CBSE TEST PAPER-07

CLASS - XI CHEMISTRY (Chemical Bonding and Molecular Structure)

General Instruction:

- All questions are compulsory.
- Marks are given alongwith their questions.

1. Define bonding molecular orbital. [1]

2. Define antibonding molecular orbital. [1]

3. Explain diagrammatically the formation of molecular orbital by LCAO. [1]

4. Which one O_2^- and O_2^{2-}, may exhibit paramagnetism? [1]

5. Why are bonding molecular orbitals more stable than antibonding molecular orbitals? [1]

6. He_2 does not exist. Explain in terms of LCAO. [2]

7. Define bond order. [1]

8. Define hydrogen bonding [1]

9. What are the types of H-bonding? Which of them is stronger? [1]

10. NH_3 has higher boiling point than PH_3. Give reason. [1]

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[ANSWERS]

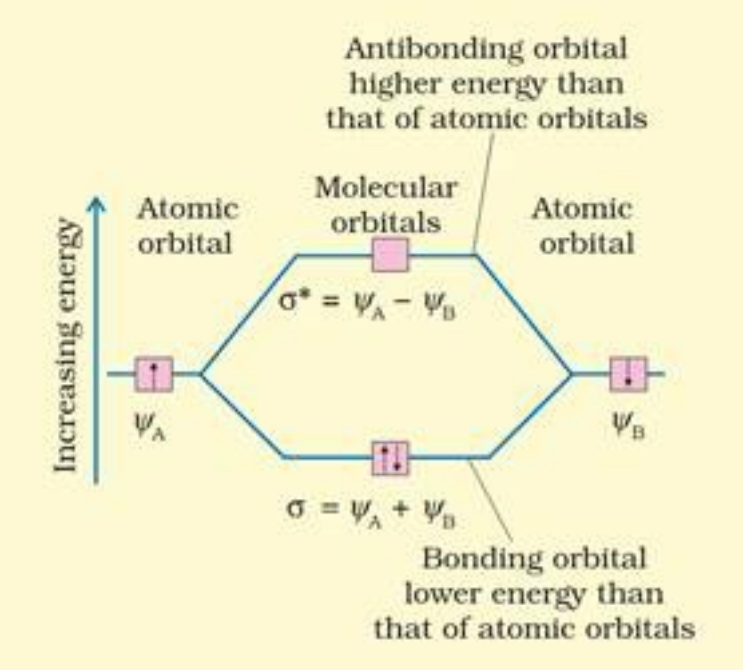
Ans1. The molecular orbital formed by the addition of atomic orbitals is called bonding molecular orbital.

$\sigma = \Psi A + \Psi B$

Ans2. The molecular orbital formed by the subtraction of atomic orbitals is called antibonding molecular orbital.

$\sigma^* = \Psi A - \Psi B$.

Ans3. The molecular orbital formed by subtraction of atomic orbital is called antibonding molecular orbital.



Ans4. O_2 would exhibit paramagnetism because it contains one unpaired electron in its Mo configuration.

Ans5. Bonding molecular orbital has lower energy and hence greater stability than the corresponding antibonding molecular orbital.

Ans6. The electronic configuration of helium atom is $1s^2$. Each helium atom contains 2 electrons, therefore, in He_2 molecule there would be 4 electrons. These electrons will accommodated in $\sigma 1s$ snd $\sigma^* 1s$ molecular orbitals leading to electronic configuration :

$He_2 : (\sigma 1s)^2(\sigma^* 1s)^2$

$Bond\ \text{order of}\ He_2 is \frac{1}{2}(2-2) = 0$

He_2 molecule is there unstable and does not exist.

Ans7. Bond order (b.o) is defined as one half the difference between the number of electrons present in the bonding and the antibonding orbitals i.e;

Bond order (b.o) = $\frac{1}{2}(N_b - N_a)$

If $N_b > N_a$, molecule is stable and

If $N_b < N_a$, molecule is unstable.

Ans8. Hydrogen bond can be defined as the attractive force which binds hydrogen atom of one molecule with the electronegative atom (F, O or N) of another molecule.

Ans9. (i) Inter-molecular H-bonding

(ii) Intra molecular H-bonding. Inter molecular H-bonding is stronger than intra-molecular H-bonding.

Ans10. In NH_3, there is hydrogen bonding whereas in PH_3 there is no hydrogen bonding.