

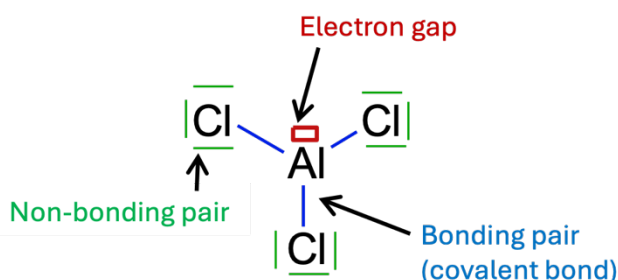


Spatial structure of a molecule

Lewis diagram of a molecule

- In an atom, electrons tend to form pairs.
- A bonding pair is made of an electron of the valence shell of each of the 2 atoms bonded. The 2 electrons are shared while forming a simple covalent bond between the 2 atoms.
- A non-bonding pair of an atom is made of 2 electrons of this atom, not involved in any covalent bond. The electrons of a non-bonding pair **Un doublet liant** est un doublet constitué par un électron de la couche externe de chacun are strongly linked to their atom.
- An electron gap of an atom represents a missing pair of electrons.
- Une **lacune électronique** d'un atome représente un doublet d'électrons manquant.

Ex :



Geometrie of molecules

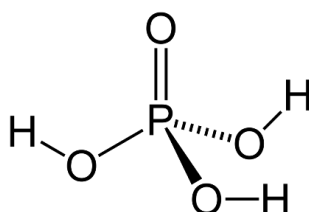
1. Valence Shell Electron Pair Repulsion – Gillespie's rule

The pairs of electrons of an atom (both bonding and non-bonding) are positioned in space so that repulsions are minimized. This is done by having them as apart from each other as possible.

2. Cram's representation

It uses the conventions of perspective drawing to represent the 3D structure of a molecule.

- A covalent bond which is in the plane of the page is represented by a line.
—
- A covalent bond which points outside the page is represented by a triangle.
- A covalent bond which points inside the page is represented by a dotted line.
- - - -



Note: The Lewis structure of the molecule is needed before representing its 3D structure.



3. Different geometries

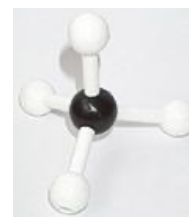
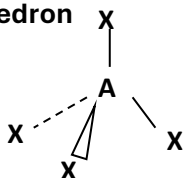
A the central atom

X the atoms bonded to A

E the non-bonding pairs surrounding A

- AX_4E_0 (A+4 atoms surrounding A. 0 non-bonding pairs on A)

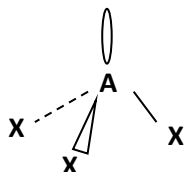
Tetrahedron



Methane, CH₄

- AX_3E_1

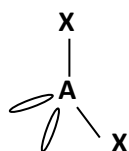
Triangular-based pyramid



Ammonia, NH₃

- AX_2E_2

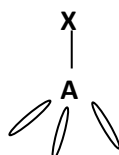
Bent molecule



Water, H₂O

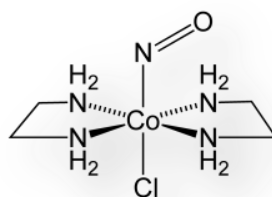
- AXE_3

Linear molecule



Hydrogen chloride, HCl

Note: Are considered here central atoms bonded with maximum 4 atoms, but there are many other cases.



Cobalt complex