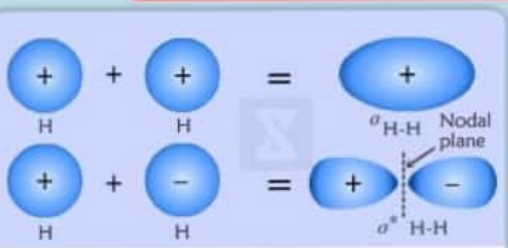
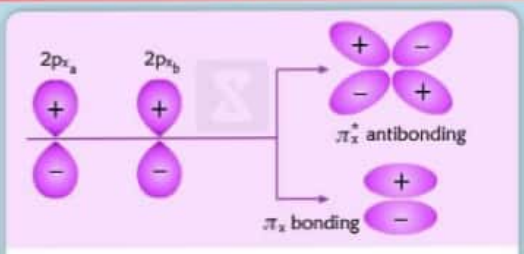
MOLECULAR ORBITAL THEORY

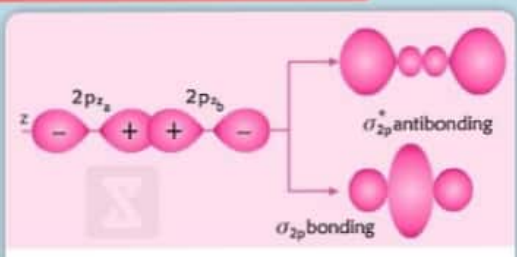
MOT explains the bonding and stability of Molecules by forming Molecular orbits



S-orbital of one atom combines with s-orbital of another atom constructively and destructively to form σ and σ molecular orbitals.

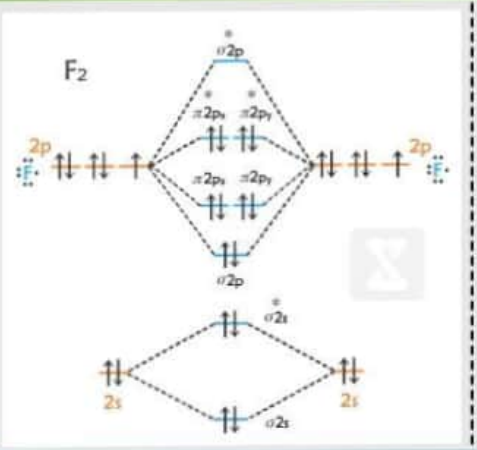


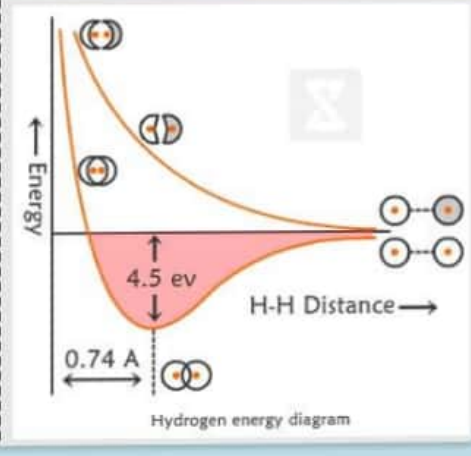
p_x orbital of one atoms combines with p_x of another atom to form σ and σ orbitals.



p_y and p_z orbitals combine and forms π and π orbitals.

Energy Diagram of Molecular Orbitals





Hydrogen energy diagram

Bond Order

$$\text{Bond order} = \frac{1}{2}\left[\begin{array}{l}\text{Number of Bond of electron in bonding orbitals}\end{array} - \begin{array}{l}\text{Number of Bond of electrons in anti-bonding orbitals}\end{array}\right]$$

Bond	H_2^+	H_2	He_2^+	He_2
Bond Order	$\frac{1}{2}$	1	$\frac{1}{2}$	0

The bond order must be positive non-zero for a bond to be stable. He_2 has a bond order of zero and that is why the He_2 molecule is not observed.