



# CBCS SCHEME

15CHE12/22

First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020  
**Engineering Chemistry**

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Derive Nernst equation for single electrode potential. (05 Marks)  
b. What are ion selective electrodes? Explain the determination of  $P^H$  using glass electrode. (05 Marks)  
c. What are fuel cells? Describe the construction and working of  $CH_3OH - O_2$  fuel cell. (06 Marks)

OR

- 2 a. Calculate EMF of a concentration cell constructed by immersing two silver electrodes in silver nitrate solutions of concentration 0.1M and 100M at 298K. Write cell representation. (05 Marks)  
b. Describe the construction and working of Zinc – Air battery. (05 Marks)  
c. Explain the following battery characteristics :  
i) Cell potential/EMF ii) Capacity iii) Cycle life. (06 Marks)

### Module-2

- 3 a. Explain electrochemical theory of corrosion of iron. (05 Marks)  
b. Discuss the effect of i) relative areas of anode and cathode ii) nature of corrosion product on the rate of corrosion. (05 Marks)  
c. What is electroless plating? Mention any four differences between electroplating and electro-less plating. (06 Marks)

OR

- 4 a. Describe differential aeration corrosion with an example. (05 Marks)  
b. What is Galvanization? Describe the process of Galvanization of iron sheet. (05 Marks)  
c. Explain the effect of the following on the nature of electro-deposit :  
i) Current density ii)  $P^H$  iii) Temperature of electro plating bath. (06 Marks)

### Module-3

- 5 a. On combustion, 0.80 g of solid fuel in a Bomb calorimeter, increased the temperature of 3.1 kg of water by 2.3°C. The water equivalent of copper calorimeter and latent heat of steam are 0.47kg and 2457kJ/kg respectively. If the fuel contains 2.5% Hydrogen, calculate the gross and net calorific value of the fuel. Given specific heat of water of 4.187kJ/kg°C. (05 Marks)  
b. Explain the synthesis of petrol by Fischer – Tropsch's process. (05 Marks)  
c. Describe the preparation of solar grade silicon by union carbide process. (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. Explain how calorific value of a solid fuel determined using bomb calorimeter. (05 Marks)  
b. What is meant by reformation of petrol? Explain any four reforming reactions. (05 Marks)  
c. Describe the construction and working of a photovoltaic cell. Mention the advantages. (06 Marks)

**Module-4**

- 7 a. Define glass transition temperature. Discuss any two parameters influencing  $T_g$  of a polymer. (05 Marks)  
b. Discuss the synthesis and applications of epoxy resins. (05 Marks)  
c. What are conducting polymers? Describe the mechanisms of conduction in polyaniline. (06 Marks)

OR

- 8 a. Illustrate free radical mechanism of addition polymerization taking vinyl chloride as monomer. (05 Marks)  
b. Discuss the following structure – property relationships i) Tensile strength ii) Crystallinity. (05 Marks)  
c. Explain the preparation of: i) polymethyl methacrylate (PMMA) ii) Kevlar. (06 Marks)

**Module-5**

- 9 a. What is boiler corrosion? Discuss the boiler corrosion due to dissolved oxygen and  $MgCl_2$ . (05 Marks)  
b. Define COD and BOD. Mention any three differences. (05 Marks)  
c. What are nano-materials? Discuss the synthesis of nano-materials by sol-gel method. (06 Marks)

OR

- 10 a. Discuss secondary treatment of sewage using activated sludge method. (05 Marks)  
b. What is meant by desalination of water? Explain desalination by reverse osmosis method. (05 Marks)  
c. Write a note on carbon nano tubes and fullerenes. (06 Marks)

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