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Total No. of Questions : 9]  
(2042)

[Total No. of Printed Pages : 7

**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 4g orbitals ? Explain.

(d) Give significance of  $\psi$  and  $\psi^2$ .

3,3,2,2

**CH-724**

( 1 )

Turn Over

2. (a) Describe the physical significance of different quantum numbers.
- (b) Why is  $4s$  orbital lower in energy than  $3d$  orbital ?
- (c)  $2s$  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  $AlCl_3 \cdot 6H_2O$  is ionic ?
- (d) Calculate the dipole moment of HCl molecule if its bond length is  $1.27 \text{ \AA}$  and dipole moment is  $1.03D$ . (Electronic charge =  $4.8 \times 10^{-10}$  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  $\text{H}_2\text{S}$  is lesser than  $\text{H}_2\text{O}$ . Explain why ?

(d) All the P-F bonds in  $\text{PF}_5$  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 permanganate. 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 ?

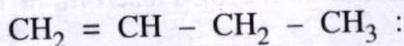
- (a)  $H_2$  (b)  $Li_2$   
(c)  $F_2$  (d)  $O_2$

(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



- (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  $l$ .
- (viii)  $\text{SF}_4$  molecule involves ..... hybridization of Sulphur atom.
- (ix) The three classes of alcohols differ widely in case of dehydration, the order of reactivity being .....
- (x)  $\text{HC} \equiv \text{CH} + \text{Na} \rightarrow \text{.....} + \text{.....}$  .  $1 \times 10 = 10$