

# CBCS SCHEME

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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 LiCl and 0.5M CuSO<sub>4</sub> solutions at 25°C. Given  $E^{\circ}\text{Li} = -3.05\text{V}$  and  $E^{\circ}\text{Cu} = 0.34\text{V}$ . (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°C.  $\text{Ag}/\text{AgNO}_3(0.005\text{m}) // \text{AgNO}_3(0.5\text{m})/\text{Ag}$ . (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°C.  
v) Percentage of H<sub>2</sub> 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<sub>3</sub>OH – O<sub>2</sub> fuel cell. (07 Marks)
- c. Describe the preparation of solar grade silicon by Union carbide process. (07 Marks)

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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