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FYUESE (1)-Chem.
MJ-1

2024-28

Full Marks : 75

Time : 3 Hours

Candidates are required to give their answer in their own words as far as practicable. Their figures in the margin indicate full marks.

Answer from **both** the Sections as directed.

Section - A

(Compulsory)

1. Answer the following :

1×5=5

(a) Define ionisation enthalpy.

(b) Which quantum number determine the shape of atomic orbital ?

(c) What is the most electronegative element in the periodic table ?

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- (d) Which group of elements has the highest ionization enthalpy and positive electron gain enthalpy ?
- (e) What is the hybridization of central atom in NH_3 ?
2. Explain why BF_3 is triangular in shape while BeF_2 is linear. 5
3. Explain the physical significance of ψ and ψ^2 . 5

Section - B

Answer any four questions ?

4. (a) What is Heisenberg's Uncertainty Principle ? Give its mathematical expression. 5
- (b) Explain the Aufbau principle and its limitations. 5
- (c) Define electronegativity. How does it influence bond order ? 5

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5. Write short notes on any three of the following :
3×5=15

- (a) Born-Haber Cycle
(b) Fajan's rule
(c) Hydrogen bonding
(d) Atomic and ionic radii
(e) Hybridisation

6. Discuss the Valence Shell Electron Pair Repulsion (VSEPR) theory. Using VSEPR theory predict and explain the shape of following molecules. 15

H_2O , PCl_5 , SF_4 , NO_3^- , IF_7

7. Explain the methods of balancing redox-equation using both the oxidation number method and the ion-electron method. Illustrate with suitable examples for each method. 15
8. (a) Explain the basic principles of valence bond theory (Heitler-London approach) with respect to the formation of a covalent bond. 7.5

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(b) Explain on the basis of Molecular Orbital Theory (MOT) – 7.5

(i) N_2 molecule is diamagnetic while O_2 molecule is paramagnetic.

(ii) Bond order of N_2^+ is lower than that of N_2 .

9. (a) How do semiconductors differ from insulators in terms of their electronic structure? 5

(b) What is the difference between polarizing power and polarizability? 5

(c) Explain why HF has a significantly higher boiling point than HCl. 5
