2023

Time - 3 hours

Full Marks - 60

*Answer **all groups** as per instructions.*
Figures in the right hand margin indicate marks.

GROUP - A

1. Answer all questions and fill in the blanks as required. [1 × 8

(a) ψ^2 leads to the idea of _____.

(b) Write the condition of an Orthogonal wave function.

(c) Which out of O and O^- has larger size ?

(d) Write the general electronic configuration of lanthanides.

(e) Which pair of electrons show diagonal relationship ?

Li, Na ; Be, Mg ; Be, Al

(f) Valence Bond theory explains the nature of _____ bond.

(g) Write the bond order in NO and NO^+.

(h) What is the shape of SF_4 molecule ?

GROUP - B

2. Answer any eight of the following within two or three sentences each. [1½ × 8

(a) What is Aufbau's principle ?

(b) What do you mean by $2p^5$ and $2p_x^1$?

(c) Which of the following has highest ionisation enthalpy ?

C, N , O and why ?

(d) What is effective nuclear charge ?

(e) Discuss radius ratio in an ionic crystal.

(f) Why electron affinity of Cl is more than that of F ?

(g) Explain, why PCl_5 exists but NCl_5 does not.

(h) Define bond length.

(i) What is a p-n junction ?

(j) Explain Oxidation Number.

GROUP - C

3. Answer any eight of the following within 75 words each. [2 × 8

(a) Calculate the wave number corresponding to second line of Balmer series.

(b) Why LiI is more covalent that LiF ?

(c) Discuss de Brogie's wave character of matter.

(d) Explain (n + *l*) rule with example.

(e) Discuss the hybridisation and shape of IF_7.

(f) What is standard electrode potential ?

(g) Define atomic radius. Discuss the factors affecting atomic radius.

(h) What is electron affinity ? Mention the factors which affect the electron affinity.

(i) Draw the MO diagram of CO and find its bond order.

(j) Explain auto-oxidation with an example.

GROUP - D

*Answer **any four** questions within 500 words each.*

4. What are quantum numbers ? Discuss the different types of quantum numbers with their significances. [6

5. Explain angular wave functions. Using the concept of angular wave function, discuss the shapes of s, p and d orbitals. [6

6. Define electronegativity. Discuss the factors affecting electronegativity. Discuss the Mulliken scale of measurement of electronegativity. [6

7. Discuss Slater's rule. Find the value of σ and Z^* for Z_n. [6

8. What is Valence Bond Theory ? Discuss the formation of H_2 molecule with the help of VB theory. [6

9. Define Lattice Energy. How it can be determined for NaCl by Born-Haber cycle ? [6

10. Explain partial ionic character in polar covalent bond. Give the difference between bond moment and dipole moment. [6