

Roll No.

Total No. of Questions : 9]
(2094)

[Total No. of Printed Pages : 8

UG (CBCS) Ist Year (Suppl.) Examination

1805

B.Sc. CHEMISTRY

(Atomic Structure, Bonding, General Organic
Chemistry and Aliphatic Hydrocarbons)

(Core)

Paper : CHEM-101

Time : 3 Hours]

[Maximum Marks : 50

Note :- Attempt *five* questions in all, selecting *one* question from each Section. Section-E (Q.No. 9) is compulsory. Candidates are required to answer accurate and precise.

Section-A

1. (a) Derive Schrodinger Wave Equation (SWE) for an electron wave.
(b) Calculate the wavelength associated with an electron of mass $m = 9.109 \times 10^{-28}$ kg that travels with 40% of the speed of light.

CS-38

(1)

Turn Over

(c) Draw the radial probability distribution curve of $3p$, $4f$ and $7s$. [4+3+3=10]

2. (a) What are the quantum numbers ? Discuss their significance.

(b) Discuss the cause of stability of the electronic configurations of copper ($Z = 29$) and chromium ($Z = 24$).

(c) Calculate screening constant (σ) and effective nuclear charge (Z_{eff}) for $3d^{10}$ electron of Zn ($Z = 30$). [4+3+3=10]

Section-B

3. (a) Draw the resonating structures of SO_4^{2-} and CO_3^{2-} .

(b) Discuss the bond length, bond strength and bond order of O_2^{2+} , O_2^+ , O_2 , O_2^- , O_2^{2-} using Molecular orbital theory.

(c) Discuss the geometry and hybridization of :

- (i) SF_4 *sp³d* TBP See-saw (2) (ii) PCl_5 [3+4+3=10] *sp³d*, TBP

CS-38

4. (a) Differentiate bonding molecular orbital from anti-bonding molecular orbitals.

(b) Discuss the structure of XeO_2F_2 and XeF_6 using VSEPR theory.

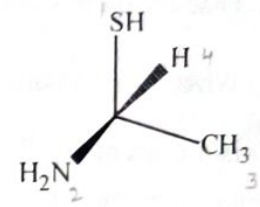
(c) Discuss Born Haber Cycle and its application.

[2+4+4=10]

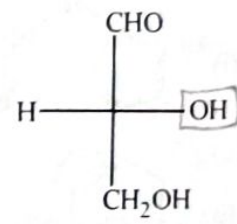
Section-C

5. (a) Assign absolute/relative configuration to the following :

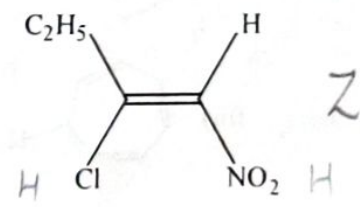
(i) R/S



(ii) D/L



(iii) E/Z



CS-38

(3)

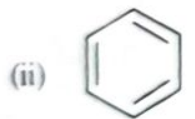
Turn Over

(b) What is Hyperconjugation ? Explain the stability of 1° , 2° and 3° carbocation on the basis of Hyperconjugation.

(c) What is an essential condition for a molecule to be Chiral ? Differentiate between enantiomers and diastereomers. [3+4+3]

6. (a) Draw the possible conformation of Cyclohexane. Discuss their stability.

(b) What is Aromaticity ? Which among the following is/are aromatic ?



CS-38

(4)

(c) What is structural isomerism ? Write the structural formula of all possible isomers of molecular formula, C_4H_6 .

(d) Acetamide is a weak base than ethylamine. Explain. [3+3+2+2=10]

Section-D

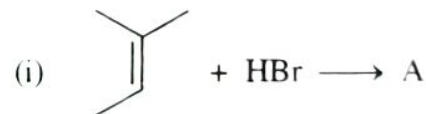
7. (a) Discuss the reaction of 1-Butene in accordance to Markovnikov's & anti-Markovnikov's addition with HBr.

(b) Discuss the hydrogenation of 2-Butyne w.r.t. Lindlar's Catalyst (Pd/C , $BaSO_4$) and Birch Reduction (Na , $Liq\ NH_3$).

(c) Compare the reactivity of alkenes and alkynes towards electrophilic addition reactions.

(d) Discuss the reaction of ethylene Glycol ($HOCH_2CH_2OH$) with alkaline $KMnO_4$. [3+2+3+2=10]

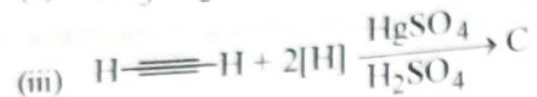
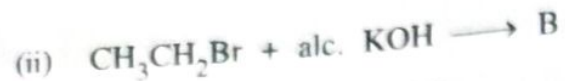
8. (a) Complete the following reactions and determine A, B, C, D and E.



CS-38

(5)

Turn Over



(b) What do you mean by $\text{S}_{\text{N}}2$ reactions? Discuss their stereochemistry, kinetics and other factors which affect the reaction mechanism (nature of substrate, strength of nucleophile, nature of leaving group and solvent).

(c) 2-Butyne is not acidic in nature. Explain.

[5+4+1=10]

Section-E

[1 each]

(Compulsory Question)

9. Do as directed : Multiple choice questions/True or False/

Fill in the blanks :

(i) The essential condition for the molecule to be chiral is dissymmetry. True (True/False)

(ii) $\text{S}_{\text{N}}1$ reactions are not favoured by the polar solvents. False (True/False)

CS-38

(6)

(iii) ψ^2 represents the probability of finding the proton in a nucleus. False (True/False)

(iv) The separation of a racemic mixture into two optically active components [$d(+)$ and $l(-)$ pair of enantiomers] is known as [Resolution/Racemization]

(v) The shape of p -orbitals is dumb-bell

(vi) Hybridization of sulphur in SO_4^{2-} is sp^3

(vii) Which of the following is an achiral molecule or object ?

(a) Hand

(b) Human body

(c) 2-Pentanol

(d) 3-Pentanol ✓

(viii) Which of the following compound exist as cis-trans isomerism ?

(a) 2-Pentyne

(b) 1-Butene

(c) 2-Hexene ✓

(d) Cyclobutene

CS-38

(7)

Turn Over

(ix) According to Fajan's Rule, which is more covalent in nature ?

(a) LiF

(b) LiCl

(c) LiBr

(d) LiI ✓

(x) Total number of nodes in 5f-subshell is :

(a) Four ✓ n-1

(b) Three

(c) Two

(d) One