

# CBCS SCHEME

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15CHE12/22

## First/Second Semester B.E. Degree Examination, June/July 2018 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's equation for single electrode potential of an electrode considering reduction reaction. (05 Marks)
- b. Define electrolyte concentration cell. Calculate the e.m.f of the given concentration cell at 298 K  
 $\text{Ag} | \text{AgNO}_3 (0.02 \text{ M}) || \text{AgNO}_3 (2 \text{ M}) | \text{Ag}$  (05 Marks)
- c. Describe construction, working and application of methanol-O<sub>2</sub> fuel cell using H<sub>2</sub>SO<sub>4</sub> as electrolyte (06 Marks)

OR

- 2 a. Define reference electrode. Describe construction and working of Calomel electrode with reactions. (05 Marks)
- b. Describe construction and working of Zn-Air battery. Mention its application. (05 Marks)
- c. Explain the following battery characteristics : (06 Marks)  
(i) Capacity (ii) Cycle life (iii) Energy-efficiency

### Module-2

- 3 a. Explain electrochemical theory of corrosion with its mechanism taking Iron as an example. (06 Marks)
- b. Describe the following factors which affects the rate of corrosion: (06 Marks)  
(i) Nature of corrosion product  
(ii) Ratio of Anodic to cathodic area  
(iii) pH of the medium.
- c. Describe electroplating of Nickel by Watt's bath. Mention its applications. (04 Marks)

OR

- 4 a. Define Metal finishing. Describe the technological importance of metal finishing. (05 Marks)
- b. Describe electroless plating of copper on PCB's with plating reaction. Mention its application. (05 Marks)
- c. Explain Differential Aeration Corrosion with an example. (06 Marks)

### Module-3

- 5 a. Describe Bomb calorimetric method for determination of calorific value of a fuel. (05 Marks)
- b. What do you mean by reforming of petroleum? Give any three reactions involved in reforming process. (05 Marks)
- c. Explain the production of solar grade silicon by Union carbide method. (06 Marks)

1 of 2

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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.

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OR

- 6 a. Calculate the gross or net calorific value of a coal sample from the following data obtained from Bomb calorimetric experiment.
- (i) Weight of coal = 0.75 kg ; (ii) Weight of water taken in calorimeter = 1200 kg ;  
(iii) Water equivalent of calorimeter = 400 kg ; (iv) Rise in temperature = 1.8°C ;  
(v) Hydrogen in coal sample = 2% (vi) Latent heat of steam = 587×4.2 kJ/kg ;  
(vii) Specific heat of water = 4.187 kJ/kg°C (06 Marks)
- b. Explain construction, working and application of photovoltaic cell. (06 Marks)
- c. Explain the purification of silicon by zone-refining technique. (04 Marks)

**Module-4**

- 7 a. Explain the free radical mechanism for addition polymerization taking Vinyl chloride as an example. (05 Marks)
- b. Explain the synthesis and application of the following :
- (i) Plexiglass (PMMA) (ii) Polyurethane (06 Marks)
- c. Define Glass transition temperature. Describe the following factors which affects  $T_g$  value.
- (i) Flexibility of polymer chain (ii) Intermolecular force of attraction. (05 Marks)

OR

- 8 a. Calculate number average and weight average mole wt. of a polymer in which 200 molecules of 1000 mole mass and 300 molecules of 2000 mole mass and 500 molecules of 3000 mole mass are present respectively. (06 Marks)
- b. Explain the synthesis, properties and application of silicon rubber. (05 Marks)
- c. What are polymer composites? Describe the synthesis and application of Kevlar fibre. (05 Marks)

**Module-5**

- 9 a. Explain scale and sludge formation in the boiler. Mention its ill effects. (05 Marks)
- b. Explain the softening of water by ion-exchange resin method. (05 Marks)
- c. Describe the Sol-Gel process for synthesis of Nanomaterial. (06 Marks)

OR

- 10 a. What is desalination of water? Explain the reverse-Osmosis process for desalination of water. (05 Marks)
- b. Write short notes on Fullerene and Dendrimers. (06 Marks)
- c. Explain the synthesis of Nanomaterial by chemical vapour condensation method. (05 Marks)

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