1 – 2 How Elements Bond

Bonding

- The properties of the elements that form the bond are different from the properties of the product they form.
  - Hydrogen + Oxygen ⟶ Water

Gas	Gas	Liquid
Explosive	Fire Triangle	Puts out fires

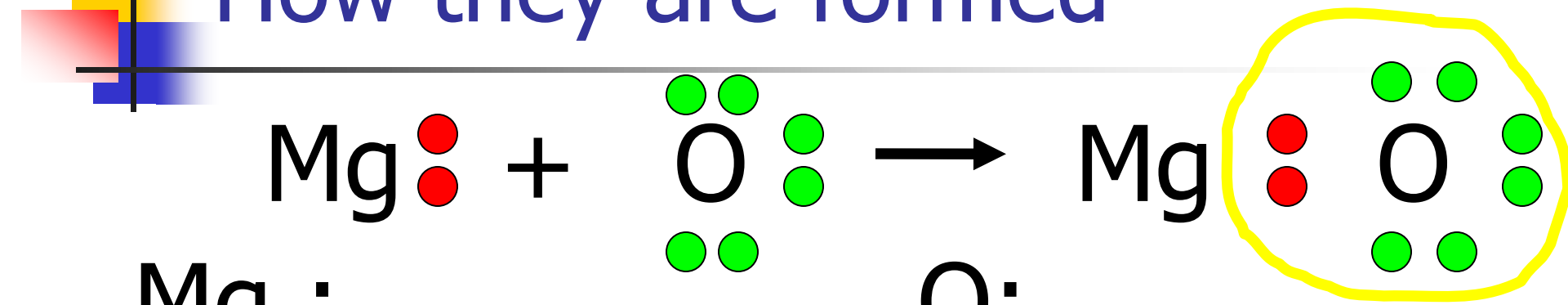
3 Types of Chemical Bonds

1. Ionic Bond
   - Steal electrons
   - Metal atom & Nonmetal atom
2. Metallic Bond
   - Pool electrons
   - Metal atom & Metal atom
3. Covalent Bond
   - Share electrons
   - Nonmetal atom & Nonmetal atom

Ionic Bond

- Ionic Bond – the force of attraction between the opposite charges of ions in an ionic compound.
- Ion – an atom that has a charge.
  - Caused when an atom gains or loses an electron.
- Compound – a pure substance containing 2 or more elements that are chemically bonded.

How they are formed



Mg :

$P^+ = 12+$

e- = 12- 10-

Charge = 2+

Mg^{2+}

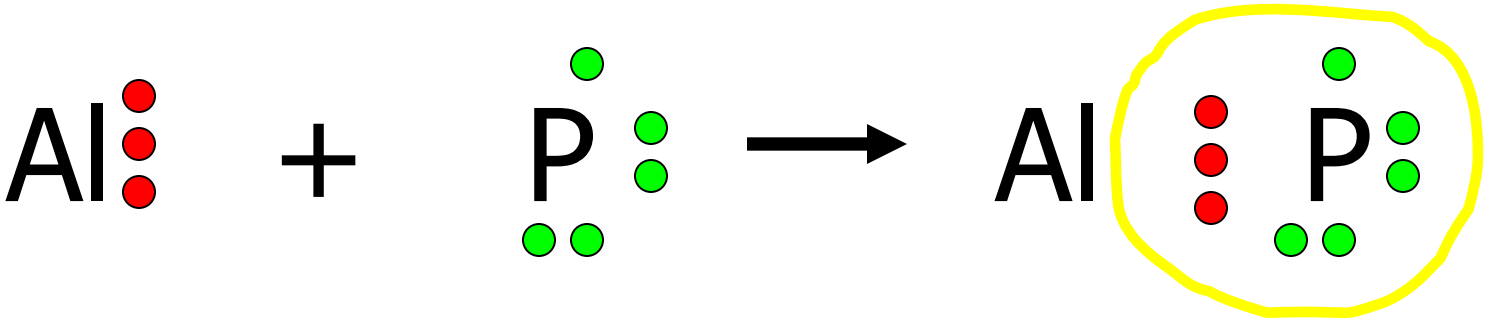
O:

$P^+ = 8+$

e- = 8- 10-

Charge = 2-

O^{2-}



Al :

$P^+ = 13 +$

$e^- = 13 - 10 -$

Charge = 3+

Al^{3+}

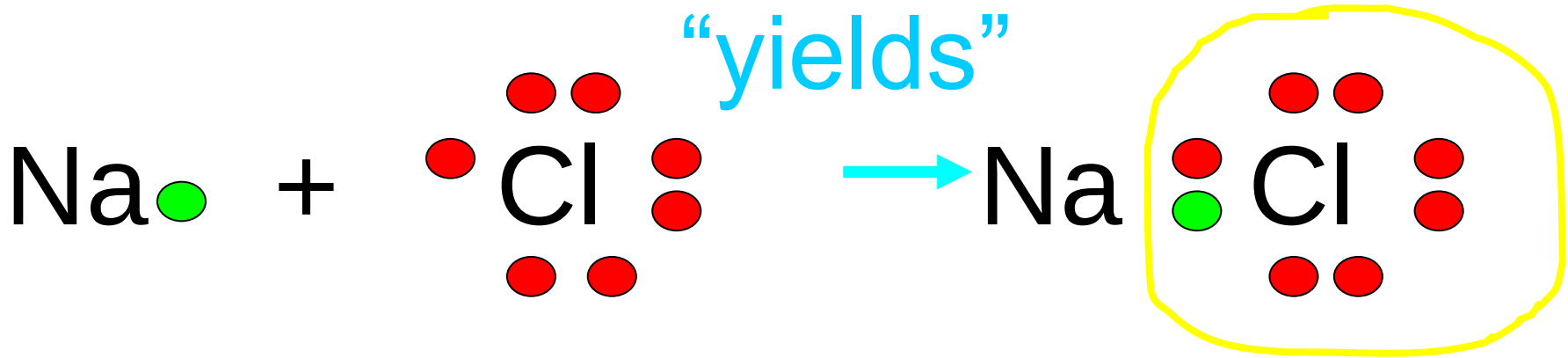
P:

$P^+ = 15 +$

$e^- = 15 - 18 -$

Charge = 3 –

P^{3-}


“yields”
Na
+
Cl
Na
Cl

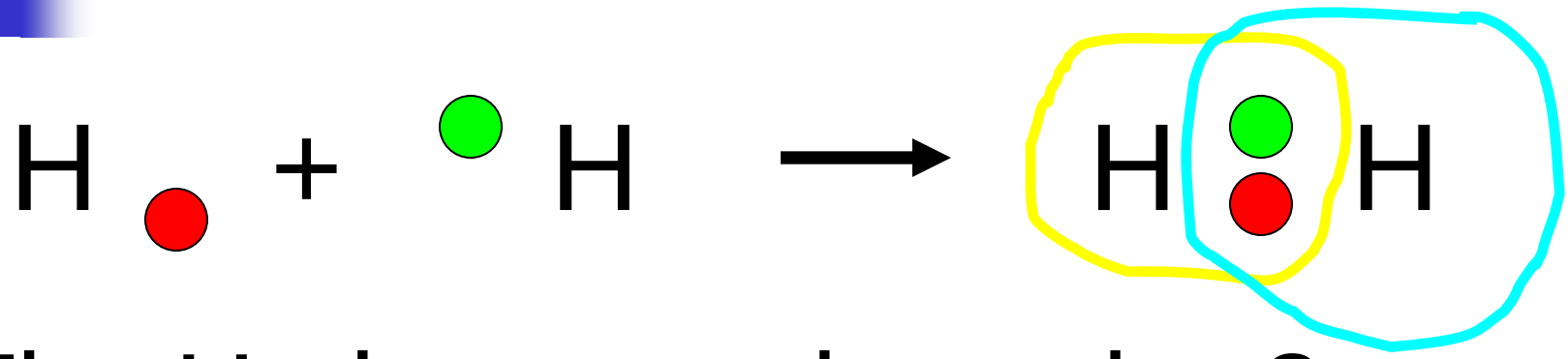
Metallic Bonding

- Metallic Bonding – form when metal atoms share their pooled electrons.
- Only done by metals.
- This bonding affects the properties of the metals.
  - It makes them malleable and ductile, the atoms can slide past each other.
  - It allows them to conduct electricity well, the outer electrons can move freely.

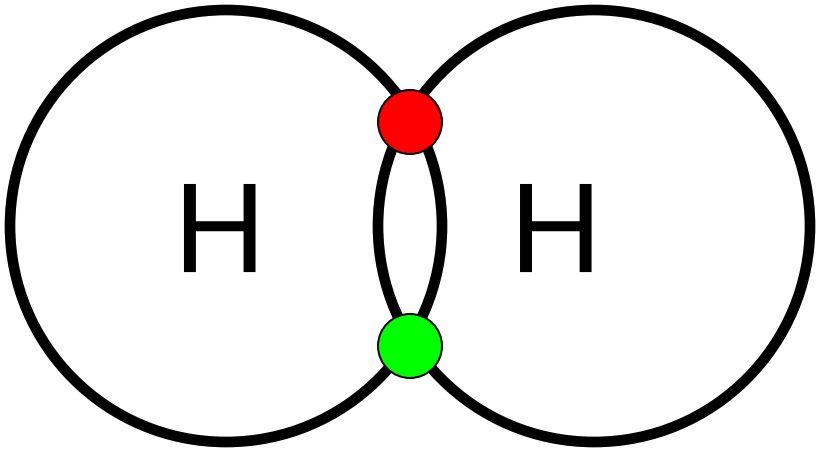
Covalent Bond

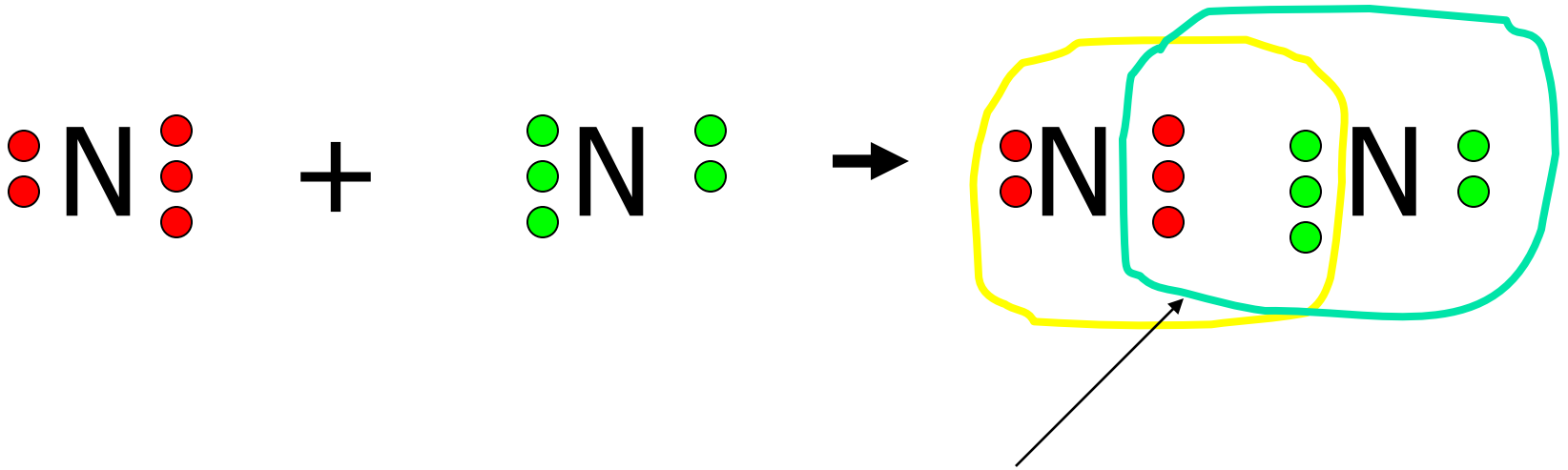
- Covalent Bond – the attraction that forms between atoms when they share electrons.
- Molecule – the neutral particle formed when atoms share electrons.

Example



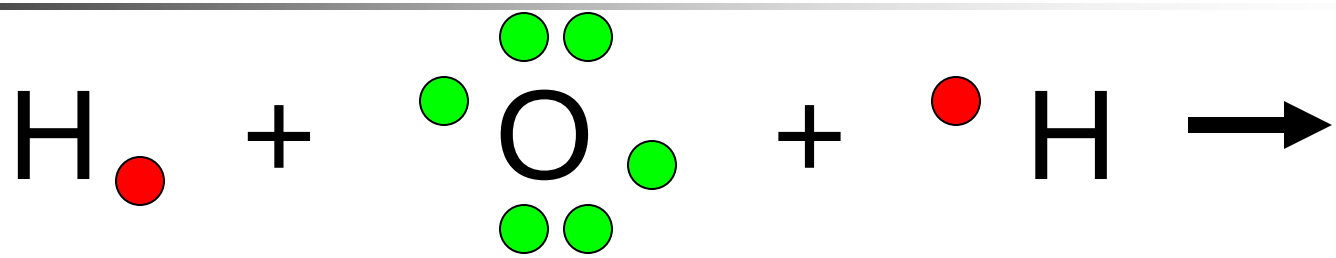
The Hydrogens share the 2 electrons giving each one the 2 needed to have a filled energy level for a split second each


H
H

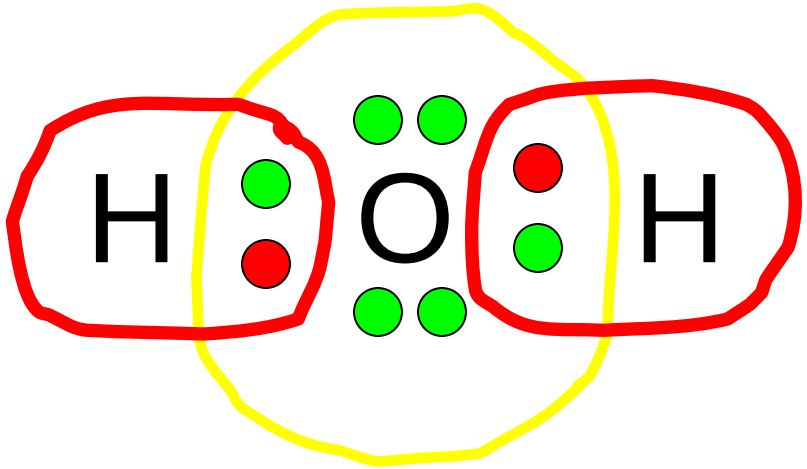


Triple Bond

H_2O



They share.



Double and Triple Bonds

- Double Bond – when two atoms share 2 pairs of electrons.
- Triple Bond – when two atoms share 3 pairs of electrons.

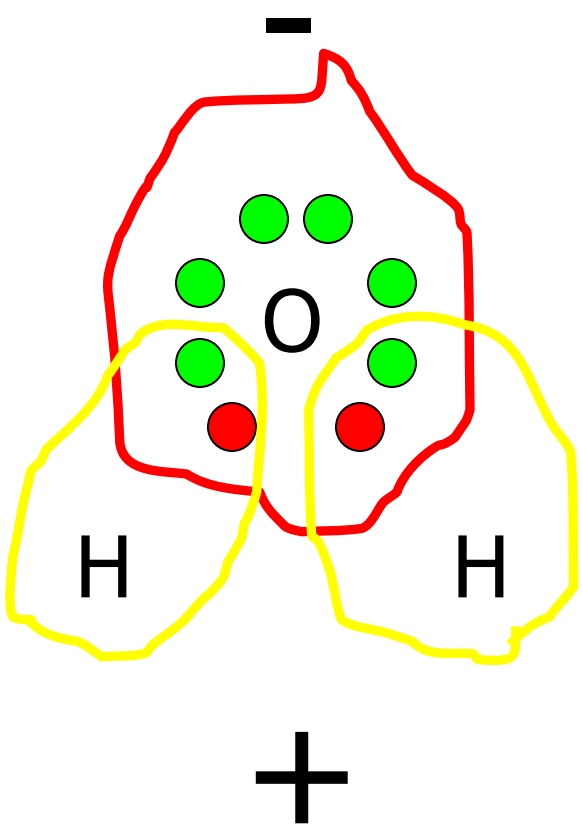
2 Types of Covalent Bonds

1. Polar Covalent Bond
   - A bond in which electrons are shared unequally.
2. Nonpolar Covalent Bond
   - A bond in which electrons are shared equally.

Polar Covalent Bond

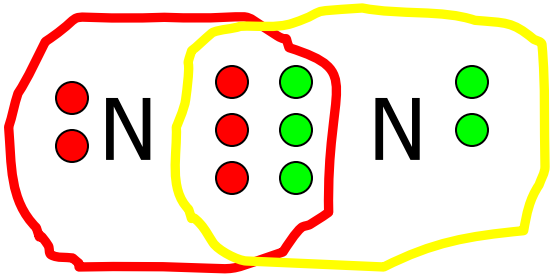
- One atom holds the shared electrons longer than the other.
  - Creates a slight negative charge on the atom being greedy.
  - A slight positive charge is created on the other atom.

Example



Nonpolar Covalent Bond

- Each atom holds the shared electrons evenly.



Chemical Formula

- Chemical Formula – a combination of chemical symbols and number that shows which elements are present in a compound and how many atoms of each element are present.

Examples

- H_2O
  - 2 Hydrogens , 1 Oxygen
- NaCl
  - 1 Sodium , 1 Chlorine
- $C_{12}H_{22}O_{11}$
  - 12 Carbon , 22 Hydrogen , 11 Oxygen