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Total No. of Questions : **9**] [Total No. of Printed Pages : **7**

(2042)

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 Hund's Rule ? Explain with example.

   (b) What do you mean by radial and angular wave functions ?

   (c) Can we have 4*g* orbitals ? Explain.

   (d) Give significance of ψ and ψ^2. 3,3,2,2

2. (a) Describe the physical significance of different quantum numbers.

(b) Why is 4*s* orbital lower in energy than 3*d* orbital ?

(c) 2*s* orbital of H-atom has one node. Explain.

(d) What are eigen functions and eigen values ? 4,2,2,2

Section–B

3. (a) Discuss Fajan's rules.

(b) What is Born-Haber cycle ?

(c) Why anhydrous $AlCl_3$ is covalent and but $AlCl_3.6H_2O$ is ionic ?

(d) Calculate the dipole moment of HCl molecule if its bond length is 1.27 Å and dipole moment is 1.03D. (Electronic charge = 4.8×10^{-10} e.s.u.). 3,2,2,3

4. (a) Give main postulates of VSEPR theory.

(b) Compare the stability of NO, NO^+ and NO^- on the basis of molecular orbital theory.

(c) Bond angle in H_2S is lesser than H_2O. Explain why ?

(d) All the P–F bonds in PF_5 are not equivalent. Explain. 3,3,2,2

Section–C

5. (a) What are free radicals ? Discuss two methods of their generation.

(b) Phenols are more acidic than alcohols. Explain.

(c) What is meant by Aromaticity ? State Huckel's rule.

(d) Account for unusual stability of (i) cycloheptatrienyl cation and (ii) triphenylmethyl cation. 3,2,3,2

6. (a) Explain the essential condition for a compound to show geometrical isomerism.

(b) Explain the following terms :

(i) Optical activity

(ii) Diastereomer

(iii) Enantiomer

(iv) Stereogenic centre

(c) Explain which is relatively more stable and why ?

(i) The Gauche or Anti conformation in case of *n*-butane.

(ii) The Boat or Chair conformation in case of cyclohexane. 2,4,4

Section–D

7. (a) Discuss the mechanism of chlorination of methane in detail. Give the evidences in favour of mechanism.

(b) Why are alkanes less reactive towards majority of the organic reagents ?

(c) Bromine is less reactive but more selective where as chlorine is more reactive and less selective. Explain with one example of in each case.

(d) Discuss Sabatier-Senderen's reaction. 4,2,2,2

8. (a) Discuss the mechanism of dehydrohalogenation of alkyl halides to alkenes. Explain its regiochemistry.

(b) Discuss stereochemistry of addition of halogens to alkenes.

(c) Explain with terminal alkynes are acidic in nature.

(d) What happens when (give chemical equation) :

(i) Ethyne reacts with ammonical silver nitrate solution.

(ii) Ethyne reacts with ammonical cuprous chloride solution.

(iii) 2-Butyne is treated with hot alkaline potassium permaganate. 3,2,2,3

Section–E

9. Multiple Choice Questions/True *or* False/Fill in the blanks :

(i) Maximum number of electron in a subshell is given by :

(a) l^2 (b) $4l + 2$

(c) $2(l + 1)$ (d) $2(n + 1)$

(ii) Which compound has greatest lattice energy ?

(a) LiBr (b) LiCl

(c) LiI (d) LiF

(iii) Which of the molecule has the weakest bond ?

(a) H_2 (b) Li_2

(c) F_2 (d) O_2

(iv) Optical isomerism is shown by :

(a) 1-Butanol (b) 2-Butanol

(c) But-1-ene (d) But-2-ene

(v) What orbital hybridization may be used to describe the carbon atoms 1, 2, 3, 4 in the compound ?

1 2 3 4

$CH_2 = CH - CH_2 - CH_3$:

(a) sp^2, sp^3, sp^3, sp^3

(b) sp^2, sp^2, sp^3, sp^3

(c) sp^2, sp^2, sp^2, sp^3

(d) sp^2, sp, sp^2, sp^3

(vi) Both 1-butanol and 2-butanol give the same mixture of alkenes on dehydration. (True/False)

(vii) There are ..... orbitals corresponding to each value of 1.

(viii) SF_4 molecule involves ..... hybridization of Sulphur atom.

(ix) The three classes of alcohols differ widely in case of dehydration, the order of reactivity being ..... .

(x) $HC \equiv CH + Na \rightarrow$ ..... + ... $1 \times 10 = 10$