Bachelor of Science (B.Sc.) Semester—I Examination

CHEMISTRY (INORGANIC CHEMISTRY) (New & Old)

Compulsory Paper—1 (New Course)

Time : Three Hours] [Maximum Marks : 50

N.B. :— (1) All ***five*** questions are compulsory and carry equal marks.

(2) Write equations and draw diagrams wherever necessary.

1. (A) Explain the following with example :

(i) Hund's rule of maximum multiplicity and

(ii) Aufbau principle. 5

(B) Define ionization potential. Discuss the factors affecting it. How does it vary in a group and a period ? 5

OR

(C) Write Schrodinger wave equation and specify the terms involved in it. 2.5

(D) Give the values of n, ℓ, m for 3d electron. 2.5

(E) Why size of cation and anion of an element is different from its parent atom ? 2.5

(F) Calculate effective nuclear charge for 4S electron of Potassium (z = 19). 2.5

2. (A) Define hybridization. Discuss Sp^3 and Sp^3d^2 hybridization with suitable example. 5

(B) Define :

(i) Polarizing power and

(ii) Polarizability of ion.

Discuss various factors affecting them. 5

OR

(C) What are postulates of valence bond theory ? 2.5

(D) Define the terms with examples :

(i) Bond energy and

(ii) Bond order. 2.5

(E) What is solvation energy ? How solvation energy of NaCl is determined using Born-Haber cycle ? 2.5

(F) Discuss the structure of CsCl crystal. 2.5

3. (A) Write electronic configuration of S-block elements and compare ionization potential of S-block elements. 5

(B) Discuss the structure and bonding in :

(i) XeF_2 and

(ii) $XeOF_4$. 5

OR

(C) Give one method of preparation of each XeF_2 and XeF_6. 2.5

(D) What is diagonal relationship ? Discuss diagonal relationship between Lithium and Magnesium. 2.5

(E) Define Hydrogen bond. How does it affect melting and boiling points of compounds ? 2.5

(F) Discuss structure and bonding in XeF_6. 2.5

4. (A) Discuss periodicity of the following properties of p-block elements :

(i) Ionization potential and

(ii) Electronegativity. 5

(B) What are Boranes ? Discuss the structure of Diborane in detail. 5

OR

(C) Discuss the structure of P_2O_5. 2.5

(D) Give one method of preparation of :

(i) Marshall's acid and

(ii) Caro's acid. 2.5

(E) Discuss diagonal relationship between Boron and Silicon. 2.5

(F) Discuss the structure of orthophosphoric acid (H_3PO_4). 2.5

5. Attempt any ***ten*** of the following :

(i) Define electron affinity.

(ii) Give electronic configuration of

(a) $Mg^{2+}_{(z=12)}$ and $O^{2-}_{(z=8)}$ ions.

(iii) Draw shapes of $dx^2–y^2$.

(iv) Mention any two limitations of valence bond theory.

(v) Define Lattice energy.

(vi) Draw potential energy diagram for formation of hydrogen molecule on the basis of VBT.

(vii) Give one example of intramolecular hydrogen bond.

(viii) Why noble gases are monoatomic in nature ?

(ix) Draw the structure of $XeOF_2$.

(x) What is Borazine ?

(xi) Draw the structure of Marshall's acid.

(xii) Why first I.P. of Nitrogen is higher than oxygen ? 1×10=10

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(E) Why size of cation and anion of an element is different from its parent atom ? 2.5

(F) Calculate effective nuclear charge for 4S electron of Potassium (z = 19). 2.5

2. (A) Define hybridization. Discuss Sp^3 and Sp^3d^2 hybridization with suitable example. 5

(B) Define :

(i) Polarizing power and

(ii) Polarizability.

Discuss various factors affecting them. 5

OR

(C) Discuss the structure of NH_3 and H_2O on the basis of VSEPR theory. 2.5

(D) Define the following terms with examples :

(i) Bond energy and

(ii) Bond order. 2.5

(E) How is solvation energy of NaCl determined using Born-Haber cycle ? 2.5

(F) Discuss structure of CsCl crystal. 2.5

3. (A) Write electronic configuration of S-block elements and compare ionization potential of S-block elements. 5

(B) Discuss the structure and bonding in :

(i) XeF_2 and

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OR

(C) Give one method of preparation of each XeF_2 and XeF_6. 2.5

(D) What is diagonal relationship ? Discuss diagonal relationship between Lithium and Magnesium. 2.5

(E) Define Hydrogen bond. How does it affect melting and boiling points of compounds ? 2.5

(F) Discuss structure and bonding in XeF_6. 2.5

4. (A) Discuss the periodicity of the following properties of p-block elements :

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(iii) Draw the shape of $d_{x^2-y^2}$ orbital.

(iv) Mention two limitations of valence bond theory.

(v) Draw the structure of SF_4 molecule using VSEPR theory.

(vi) Define Lattice energy.

(vii) Give one example of intramolecular hydrogen bond.

(viii) Why are noble gases monoatomic in nature ?

(ix) Draw the structure of $XeOF_2$.

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