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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 $25^{\circ}C$. 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]

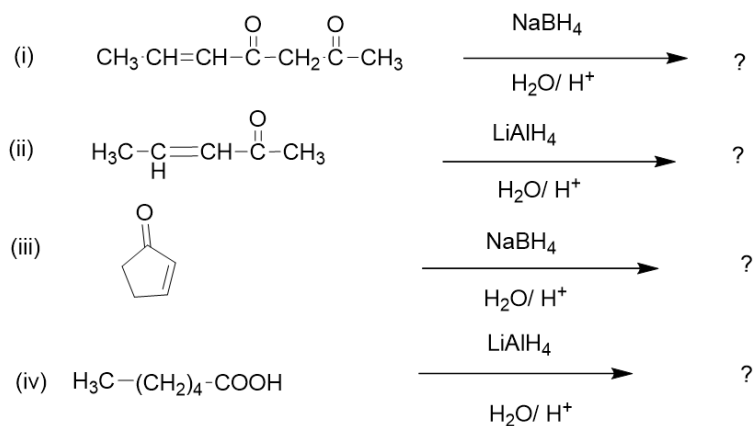
UNIT – III

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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Question Paper Code: AHSB03



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech I Semester End Examinations (Regular) - November, 2018

Regulation: IARE – R18

ENGINEERING CHEMISTRY

Time: 3 Hours

(Common to CSE | IT | EEE)

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) Write a detailed note on electrochemical series. [7M]
(b) Describe the construction and working of Lead acid battery with reactions occurring during charging and discharging [7M]
2. (a) Distinguish galvanic corrosion and pitting corrosion. Explain its mechanism. Why we need to prepare both nut and bolt in same metal? [7M]
(b) Explain how cathodic protection is useful in controlling corrosion? [7M]

UNIT – II

3. (a) Define the term hardness of water? Differentiate between temporary and permanent hardness of water. Define the various units of hardness and write the relation between them. [7M]
(b) Write a detailed note on internal treatment methods of softening of water by Calgon method and phosphate condition. [7M]
4. (a) Explain ion exchange process used to soften water? Why is it considered as the best method to soften hard water? [7M]
(b) Explain the term reverse osmosis? How can be it used to obtain fresh water from sea water? [7M]

UNIT – III

5. (a) What is doping? Explain in detail how does doping effect on conductance? [7M]
(b) Draw the molecular orbital energy level diagram of O_2 and NO molecules and calculate its bond order? [7M]
6. (a) Explain in detail about N_2 and CO molecules with neat sketches of energy diagrams. [7M]
(b) Write the salient features of CFT Explain the transition metal ion d-orbitals splitting in square planar geometries. [7M]

UNIT – IV

7. (a) What is nucleophilic substitution reaction? Write the mechanism of SN_1 and SN_2 reactions. [7M]
(b) Explain Markownikoff and anti Markownikoff's addition rule with suitable example. [7M]
8. (a) Explain the structure, synthesis and applications of Paracetamol. [7M]
(b) What is Saytzeffs rule? Explain the rule with suitable examples. [7M]

UNIT – V

9. (a) How the ultimate analysis of coal is carried out and write its significance [7M]
(b) Write a short note on [7M]
i. Cetane number
ii. Applications of CNG
10. (a) Define octane number. Explain the composition, properties and application of LPG. [7M]
(b) The percentage composition of a sample of bituminous coal was found to be as under: C = 75.4%; H = 5.3%; O = 12.6%; N = 3.2%; S = 1.3% and Ash = rest. Calculate the minimum weight of air necessary for complete combustion of 1 Kg of coal. Oxygen in air is 23% by weight. [7M]

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