VALENCE BOND THEORY (LINUS PAULING AND SLATER) B. SC. F.Y.

DIRECTIONAL NATURE OF COVALENT BONDS

BY

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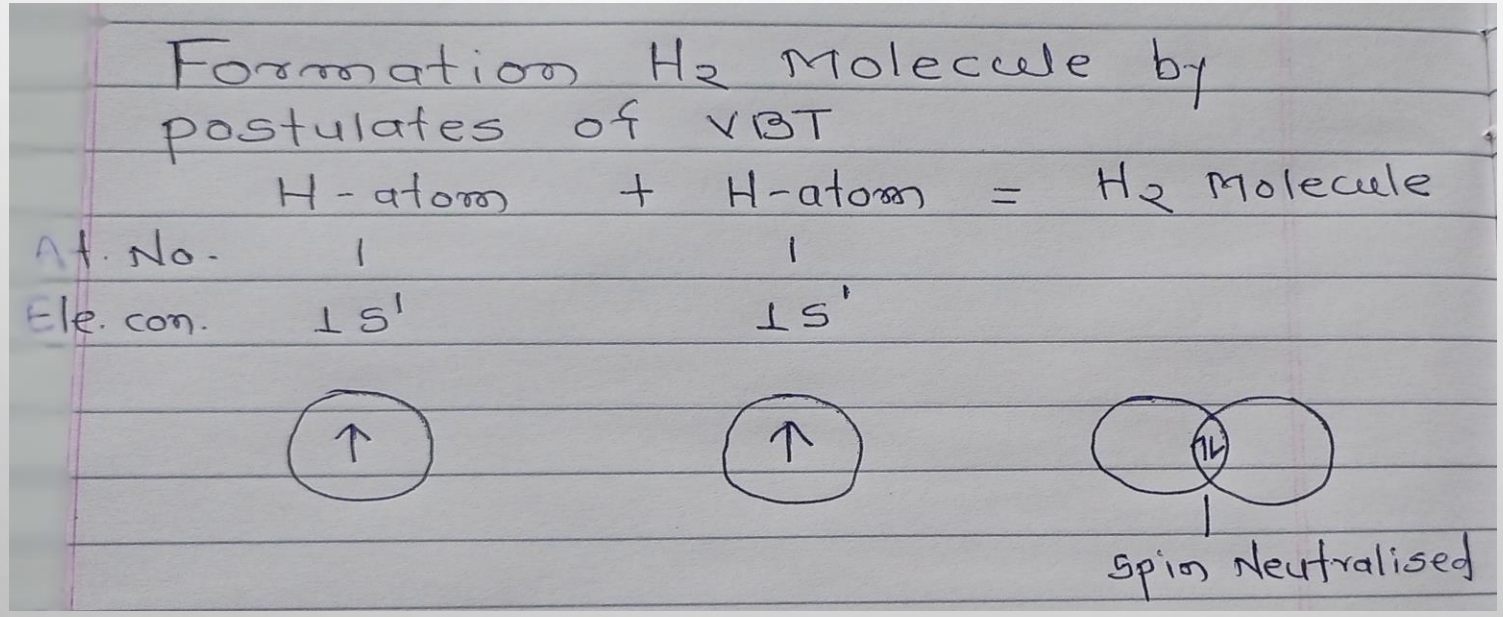
INTRODUCTION OF PAULING-SLATER THEORY

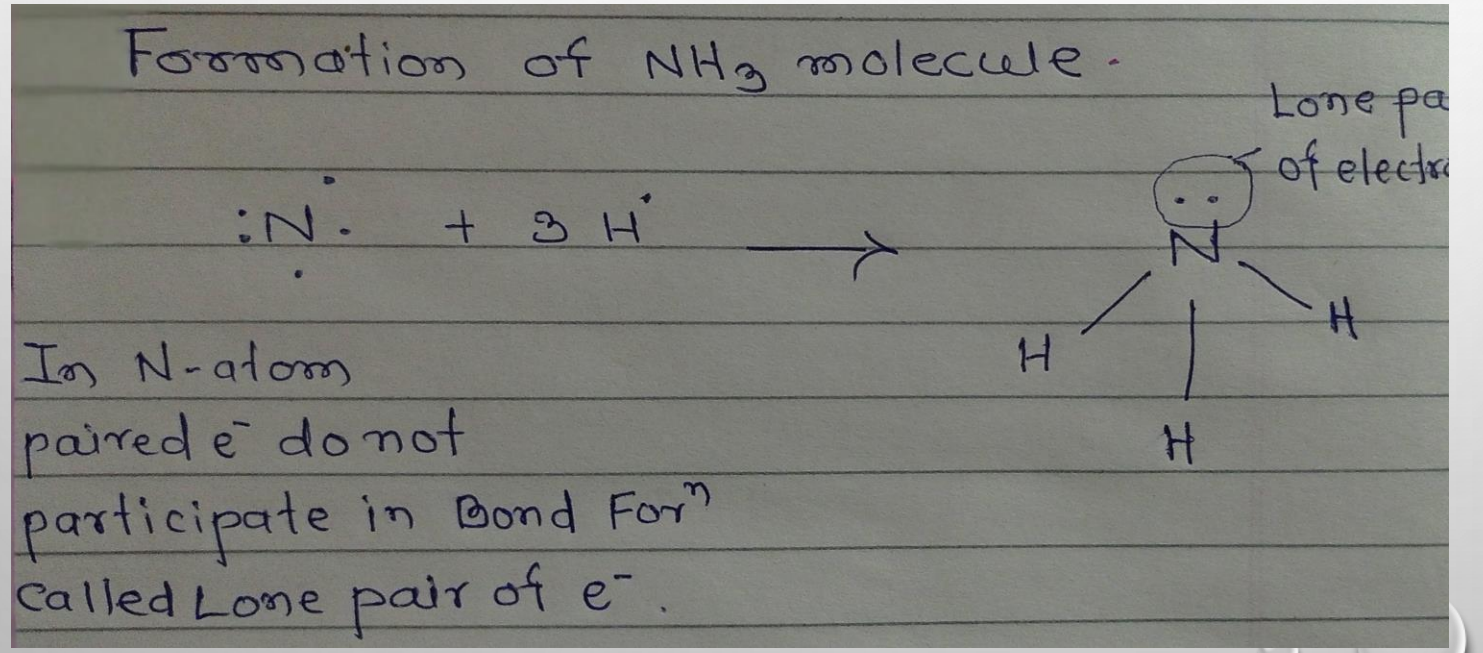
- MODIFIED FORM OF VALENCE BOND THEORY.
- THEORY MODIFIED BY PAULING AND SLATER IN 1931.
- TO ACCOUNT THE DIRECTIONAL CHARACTER OF COVALENT BOND

ACCORDING TO THIS THEORY

- **OVERLAPPING OF PURE ATOMIC ORBITAL BETWEEN WHICH BOND BEING FORMED.**



- THE ATOMIC ORBITALS OF VALENCE SHELL WHICH HAVE PAIRED ELECTRONS DO NOT PARTICIPATE IN THE OVERLAPPING PROCESS AND DOES NOT CONTRIBUTE THE BOND FORMATION.
- SUCH ELECTRON PAIR IN THE ORBITAL IS THEREFORE CALLED **NON-BONDING ELECTRON PAIR** OR **LOAN PAIR OF ELECTRON**.



- **THE NUMBER OF COVALENT BONDS FORMED BY AN ATOM IS EQUAL TO THE NUMBER OF UNPAIRED ELECTRON IN IT.**

Covalent molecule	Number of co-valent bonds in an atom	Number of unpaired electrons in an atom
Methane (ÇH4)	4 co-valent bonds	4 unpaired electrons in C atom of methane molecule
Ammonia (NH3)	3 co-valent bonds	3 unpaired elcteons in N atom of ammonia molecule
Water (H2O)	2 co-valent bonds	2 unpaired electrons in O atom of water molecule
Phosphorus pentachloride (PCl5)	5 co-valent bonds	5 unpaired electrons in P atom of phosphorus pentachloride.

- THE STRENGTH OF THE COVALENT BOND IS PROPORTIONAL TO THE EXTENT OF OVERLAPPING OF THE TWO ATOMIC ORBITALS.
- THE ORBITAL WHICH IS DIRECTIONALLY CONCENTRATED WILL FORM A STRONGER BOND THAN NON-DIRECTIONAL ORBITAL.

EX. THE S-ORBITAL DOES NOT SHOW DIRECTIONAL PREFERENCE WHERE AS S, P AND F-ORBITAL TENDS TO FORM A BOND IN THE DIRECTION OF MAXIMUM ELECTRON DENSITY WITHIN THE ORBITAL.

THE CO-VALENT BOND FORMED BY S-S OVERLAP IS RELATIVELY WEAK AS COMPAIRED TO S-P OR P-P OVERLATHEP IS RELATIVELY STRONGER BECAUSE OF P-ORBITAL DIRECTED TOWARDS THREE AXES.

THANK YOU AND STAY HAPPY AND HEALTHY.

NEXT SUBTOPIC

HYBRIDIZATION?