

# Valence Shell Electron Pair Repulsion Theory [VSEPR]

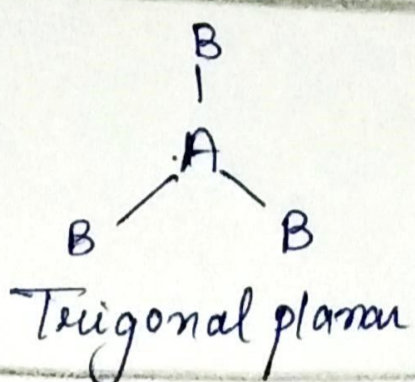
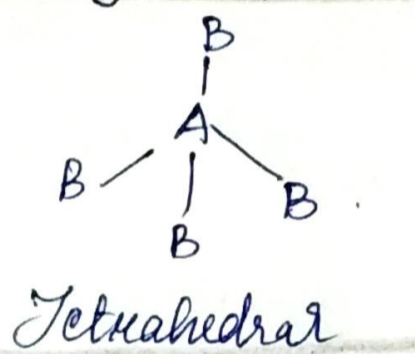
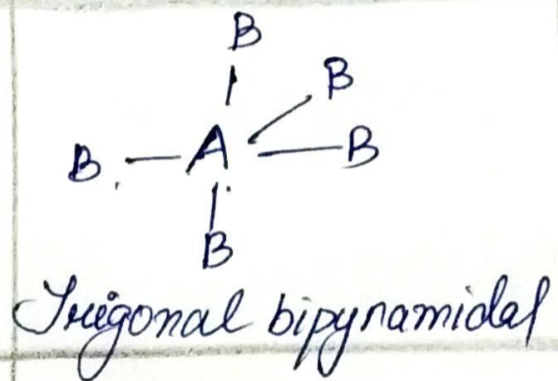
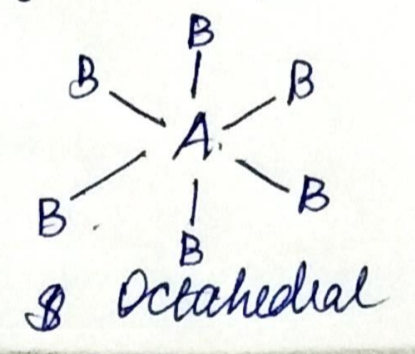
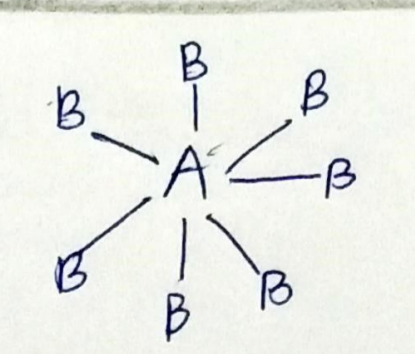
- Lewis concept failed to explain the shape of molecules, so this theory provides a simple procedure to predict the shapes of covalent molecules.

The main postulates of VSEPR theory are as follows:-

- 1.) The shape of molecules depends upon the number of valence shell electron pairs around the central atom.
- 2.) These pairs of electrons tend to occupy such positions in space that minimise repulsion and thus maximise distance between them.
- 3.) ~~Order~~ A multiple bond is treated as if it is a single electron pair and the two or three electron pairs of a multiple bond are treated as a single super pair.
- 4.) The repulsive interaction of electron pairs order:-  
$$L \cdot P - L \cdot P \text{ (lone pair)} > L \cdot P \text{ (lone pair)} - B \cdot P \text{ (bond pair)}$$
$$> B \cdot P \text{ (bond pair)} - B \cdot P$$



Possible cases of geometry :-

| Cases     | Geometry                                                                                                      | Bond angle                            | Example        |
|-----------|---------------------------------------------------------------------------------------------------------------|---------------------------------------|----------------|
| 1. $AB_2$ | $B-A-B$<br>Linear                                                                                             | $180^\circ$                           | $CO_2, BeCl_2$ |
| 2. $AB_3$ | <br>Trigonal planar          | $120^\circ$                           | $BF_3$         |
| 3. $AB_4$ | <br>Tetrahedral             | $109.28'$                             | $CH_4$         |
| 4. $AB_5$ | <br>Trigonal bipyramidal   | $120^\circ, 180^\circ,$<br>$90^\circ$ | $PCl_5$        |
| 5. $AB_6$ | <br>Octahedral             | $90^\circ, 180^\circ$                 | $SF_6$         |
| 6. $AB_7$ | <br>Pentagonal Bipyramidal | $72^\circ, 90^\circ,$<br>$180^\circ$  | $IF_7$         |