Total No. of Questions : 9] [Total No. of Printed Pages : 4
(1049)

UG (CBCS) Ist Year Annual Examination

2005

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 is compulsory.

Section–A

1. (a) What do you understand by normal and orthogonal wave functions ? 2½

   (b) In forming Fe^{2+} from Fe, electrons are removed from 4*s* orbital and not from 3*d* orbital. Explain. 2½

   (c) Derive Schrödinger wave equation. 5

2. (a) Draw radial probability distribution curves for 3*s* and 4*d* orbitals. 3

   (b) Using Slater's rule, calculate effective nuclear charge for 3*d* electron in zinc atom. 3

   (c) Differentiate between orbit and orbital. 3

   (d) Define Bohr-Bury's rule. 1

Section–B

3. (a) What do you understand by polarising power and polarizability ? 3

(b) What are tetrahedral and octahedral sites in closed packed arrangements ? Explain. 4

(c) Discuss Linear combination of Atomic orbitals. 3

4. (a) Draw molecular orbital diagram of CO and calculate its bond order. Bond length of CO^+ is larger than CO. Explain. 5

(b) Discuss the geometry of ClF_3 on the basis of VSEPR theory. 2½

(c) All the I-F bonds in IF_7 are not equivalent. Give reasons. 2½

Section–C

5. (a) What do you understand by the term carbocations ? Discuss their structures and the relative stabilities of various types of carbocations. 5

(b) Which of the two is more acidic and why— trichloroacetic acid and acetic acid ? 3

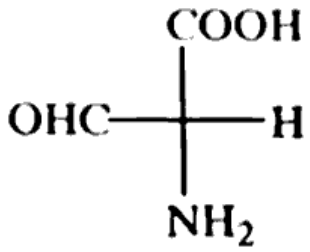
(c) Tropylium ion is aromatic in nature. Explain. 2

6. (a) Differentiate between diastereomers and enantiomers. 2

(b) Discuss conformational isomerism of *n*-butane. 5

(c) Assign R and S configuration for the following compounds :

(i)



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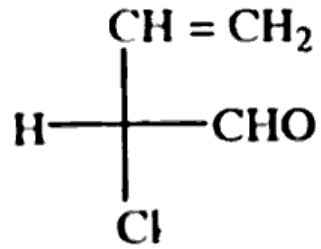

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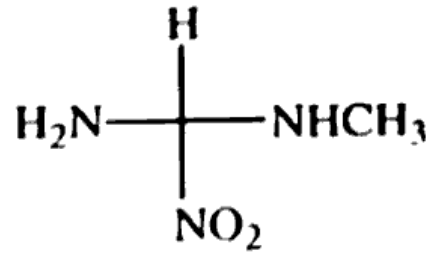

3

Section–D

7. (a) Give the mechanism of Corcy-House reaction. 4

(b) Why does halogenation of alkanes in the presence of tetramethyl lead takes place at lower temperature than when done in its absence ? 2

(c) Give the mechanism of Kolbe's electrolytic reaction. 4

8. (a) Give the mechanism of acidic dehydration of alcohols. 4

(b) An alkene on ozonolysis followed by treatment with Zn/H_2O gives acetone and formaldehyde predict the starting alkene by giving the reactions involved. 3

(c) Compare the reactivity of alkenes and alkynes towards electrophilic addition reactions. 3

Section–E

9. (i) $3d_{z^2}$ orbital has zero density in xy plane. (True/False)

(ii) Give all the possible values of quantum numbers for an electron in $4d$ orbital.

(iii) LiCl has higher boiling point than HCl. Why ?

(iv) XeF_2 molecule involves ..... hybridisation.

(v) Arrange NO, NO^+ and NO^- in the increasing order of their bond order.

(vi) Electromeric effect operates only in unsaturated systems. (True/False)

(vii) The process of separation of racemic mixture into d^- and l^- enantiomers is called ..... .

(viii) Why is the dipole moment of trans-2-butene is zero ?

(ix) What is the major product formed on hydroboration oxidation of propene ?

(x) Terminal alkynes are acidic. Why ? $10\times1=10$