

CBCS SCHEME

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18CHE12/22

First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024 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 and entropy. Derive Nernst equation for single electrode potential. (07 Marks)
- b. Define electrolyte concentration cell. Represent the cell formed by coupling of two copper electrodes immersed in cupric sulphate solutions. The concentration of cupric ions in one electrode system is 100 times more than the other. Write cell reactions and calculate potential at 298 K. (06 Marks)
- c. Discuss the construction of glass electrode. Explain the determination of pH of a solution using glass electrode. (07 Marks)

OR

- 2 a. Define battery. Give complete classification of batteries with examples. (07 Marks)
- b. What is reference electrode? Explain construction and working of calomel electrode. Mention its applications. (07 Marks)
- c. Explain construction, working and applications of lithium ion battery with discharging reactions. (06 Marks)

Module-2

- 3 a. Define corrosion. Explain the rusting of iron based on electrochemical theory of corrosion. (07 Marks)
- b. Discuss the following factors affecting the rate of corrosion:
(i) Ratio of anodic area to cathodic area.
(ii) Nature of corrosion product
(iii) pH (07 Marks)
- c. Define metal finishing. Give technological importance of metal finishing. (06 Marks)

OR

- 4 a. Define anodizing. Explain anodizing of aluminium. Mention its applications. (07 Marks)
- b. Define electroplating. Distinguish between electroplating and electroless plating. (07 Marks)
- c. Define electroless plating. Describe the electroless plating of copper. (06 Marks)

Module-3

- 5 a. Define GCV. Explain the determination of calorific value of a solid fuel by using Bomb Calorimeter. (08 Marks)
- b. Define fuel cell. Distinguish between conventional cell and fuel cell. (06 Marks)
- c. Define photovoltaic cell. Explain the construction and working of photovoltaic cell. Mention any two advantages. (06 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. On burning 0.92×10^{-3} kg of solid fuel in a Bomb calorimeter, the temperature of 2.4 kg of water is increased from 24°C to 27.8°C . The water equivalent of calorimeter and latent heat of steam are 1.2 kg and 587×4.2 kJ/kg. Specific heat of water is 4.187 kJ/kg $^{\circ}\text{C}$. If the fuel contains 4.5% of hydrogen, calculate its gross and net calorific values. (07 Marks)
- b. Define knocking in petrol engine. Give its mechanism in chemical terms and mention its ill effects. (07 Marks)
- c. Explain construction, working and applications of Solid Oxide Fuel Cell (SOFC). (06 Marks)

Module-4

- 7 a. Discuss the sources, effects and control methods of following air pollutants:
(i) Carbon monoxide (ii) Oxides of sulphur (12 Marks)
- b. Define BOD and COD. In COD test 28.5 cm 3 and 12.3 cm 3 of 0.045 N FAS solution are required for blank and sample titration respectively. The volume of the test sample used is 25 cm 3 . Calculate the COD of the sample solution. (08 Marks)

OR

- 8 a. Discuss the sources and any two disposal methods of solid waste. (07 Marks)
- b. Define softening of water. Explain softening of water by ion-exchange process. (07 Marks)
- c. Define sewage. Explain secondary treatment of sewage by activated sludge process. (06 Marks)

Module-5

- 9 a. Discuss the principle and instrumentation of colorimetry. (08 Marks)
- b. Explain different applications of atomic absorption spectroscopy and flame photometry. (06 Marks)
- c. Define nanomaterials. Explain the synthesis of nanomaterials by sol-gel method. (06 Marks)

OR

- 10 a. Discuss theory and instrumentation of conductometry. (06 Marks)
- b. Explain any four size dependent properties of nanomaterials. (08 Marks)
- c. Discuss properties and applications of graphenes. (06 Marks)
