63 (FY)SEM–3/MAJ/CHMMAJ2014

2025

CHEMISTRY

Paper : CHMMAJ2014

(Inorganic Chemistry – I)

Full Marks : 50

Pass Marks : 20

Time : Two hours

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

1. Choose the correct answer : 1×5=5

   (a) Borazine is often called "inorganic benzene" because it :

   (i) Is highly ionic

   (ii) Has alternating *B–N* bonds in a planar ring

   (iii) Is a conductor

   (iv) Has *Si–O* backbone

(b) In which one of the following type of silicates, all four oxygen atoms of SiO_4 tetrahedron remain shared ?

(i) Nesosilicates

(ii) Cyclosilicates

(iii) Tectosilicates

(iv) Inosilicates

(c) Which pair represents a conjugate acid-base pair ?

(i) $HCl/NaCl$

(ii) HCl/KCl

(iii) NH_3/NH_4^+

(iv) $NaOH/OH^-$

(d) Which noble gas is used in balloons because of its low density and non-flammability ?

(i) *Ne*

(ii) *He*

(iii) *Ar*

(iv) *Kr*

(e) In XeF_4, the number of lone pairs on *Xe* atom is :

(i) 0

(ii) 1

(iii) 2

(iv) 3

2. Answer the following questions : ***(any five)*** 2×5=10

(a) What are polyhalides ? Give examples. 1+1=2

(b) Define phosphazenes with examples.

(c) Arrange the noble gases in increasing order of ionization enthalpy.

(d) Explain why Xenon is preferred in high-intensity discharge lamps.

(e) What is Inert pair effect ?

(f) Why is Argon used in electric bulbs instead of nitrogen ?

(g) Which of the following can be classified as Lewis base and border line Lewis base ?

Ethylene, water, diethyl ether, acetone, benzene

3. Answer the following questions : ***(any five)*** 5×5=25

(a) Why XeF_2 is linear? Discuss the molecular orbital diagram of XeF_2. 1+4=5

(b) State Pearsons HSAB principle and discuss its applications with suitable examples. What are the limitations of HSAB principles? 1+2+2=5

(c) What is amphoteric substance? Discuss conjugate acid-base pairs with suitable examples. 2+3=5

(d) Explain the structure and bonding in diborane (B_2H_6) using molecular orbital theory.

(e) Write *one* method for preparation of borazine. Discuss its structure. Why is borazine called inorganic benzene? Explain. 1+2+2=5

(f) Describe the preparation, properties, and uses of interhalogen compounds.

(g) Compare cyclic phosphazenes and linear phosphazenes in terms of synthesis, stability and uses.

(h) Arrange the following in the order of increasing acidic strength. Give reasons.

(i) HNO_3, HPO_3, $HAsO_3$

(ii) CCl_3COOH, CBr_3COOH, Cl_3COOH

4. Answer the following questions : ***(any one)*** 10×1=10

(a) (i) Discuss the preparation of hexachlorocyclotriphosphazene $(NPCl_2)_3$. What are its structural characteristics. 3+2=5

(ii) Explain the bonding in phosphazenes. Why phosphazenes are called inorganic analogous of organic polymers. 3+2=5

(b) (i) Define the term symbiosis. Predict on the basis of HSAB principle whether the following reactions are feasible in the forward direction or not. 1+2+2=5

$BF_3H^- + BH_3F^- \rightarrow BF_4^- + BH_4^-$

$CH_3HgF + HSO_3^- \rightarrow CH_3HgSO_3^- + HF$

(ii) Write short notes on :

(a) Bonding of polyhalides

(b) Feldspar

$2\frac{1}{2}+2\frac{1}{2}=5$