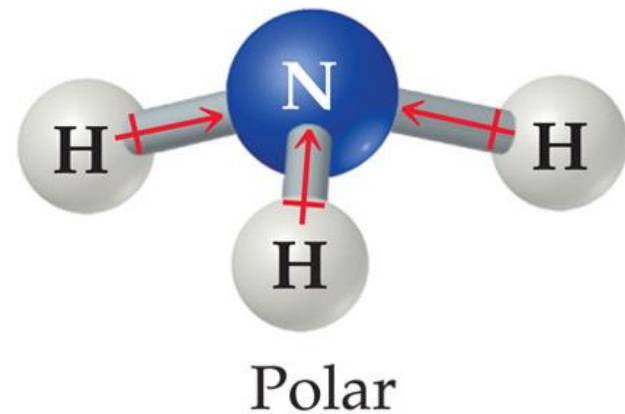
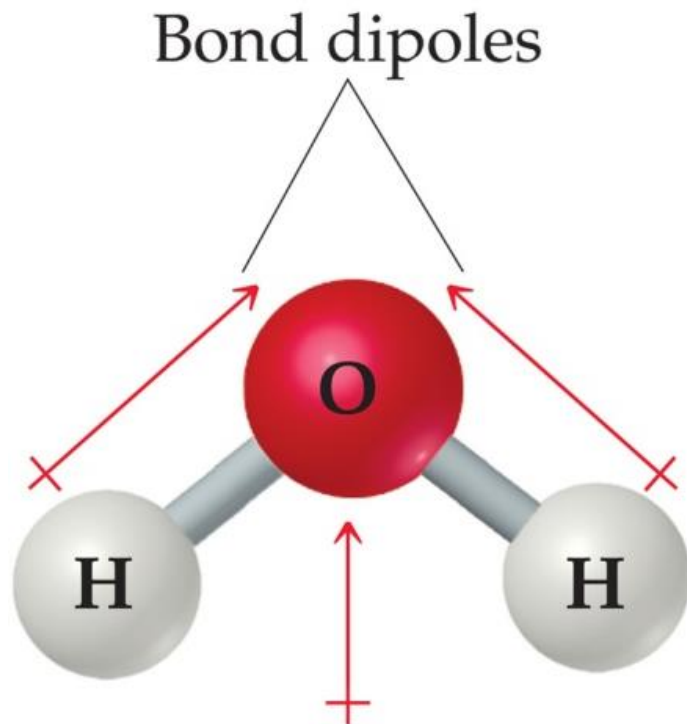


# Unit 4: Covalent Bonding & Nomenclature



covalent bond – formed by sharing e<sup>-</sup>s between atoms. (nonmetals only)

molecule – neutral group of **atoms** joined by **covalent bonds**.

molecular compound – composed of molecules with covalent bonds.

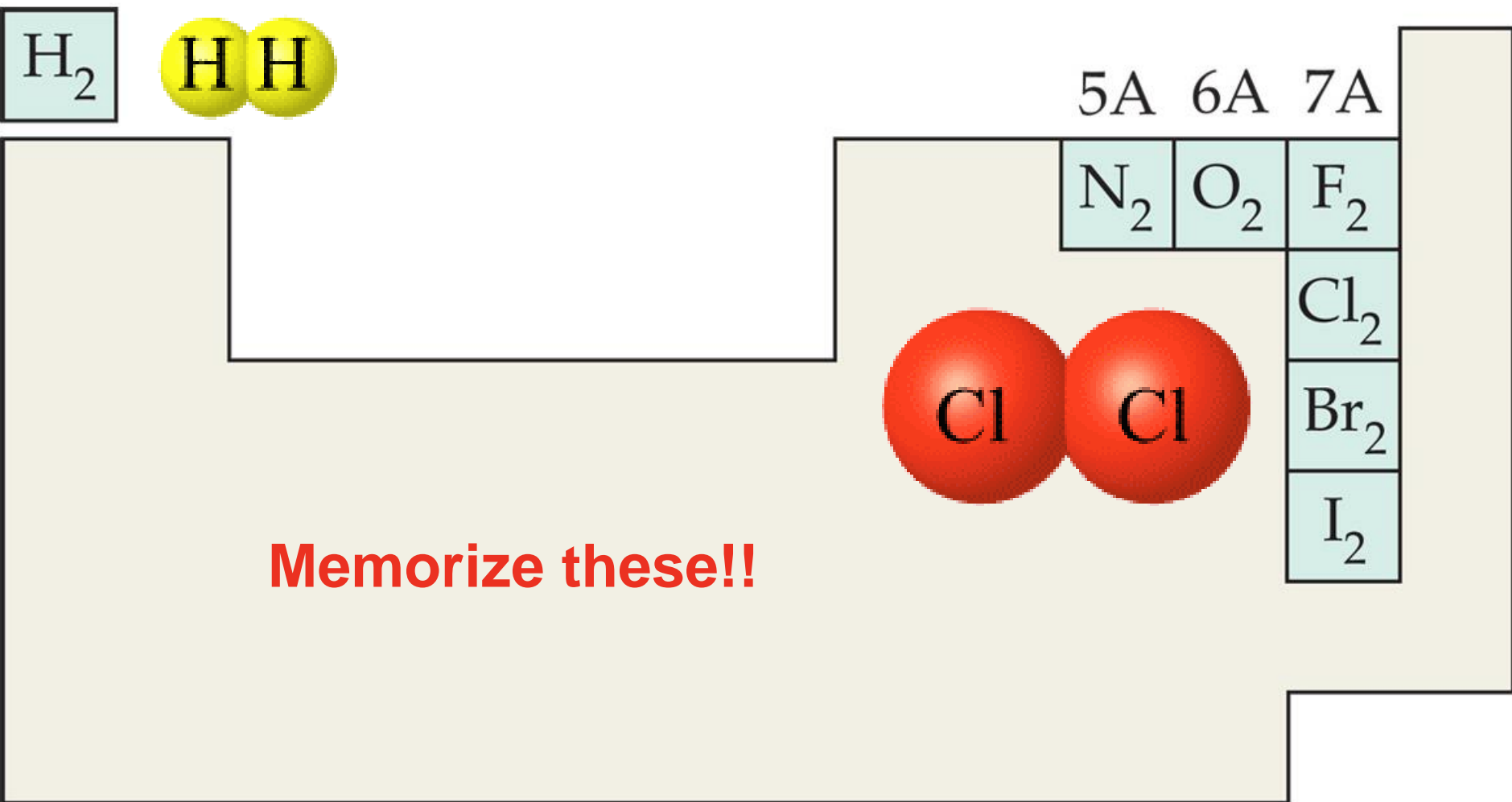


Water (H<sub>2</sub>O)



Carbon monoxide (CO)

diatomic molecule – molecule consisting of **two atoms of the same element**.



molecular formula: shows **how many atoms** of **each element** a molecule contains.



Water ( $\text{H}_2\text{O}$ )

1 molecule of  $\text{H}_2\text{O}$   
contains  
2 hydrogen atoms  
1 oxygen atom



Carbon dioxide ( $\text{CO}_2$ )

1 molecule of  $\text{CO}_2$   
contains  
2 oxygen atoms  
1 carbon atom



Ethanol ( $\text{C}_2\text{H}_6\text{O}$ )

1 molecule of  $\text{C}_2\text{H}_6\text{O}$   
contains  
6 hydrogen atoms  
2 carbon atoms  
1 oxygen atom



Hydrogen atom (H)



Carbon atom (C)



Oxygen atom (O)

## Properties of molecular compounds:

- lower melting and boiling points than ionic compounds. (usually liquid or gas)
- poor conductors



Water (H<sub>2</sub>O)

1 molecule of H<sub>2</sub>O



Carbon dioxide (CO<sub>2</sub>)

1 molecule of CO<sub>2</sub>

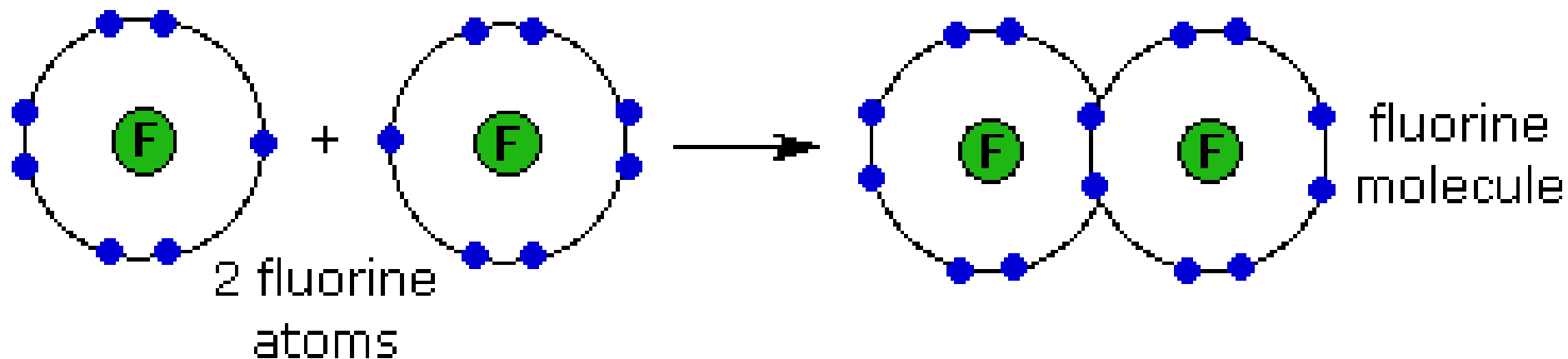


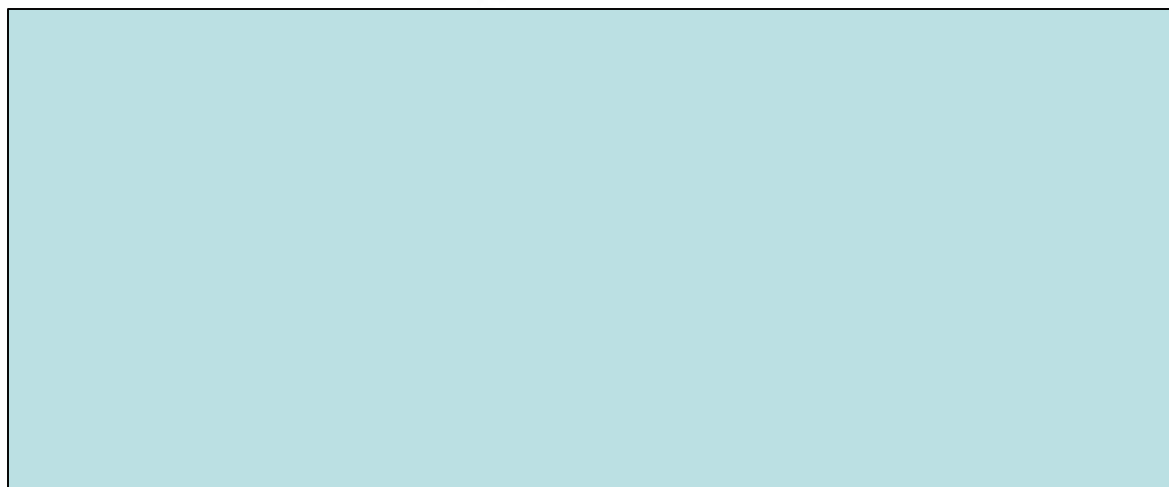
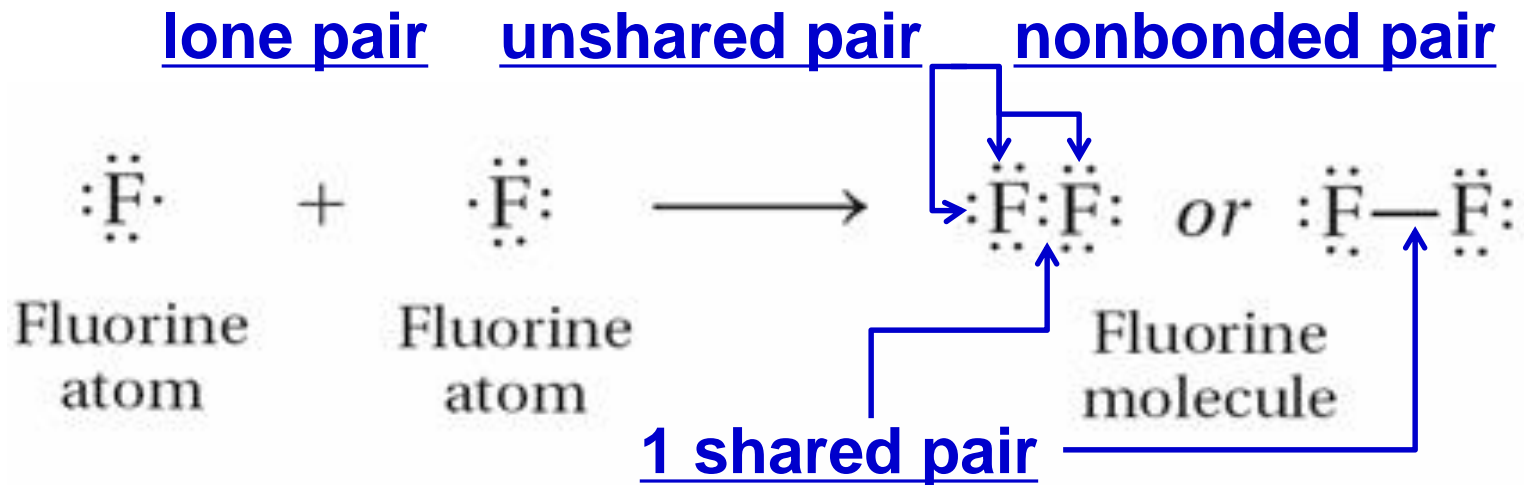
Ethanol (C<sub>2</sub>H<sub>6</sub>O)

1 molecule of C<sub>2</sub>H<sub>6</sub>O

## Octet Rule:

atoms tend to combine to have **8 electrons** in their **outer shell** like **noble gases**.





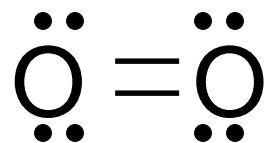
single bond: atoms bonded by **sharing a pair of electrons**.



Fluorine molecule

## Double and Triple Covalent Bonds

double bond: bond that shares **two pairs** of electrons.



triple bond: bond that shares **three pairs** of electrons.





## Quick Quiz!

1. A molecular compound usually consists of
  - A. two metal atoms and a nonmetal atom.
  - B. two nonmetal atoms and a metal atom.
  - C. two or more metal atoms.
  - D. two or more nonmetal atoms.

## Quick Quiz.

2. A molecular formula shows

A. how many atoms of each element a molecule contains.

B. a molecule's structure.

C. which atoms are bonded together.

D. how atoms are arranged in space.

## Quick Quiz.

3. Compared to ionic compounds, molecular compounds tend to have relatively
- A. low melting points and high boiling points.
  - B. low melting points and low boiling points.**
  - C. high melting points and high boiling points.
  - D. high melting points and low boiling points.

## Quick Quiz.

4. In covalent bonding, atoms attain an octet electron configuration like noble gases by
- A. losing electrons.
  - B. gaining electrons.
  - C. transferring electrons.
  - D. sharing electrons.

## Quick Quiz - .

7. Draw the correct Lewis structure for nitrous oxide (or laughing gas),  $\text{N}_2\text{O}$ .

hint: arrange the atoms as...

