Printed Pages : 7 TAS102

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 9914 Roll No.

B.Tech

(SEM I) ODD SEMESTER THEORY EXAMINATION 2009-10

CHEMISTRY

Time : 3 Hours] *[Total Marks : 100*

Note : *All questions carry* ***equal*** *marks.*

PART - A

1 Answer any **two** of the following a/b/c : 20

(a) (i) Draw the molecular orbital diagram of NO molecule. 10

(ii) Indicate the electronic configuration of the participating nitrogen and oxygen.

(iii) The bond order of the molecule.

(iv) The number of sigma and pi bonds.

(v) Account for its lesser stability compared to N_2 molecule.

(b) Comment on the valence bond theory of metals. 10

 examples.

OR

(c) Calculate the density and atomic radii of elementary silver which crystallizes in a face centred cubic lattice with unit cell length = 4.086×10^{10}m (Atomic weight of Ag=107.88 a.m.u.) **10**

(a) An organic compound 'A' on elemental analysis contained 92.3% carbon and 7.7% hydrogen. It undergoes catalytic hydration to yield 'B'. The spectral data of 'B' is as follows : **20**

UV absorption band at 293 nm,
Infrared absorption at 1730cm^{-1}, Proton NMR taken in $CDCl_3$ showed a doublet (3H) at 7.8 Tau and a downfield quartet (1H) at 0.2 Tau respectively. The molecular weight was found to be 44 amu. (Mass spectrometry)

Compound 'B' undergoes self condensation under alkaline conditions. Identify 'A' and 'B' and give your reasoning.

OR

(b) How would you prepare polymers having a high degree of stereochemical regularity ? Illustrate your answer by giving suitable examples. **20**

Does the nature of metal catalyst somehow determine the stereochemistry of the reaction ?

3 Attempt any **two** parts of following : **20**

(a) Draw the energy profile diagram of nucleophilic substitution reactions $\left(SN^1 \text{ and } SN^2\right)$ and indicate in each case the role of solvent on the rate of reaction. **10**

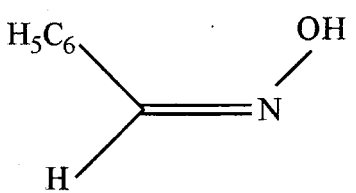
(b) Attempt any **two** of the following : **10**

(i) Write down the structures of all possible products formed by the aldol condensation between ethanal and propanal and also indicate the major product of the reaction.

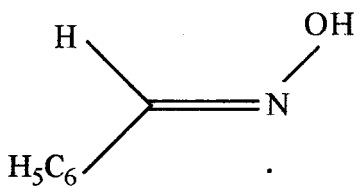
(ii) Write the mechanism of the name reaction involving the formation of a six membered ring containing one double bond.

(iii) Discuss the mechanism of disproportionation of benzaldehyde in the presence of concentrated sodium hydroxide solution.

(iv) In the Beckmann rearrangement reaction the two oximes (A and B) derived from benzaldehyde,



(A)



(B)

give rise to two different products. - Explain.

(c) Write short notes on any **three** of the following : **10**

(i) The third allotrope of carbon.

(ii) The conducting polymers and their applications.

(iii) E and Z nomenclature.

(iv) Conformations of n-Butane (energy profile diagram)

(v) Optically active compounds without chirality.

4 Attempt any **two** parts of following : **20**

(a) (i) The half-life period of a first order reaction is 15 minutes. Calculate the rate constant and the time taken to complete 80% of the reaction. **10**

OR

(ii) At 300 km a first order reaction is 50% completed in 20 minutes. At 350°K, the same reaction is 50% completed in 5 minutes. Calculate the energy of activation of the reaction.

(b) Determine the number of components, number of phases and degree of freedom for the following systems : **10**

(i) $H_2O(s) \rightleftharpoons H_2O(l) \rightleftharpoons H_2O(g)$

(ii) $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$

OR

Is it possible to have quadruple point in a phase diagram for a one component system ? - Explain.

(c) Give reasons to explain the following observations : **10**

(i) Impure metal corrodes faster than pure metal under indentical conditions.

(ii) Rate of metallic corrosion increases with temperature.

(iii) Iron corrodes faster than aluminium even though iron is placed below aluminium in the electro-chemical series.

5 Attempt any **two** parts of following : **20**

(a) 1.56 g of a sample of coal was kjeldahlized and the NH_3 gas evolved was absorbed in a 50.0 ml of 0.1 N H_2SO_4. After absorption, the excess (residual) acid required 6.25 ml of 0.1N NaOH for exact neutralization. 2.60g of coal sample in a quantitative analysis gave 0.1755g of $BaSO_4$. Calculate the percentage of 'N' and 'S' in the sample. **10**

(b) Write short notes on any **two** of the following : **10**

(i) Characteristics of a good fuel.

(ii) Advantages of bio-gas.

(iii) Usefulness of proximate analysis.

(iv) What are major applications of petro-chemicals ?

(v) Describe the ion-exchange process for the demineralization of water.

(c) Write short notes on any **three** of the following : **10**

(i) Reverse osmosis

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(ii) Calgon conditioning

(iii) Noise pollution

(iv) Acid rain

(v) What are the chemical reactions involved in the formation of smog.
