO_3(C_1)$ // $AgNO_3$ (C_2 = 0.2m) / Ag is 0.8V. Calculate C_1 of the cell. **(07 Marks)**

Module-2

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

Explain i) Differential Metal Corrosion ii) Pitting Corrosion **(07 Marks)**

c. What do you mean by metal finishing? Mention any five technological importances. **(06 Marks)**

OR

4 a. Define and explain any two terms :
i) Polarisation ii) Decomposition potential iii) Over voltage. **(06 Marks)**

b. What is Electroless Plating? Explain the Electroless plating of copper. **(07 Marks)**

c. Explain the process of Galvanization. **(07 Marks)**

Module-3

5 a. What is Knocking? Explain the mechanism. **(07 Marks)**

b. On burning 0.96 grams of solid fuel in bomb calorimeter the temperature of 3500 grams of water increased by 2.7°C water equivalent of calorimeter and latent heat of steam are 385 grams and 587 cal/gram respectively. If the fuel contains 5% H_2 , calculate its gross and net calorific value. Specific heat of water = 4.187 kJ/kg K. **(06 Marks)**

c. What are Fuel Cells? Describe the construction and working of $CH_3OH – O_2$ fuel cell. **(07 Marks)**

OR

6 a. What are Solar Cells? Explain the construction and working of a typical P.V. Cell. **(07 Marks)**

b. Explain the production of solar grade Si by Union Carbide Process. **(07 Marks)**

c. Write a note on : i) Power alcohol ii) Unleaded petrol. **(06 Marks)**

Module-4

7 a. What are the main sources, effects and control of lead pollution? **(07 Marks)**

b. Mention the various causes, effects and disposal methods of e – waste. **(07 Marks)**

c. 50 mℓ of an industrial sewage has consumed 11.5 mℓ of 0.4N $K_2Cr_2O_7$ solution for complete oxidation. Calculate C.O.D of industrial sewage. **(06 Marks)**

OR

8 a. Explain the activated sludge treatment of sewage water. **(07 Marks)**

b. What is Desalination? Describe the desalination of seawater by reverse Osmosis process. **(07 Marks)**

c. Write a note on Ozone depletion. **(06 Marks)**

Module-5

9 a. Explain the theory, Instrumentation and Application of Calorimetry. **(06 Marks)**

b. What is Potentiometric titration? Explain the principle involved in Potentiometric titration. **(07 Marks)**

c. Write a note on Fullerene. Mention its application. **(07 Marks)**

OR

10 a. What are Nano – materials? Give their synthesis by Sol – gel techniques. **(07 Marks)**

b. Write a note on Graphenes. Mention their applications. **(07 Marks)**

c. Explain the theory and applications of Atomic Absorption Spectroscopy. **(06 Marks)**

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CBCS SCHEME

18CHE12

First Semester B.E. Degree Examination, Dec.2018/Jan.2019
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 terms : (i) Free energy (ii) Entropy (iii) Cell potential. **(06 Marks)**

b. For the cell, $Fe \mid Fe^{2+}(0.01M) \parallel Ag^{+}(0.1M) \mid Ag$, write the cell reaction and calculate the e.m.f of cell at 298 K, if standard potentials of Fe and Ag electrodes are – 0.44 V and +0.8V respectively. **(07 Marks)**

c. What are Secondary Batteries? Explain the construction and working of Nickel – metal hydride (Ni - MH) battery. Mention its applications. **(07 Marks)**

OR

2 a. Define Primary, Secondary and Reserve batteries with examples. **(06 Marks)**

b. What are concentration cells? The cell potential of copper concentration cell $Cu \mid CuSO_4\ (0.005M) \parallel CuSO_4\ (X) \mid Cu$ is 0.0295 V at 25°C. Calculate the value of X. **(06 Marks)**

c. Explain the construction and working of glass electrode giving its application in determination of pH of solution. **(08 Marks)**

Module-2

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

b. Explain (i) Water line corrosion (ii) Pitting corrosion. **(06 Marks)**

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

OR

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

b. Explain the process of (i) Galvanizing (ii) Anodising of Al. **(07 Marks)**

c. What is electroplating? Explain electroplating of chromium. Mention why chromium cannot be used as anode. **(07 Marks)**

Module-3

5 a. Define calorific value of fuel. Explain the experimental determination of calorific value of solid / liquid fuel using Bomb calorimeter. **(08 Marks)**

b. What are fuel cells? Describe the construction and working of Solid Oxide Fuel Cell (SOFC). **(06 Marks)**

c. What are Solar cells? Explain the construction and working of photovoltaic (PV) cell. **(06 Marks)**

OR

6 a. Explain the preparation of solar grade Silicon by Union Carbide process. **(07 Marks)**

b. Write a note on (i) Power alcohol (ii) Unleaded petrol. **(06 Marks)**

c. 0.75 g of coal sample (Carbon 90%, H_2 5% and ash 5%) was subjected to combustion in Bomb calorimeter. Mass of water taken in calorimeter was 2.5 kg and the water equivalent of calorimeter is 0.65 kg. The rise in temperature was found to be 3.2°C. Calculate higher and lower calorific values of the sample. Latent heat of steam = 2457 kJ/kg and specific heat of water = 4.187 kJ/kg/°C. **(07 Marks)**

Module-4

7 a. What are the causes, effects and disposal methods of e-waste? **(07 Marks)**

b. What are the sources, effects and control of lead pollution? (Pb pollution). **(07 Marks)**

c. In a COD test, 30.2 cm^3 and 14.5 cm^3 of 0.05 N FAS solutions are required for a Blank and Sample titration respectively. The volume test sample used was 25 cm^3. Calculate the COD of the sample solution. **(06 Marks)**

OR

8 a. Explain the sources, effects and control of oxides of nitrogen. **(07 Marks)**

b. Explain softening of water by ion exchange method. **(07 Marks)**

c. Explain the Activated sludge treatment of sewage water. **(06 Marks)**

Module-5

9 a. Explain the theory, instrumentation and application of Atomic absorption spectroscopy. **(07 Marks)**

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

c. Write a note on Fullerene. Mention its application. **(06 Marks)**

OR

10 a. What are Nanomaterials? Explain the synthesis of nanomaterials by precipitation method. **(07 Marks)**

b. Explain the synthesis of Nano materials by Sol-Gel technique. **(06 Marks)**

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

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