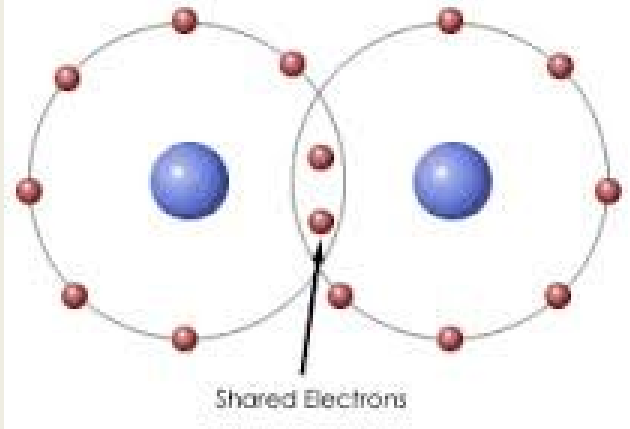
What if neither atom wants to give up an electron?

Then a….

COVALENT BOND

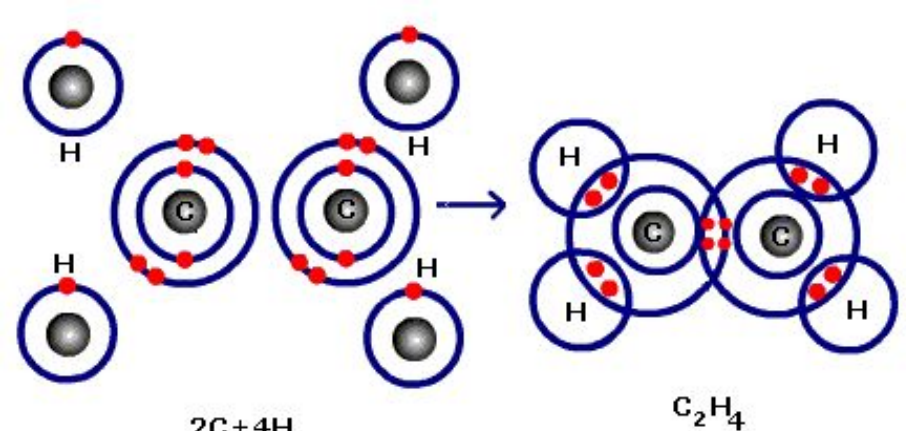
is formed!

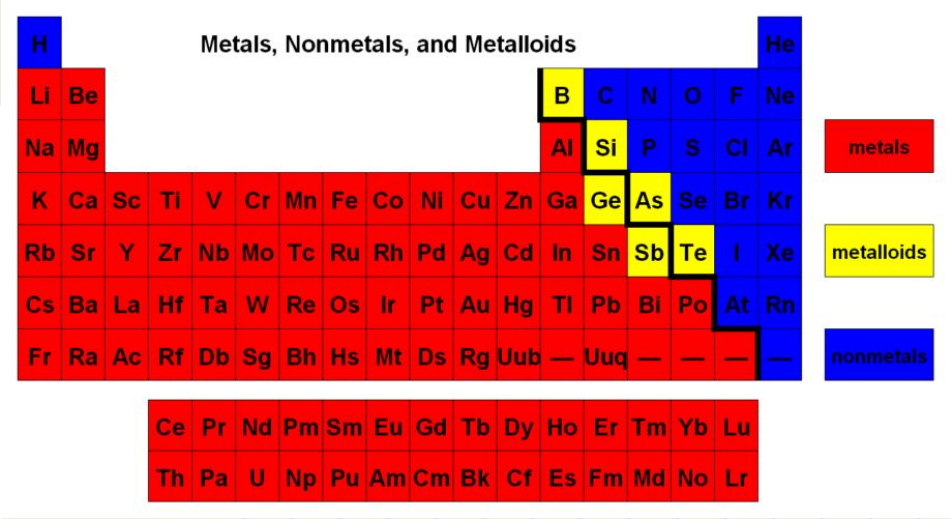
In this bond molecules are formed by the *sharing* of electrons



Characteristics of Covalent Bonds

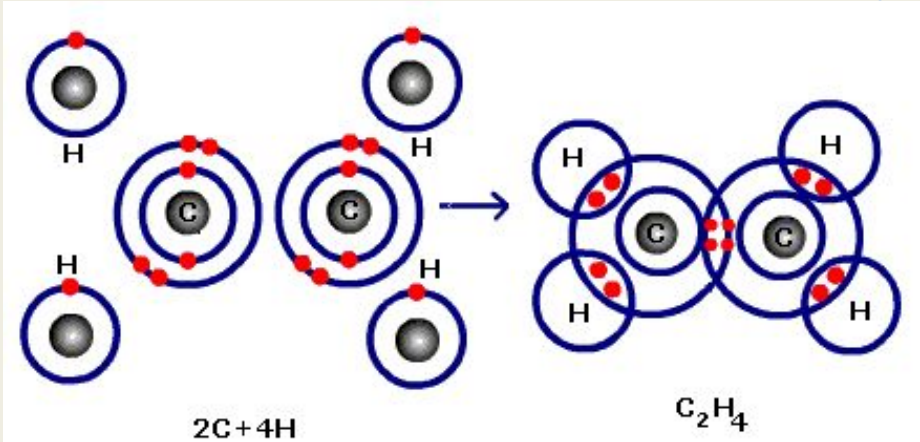
- Formed between nonmetals and nonmetals
- Formed by sharing electron pairs—the tug-of-war for the electrons holds atoms together.
- low melting and boiling points





Characteristics of Covalent Bonds

- Types of Covalent Bonds
  - Single/double/triple
  - Polar and Non-polar
- Examples; O_2, CO_2, C_2H_6, H_2O, SiC



Single, double, and triple bonds

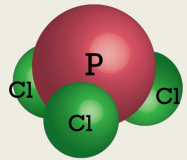
Some bonding creates single covalent bonds, while others make double and triple bonds

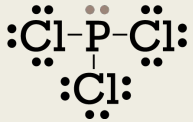
They form depending on how many electrons the atom needs to create a full valance shell and how many electrons the atoms can share.

These bonds vary in strength and create molecules/compounds with different properties.

Phosphorus Trichloride

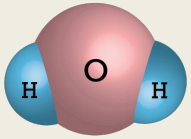
PCl_3

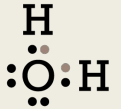


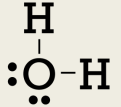


Water

H_2O

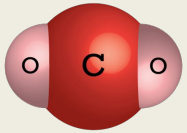


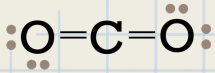




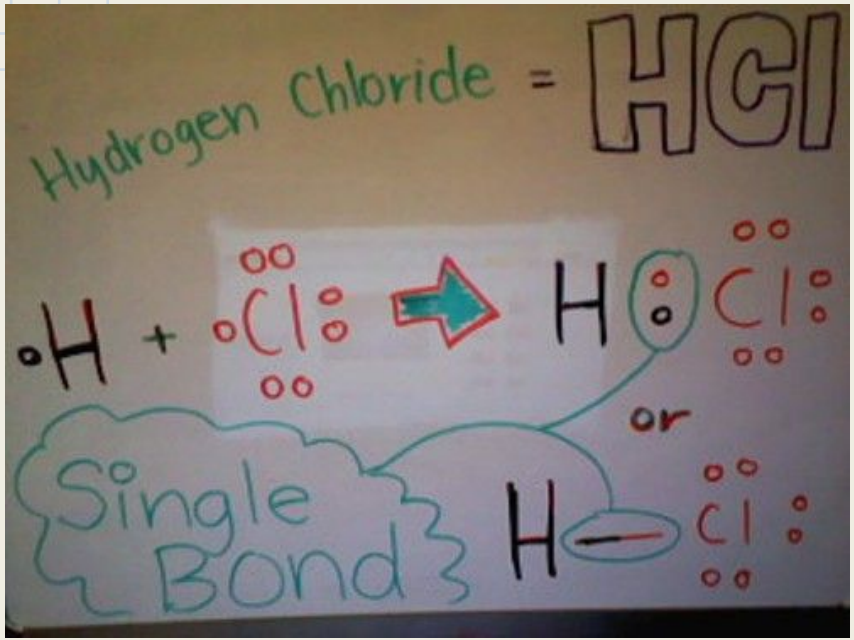
Carbon Dioxide

CO_2





Single bonds



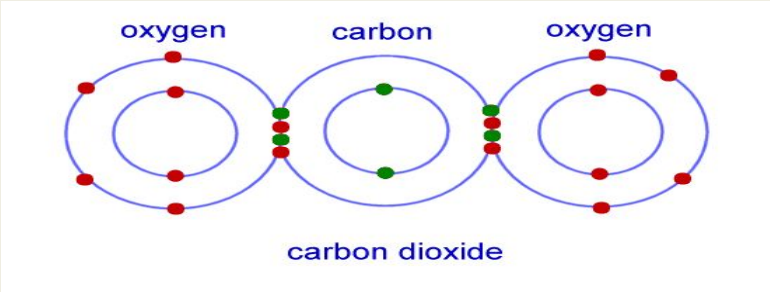
single bond is when two electrons (one pair) are shared between two atoms.

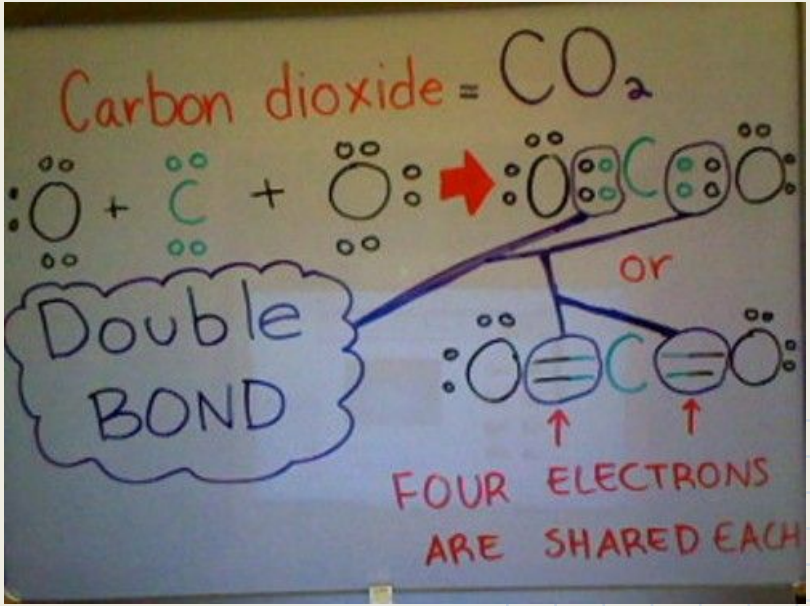
Drawn as a single line between the two atoms.

Double Bonds

A Double bond is when atoms share **two pairs** of electrons with each other.

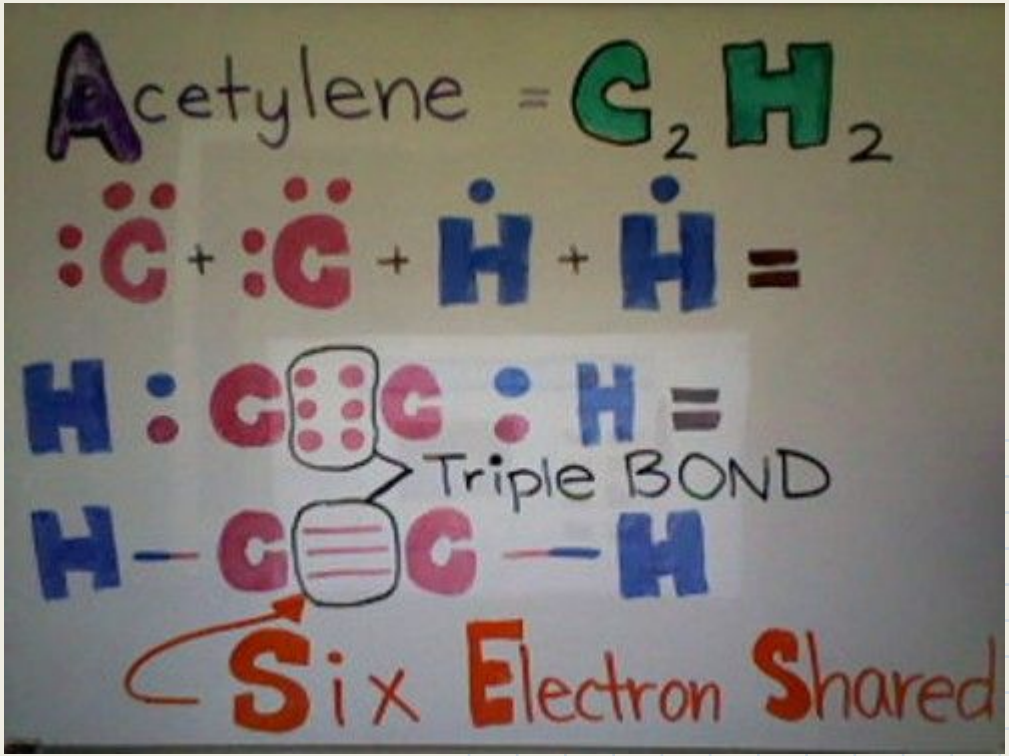
depicted by two horizontal lines between two atoms in a molecule.





Triple Bonds

A triple bond is when three pairs of electrons are shared between two atoms in a molecule.



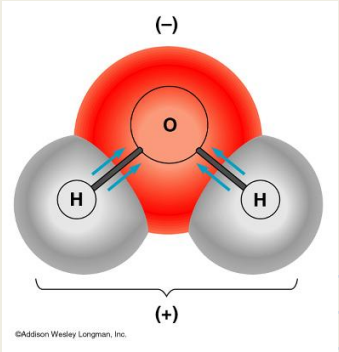
Polar Covalent Bonds

when electrons are shared but shared *unequally*

This is caused by one molecule having higher electronegativity than others (further right on table)

Examples:

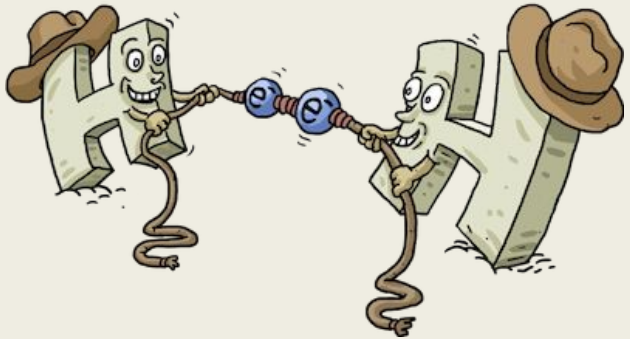
- HCl and H_2O
- water is a *polar molecule* because oxygen is more electronegative than hydrogen, and therefore electrons are pulled closer to oxygen.



Nonpolar Covalent Bonds

when electrons are shared *equally*

Examples:
H_2, O_2, Cl_2



Polarity-who cares???

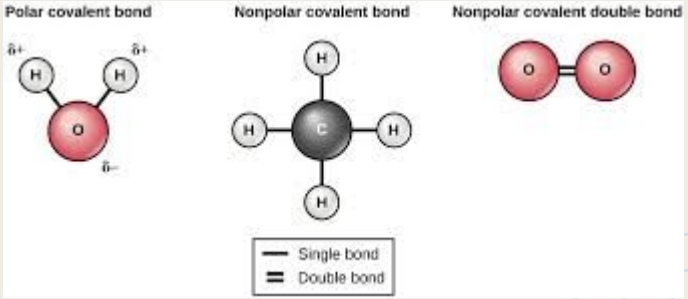
- Polarity determines a lot of important properties of substances.
  - Solubility/ability to dissolve other things
  - surface tension
  - melting and boiling points.

- For example, polar and non-polar molecules do not mix.
  - oil is non polar, while water is polar.

Check for Understanding

- Explain the difference between single/double/and triple bonds

- Explain the difference between polar and nonpolar covalent bonds



- Explain as many differences as you can between covalent and ionic bonds