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Question Paper Code: AHSB03



# INSTITUTE OF AERONAUTICAL ENGINEERING (Autonomous)

B.Tech II Semester End Examinations (Regular) - May, 2019

**Regulation: IARE – R18**

## ENGINEERING CHEMISTRY

**Time: 3 Hours**

**(Common to AE | ECE | ME | CE)**

**Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

### UNIT – I

1. (a) Deduce Nernst equation and write the applications of Nernst equation. [7M]  
(b) Calculate the electrode potential of the copper wire dipped in 0.1 M  $CuSO_4$  solution at 25°C. The standard electrode potential of copper is 0.34 V. [7M]
2. (a) What is corrosion? Discuss the mechanism of electrochemical corrosion. Explain briefly about the electro plating of copper and mention the conditions. [7M]  
(b) The standard reduction potentials of  $Zn^{+2}/Zn$  and  $Cu^{+2}/Cu$  are -0.76V and +0.34 V respectively. What is the e.m.f of the cell?  $Zn^{+2} (0.05M)/Zn // Cu^{+2}(0.005M)|Cu$ . [7M]

### UNIT – II

3. (a) Describe the reverse osmosis method for obtaining fresh water from challenging water sources (like ocean water) and mention its advantages. [7M]  
(b) Learner wants to evaluate the accuracy of the EDTA method for estimation of water hardness. He took a sample of water containing dissolved salts as given below in mg/litre.  
 $Ca(HCO_3)_2 = 16.2$ ,  $CaSO_4 = 13.6$ ,  $Mg(HCO_3)_2 = 7.3$ ,  $MgCl_2 = 9.5$  and  $NaCl = 60$  and calculated temporary hardness and permanent hardness. Now he carried EDTA titration and observed that 100 mL of this water sample consumed 3.5ml of 0.01M EDTA on titration before boiling and 2.2 ml of 0.01M EDTA after boiling. [7M]
4. (a) List the salts responsible for temporary hardness and permanent hardness. Mention the disadvantages of using hard water for domestic and industrial purpose. [7M]  
(b) Every demineralised water is softened water and every softened water is not demineralised water? Justify. [7M]

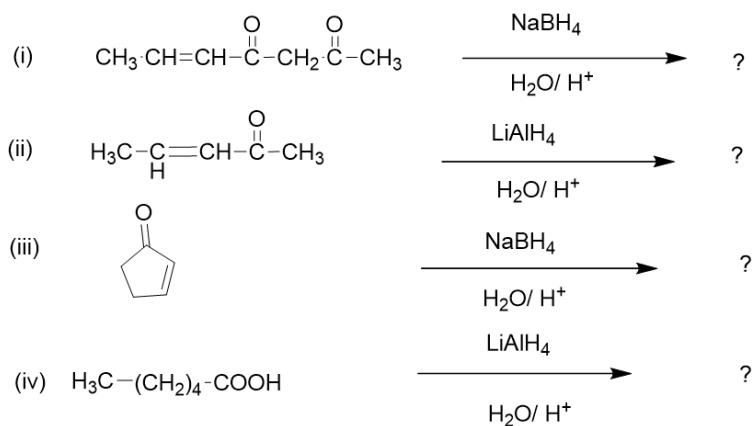
### UNIT – III

5. (a) Calculate the bond order, bonding and anti-bonding orbitals in  $O_2$ ,  $N_2$ , CO and NO. [7M]  
(b) Give the splitting of the degenerate d-orbitals of octahedral, square planar and tetrahedral? [7M]

6. (a) List three rules for the linear combination of atomic orbitals and write its merits and demerits. [7M]
- (b) What is meant by bond order? How it is related to MOT energy level diagrams. [7M]

#### UNIT – IV

7. (a) What is Saytzeff's rule? Explain the Saytzeff's rule with suitable example? [7M]
- (b) Explain about electrophilic addition reaction with any two suitable examples. [7M]
8. (a) What is aspirin? Discuss the synthesis and pharmaceutical applications of aspirin. [7M]
- (b) Predict the product of the following reactions [7M]



#### UNIT – V

9. (a) Discuss the relative merits of solid, liquid and gaseous fuels? Explain the terms 'Proximate analysis' and 'Ultimate analysis' and write the significance of both analysis. [7M]
- (b) Calculate the gross and net calorific values of a coal sample having the following composition Carbon=80%, Hydrogen=7%, Oxygen=3%, Sulphur=3.5%, Nitrogen=2% and Ash=5%. [7M]
10. (a) Explain the difference between gross calorific value and net calorific value. Outline the characteristics of a good fuel. [7M]
- (b) List the various steps involved in refining of petroleum. At what temperature kerosene, diesel and gasoline are obtained. How do they differ in their composition? [7M]

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