

Total No. of Printed Pages—7

**3 SEM TDC CHMH (CBCS) C 5**

**2 0 2 5**

( Nov/Dec )

**CHEMISTRY**

( Core )

Paper : C-5

**( Inorganic Chemistry )**

Full Marks : 53

Pass Marks : 21

Time : 3 hours

*The figures in the margin indicate full marks  
for the questions*

1. Select the correct answer : 1×5=5

(a) Which of the following acids results from better hard-hard combination?

(i) HCN

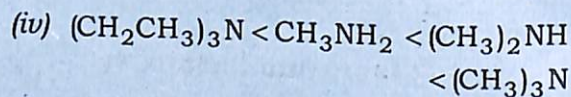
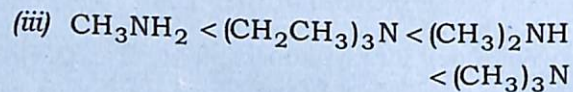
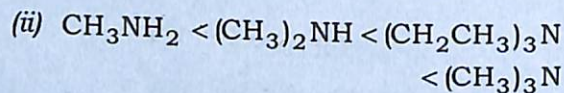
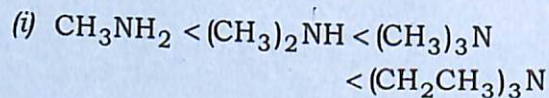
(ii) HI

(iii) HCl

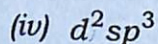
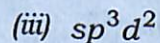
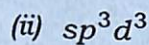
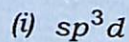
(iv) HNO<sub>2</sub>

( 2 )

(b) Which one of the following is the correct order of increasing basicity?



(c) The type of hybridization for  $\text{IF}_5$  is



(d) The shape of  $\text{XeOF}_4$  molecule with  $sp^3d^2$  hybridization is

(i) pentagonal bipyramidal

(ii) octohedral

(iii) trigonal bipyramidal

(iv) tetrahedral

26P/200

( Continued )

( 3 )

(e) In clathrates, the host-guest interaction is also known as

(i) covalent interaction

(ii) ionic interaction

(iii) coordination interaction

(iv) non-covalent interaction

2. Answer any six of the following questions :

2×6=12

(a) What are interhalogen compounds?

Give examples.

1+1=2

(b) Compare the acid strength of  $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$  and  $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ .

2

(c) Give two reactions to show resemblance of lithium with magnesium.

2

(d) Draw the structure of boric acid.

2

(e) Borazine is called inorganic benzene. Explain with example.

1+1=2

(f) Why do helium and neon not form clathrates?

2

26P/200

( Turn Over )

( 4 )

- (g)  $\text{XeF}_6$  cannot be stored in glass vessel. Explain with chemical reaction. 2
- (h) Discuss the effect of dielectric constant of solvents in relative strength of acids and bases. 2
3. Answer any four of the following questions :  $3 \times 4 = 12$
- (a) What are closo-, nido- and arachno-boranes? Give one example of each.  $1+1+1=3$
- (b) What are polyhalides? "Among the halogens, iodine has the maximum tendency to form polyhalide anion." Explain the statement.  $1+2=3$
- (c) What are silicones? Give the preparation of cross-linked silicones.  $1+2=3$
- (d) Why is borazine called inorganic benzene? How is it prepared from diborane? Give a reaction to distinguish borazine from benzene.  $1+1+1=3$
- (e) What are hydrides? Classify different types of hydrides with one example of each.  $1+2=3$

26P/200

( Continued )

( 5 )

- (f) Discuss the formation of  $3c-2e$  bonds in diborane from molecular orbital theory. (Give the required MO diagrams.) 3
4. Answer any three of the following questions :  $4 \times 3 = 12$
- (a) Mention the Wade's rules for determining the skeletal structure of boranes. Applying these rules, predict the structures of  $\text{B}_5\text{H}_{11}$  and  $\text{C}_2\text{B}_4\text{H}_8$ .  $2+2=4$
- (b) Define acids and bases from solvent system theory. Discuss the acid-base behaviour of  $\text{NH}_4\text{Cl}$  and  $\text{KNH}_2$  in liquid ammonia.  $2+2=4$
- (c) Complete the following reactions :  $1 \times 4 = 4$
- (i)  $\text{H}_3\text{BO}_3 + \text{NaOH} + \text{H}_2\text{O} \longrightarrow ?$
- (ii)  $\text{BCl}_3 + \text{LiAlH}_4 \longrightarrow ?$
- (iii)  $\text{XeF}_6 + \text{SiO}_2 \longrightarrow ?$
- (iv)  $\text{NaNO}_3 + \text{H}_2\text{SO}_4 \xrightarrow{150^\circ\text{C}-200^\circ\text{C}} ?$
- (d) What is meant by diagonal relationship of elements in the periodic table? Discuss the diagonal relationship between lithium and magnesium.  $1+3=4$

26P/200

( Turn Over )

( 6 )

5. Answer any *three* of the following questions :

3×3=9

(a) What are phosphazines? Discuss the structure of hexachlorocyclo-triphosphazine. 1+2=3

(b) State the HSAB principle. Explain why  $[\text{CoF}_6]^{3-}$  is more stable than  $[\text{CoI}_6]^{3-}$ .

1+2=3

(c) What are the reasons for anomalous behaviour of fluorine with its group members? Compare the variation of oxidation states of group 17 elements.

2+1=3

(d) Give the names of oxo-acids of chlorine. Compare the acid strength of oxo-acids of chlorine.

2+1=3

6. Answer *either* (a) or (b) :

(a) Give the structures of the following :

1×3=3

(i)  $\text{P}_2\text{O}_5$

(ii)  $\text{H}_2\text{S}_2\text{O}_8$

(iii)  $\text{HClO}_4$

( 7 )

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

1½×2=3

(i) Zone refining

(ii) Fullerenes

(iii) Carbon reduction

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