

## B.Tech 2nd Semester Exam., 2016

## ENGINEERING CHEMISTRY

Time : 3 hours

Full Marks : 70

## Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Fill in the blanks/Answer the following (any seven) : 2×7=14

- (a) If 50 ml hard water required 1.5 ml of 0.1 M EDTA, the hardness of water is \_\_\_\_\_ p.p.m.
- (b) The general formula of zeolite is \_\_\_\_\_.
- (c) What is an azeotropic mixture?
- (d) Colligative properties depend on \_\_\_\_\_.
- (e) Why does iron corrode faster than Al?
- (f) Why are liquid fuels better than solid fuels (3 characters)?

- (g) What is power alcohol?
- (h) Hardness of water containing 1.62 mg calcium bicarbonate and 1.2 mg magnesium sulphate in 500 ml is \_\_\_\_\_ p.p.m. \_\_\_\_\_ °Cl.

- (i) Arrange in increasing order of freezing of 0.1 M solution of glucose, calcium chloride, sodium chloride and acetic acid.

- (j) Why are brass vessels tinned?

2. (a) What is hardness of water? How is it expressed? 3

- (b) Write the principal and chemical reactions involving lime-soda method of softening of water. 5

- (c) A water sample contains the following in mg/lit :

Ca(HCO<sub>3</sub>)<sub>2</sub> = 8.1, Mg(HCO<sub>3</sub>)<sub>2</sub> = 2.92,  
MgCl<sub>2</sub> = 9.5, MgSO<sub>4</sub> = 1.2, CaCl<sub>2</sub> = 1.11,  
NaHCO<sub>3</sub> = 4.2, CO<sub>2</sub> = 2.2, HCl = 3.65

Calculate the amount of lime and soda required for softening 50000 lit of water. 6

3. (a) Describe Fisher-Tropsch method of manufacture of gasoline. 4
- (b) Define octane number and cetane number. What are the structural features of fuel that increases octane numbers? 4
- (c) A coal sample contains 76% carbon, 10% hydrogen, 8% oxygen and 6% nitrogen. Find the minimum amount of  $O_2$  and air by weight for complete combustion of 1 kg of coal. Also calculate the weight of air if 20% excess air is supplied. (Air contains 23%  $O_2$  by weight.) 6
4. (a) Write the charging and discharging reactions of lead-acid storage battery. 4
- (b) Explain the construction and working of  $H_2-O_2$  fuel cell. 6
- (c) What is the pH of the solution of the given cell if its cell potential is 1.04 volt?  
 $E^\circ Ag^+ / Ag = +0.8$  volt  
 $Pt : H_2 (1 \text{ atm}) | H^+ (pH = ?) || Ag^+ (0.01 M) | Ag$   
 Write the cell reaction also. 4

5. (a) Differentiate between the following :  $2 \times 2 = 4$
- (i) Thermosetting and Thermoplastic resins
- (ii) Graft copolymer and Block copolymer
- (b) Give the method of preparation and uses (three) of the following : 10
- (i) Nylon-6 from cyclohexanol
- (ii) Neoprene from acetylene
- (iii) ABS polymer
- (iv) Plexiglass
6. (a) Explain with examples Pilling-Bedworth law. 4
- (b) What are causes for the formation of cathodes and anodes regions on the metal surface? 4
- (c) What are the factors that control the rate of corrosion? 6
7. (a) State Raoult's law of lowering of vapour pressure. Give its limitations. 4
- (b) What is ideal solution? Explain positive and negative deviations from ideal behaviour of liquid pairs. 5

- (c) At  $100^{\circ}\text{C}$ , the vapour pressure of solution of 6.2 gm of solute in 126 gm water is 745 mm. What is the boiling point of solution ( $K_b = 0.52$ )? 5

8. Write the method of prevention of the following :  $3\frac{1}{2} \times 4 = 14$

- (a) Scale formation
- (b) Caustic embrittlement
- (c) Priming and foaming
- (d) Boiler corrosion

9. Write short notes on the following :  $3\frac{1}{2} \times 4 = 14$

- (a) Galvanic series
- (b) Waterline corrosion
- (c) Pitting corrosion
- (d) Glass transition temperature