

MOLECULAR SUBSTANCES: → *non-metals*

- are solids, liquids or gases at SATP
- if soluble, dissolve in water to form **colorless** aqueous solutions that **do not conduct** electricity ie. they are **non-electrolytes**
- they contain only **nonmetal atoms**

Molecule

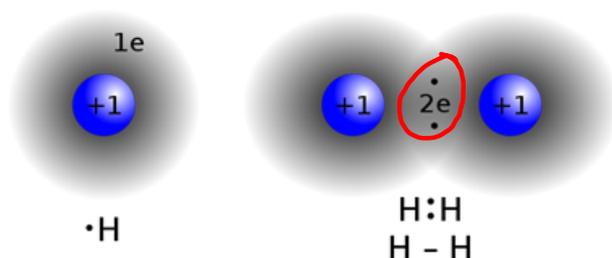
a particle of a molecular substance that contains a fixed number of covalently-bonded nonmetal atoms

Covalent Bond:

formed from the sharing of valence electrons between nonmetal atoms, which results in an electron structure that is the same as a noble gas, for each atom in the molecule

Example:

H₂ A molecule of hydrogen gas has 2 atoms of Hydrogen, each with one electron. When they bond they share a pair of electrons (one pair = one covalent bond). Since each atom now has 2 electrons, they both have same electron structure as He (noble gas).



NOTE: molecules DO NOT form ions.

http://www.youtube.com/watch?v=1wpDicW_MQQ&feature=related

http://www.youtube.com/watch?v=LRVW0tgSLRI&feature=endscreen&NR=1&safety_mode=true&persist_safety_mode=1&safe=active

<http://www.youtube.com/user/greatpacificmedia#p/u/55/UR4eG60jjQQ>

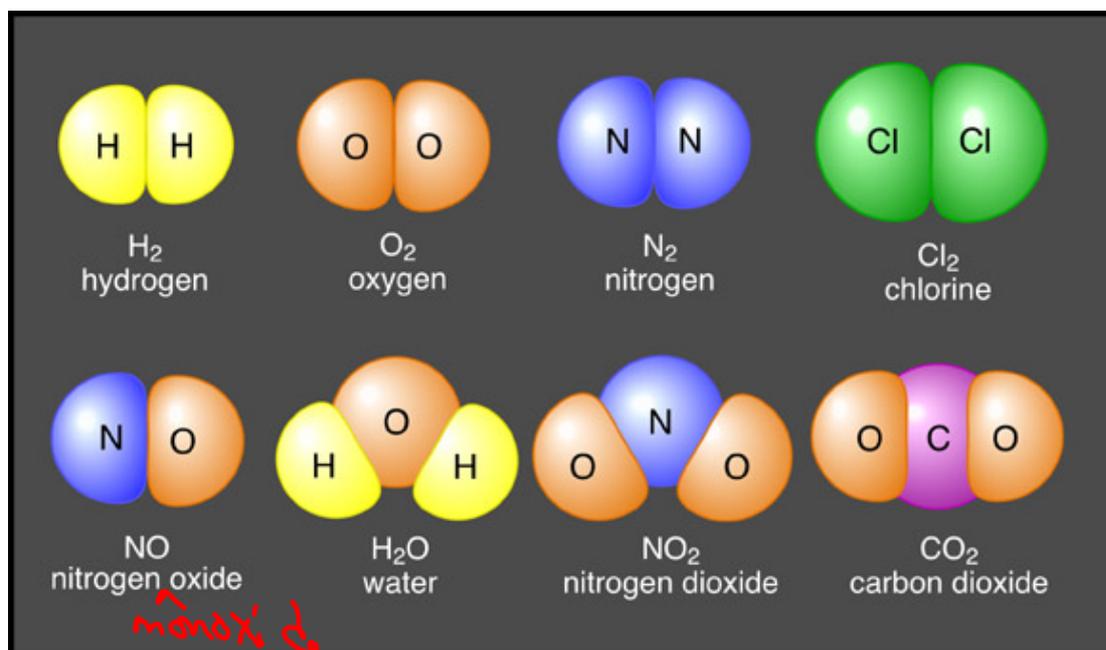
<http://www.youtube.com/user/greatpacificmedia#p/u/55/UR4eG60jjQQ>

Molecular Substances Include Molecular Elements and Molecular Compounds

Molecular elements: contain only **one kind of nonmetal atom**

Type	Molecular Elements
Monatomic one atom	Noble gases : He(g) Ne(g) Ar(g) Kr(g) Xe(g) Rn(g)
Diatomic two atoms/molecule	Hydrogen, Oxygen, Nitrogen and the Halogens The "HONorable Halogens" H ₂ (g), O ₂ (g), N ₂ (g), F ₂ (g), Cl ₂ (g), Br ₂ (g), I ₂ (s), At ₂ (s)
Polyatomic more than 2 atoms/molecule	Ozone = O ₃ (g) Phosphorus = P ₄ (s) Sulfur (Sulphur) = S ₈ (s)

Molecular elements and Molecular compounds



Molecular Compounds

a) Common (to memorize):

$\text{H}_2\text{O}_{(l)}$ = water $\text{CH}_4_{(g)}$ = methane $\text{CH}_3\text{OH}_{(l)}$ = methanol

$\text{C}_3\text{H}_8_{(g)}$ = propane $\text{C}_2\text{H}_5\text{OH}_{(l)}$ = ethanol $\text{H}_2\text{O}_2_{(l)}$ = hydrogen peroxide

$\text{NH}_3_{(g)}$ = ammonia $\text{C}_6\text{H}_{12}\text{O}_6_{(s)}$ = glucose $\text{C}_{12}\text{H}_{22}\text{O}_{11(s)}$ = sucrose

b) Binary Molecular Compounds

- composed of 2 different kinds of nonmetalseg. CO CO₂ CCl₄ SO₃
N₂O

Writing Molecular Formulas**General Rules**

1. Write each atom symbol.
2. Each prefix indicates the subscript for the nonmetal atom that precedes it (# of atoms present).
3. If no prefix is present, then there is only one atom of that nonmetal present. Monoxide = one oxygen atom present.

Examples: Fill-in the table by writing the molecular formulas

Name	Formula	Name	Formula
Carbon monoxide	CO	Trisulfur hexaoxide	S ₃ O ₆
Carbon tetrachloride	CCl ₄	Dinitrogen pentaoxide	N ₂ O ₅
phosphorus pentachloride	PCl ₅	disulfur tetraoxide	
tetraphosphorus decaoxide	P ₄ O ₁₀	tetraphosphorus octaoxide	P ₄ O ₈

Note:

Formulas for common molecular substances **must be**

memorized, as well as those for the

"HONorable Halogens": $\text{H}_{2(g)}$ $\text{O}_{2(g)}$ $\text{N}_{2(g)}$ $\text{F}_{2(g)}$ $\text{Cl}_{2(g)}$ $\text{Br}_{2(l)}$

$\text{I}_{2(s)}$ $\text{At}_{2(s)}$

Naming Molecular Substances

General Rules

1. First element is named in full.
2. Second element name is shortened and given **ide** ending.
3. Use prefixes (same as for hydrates) to indicate the number of each kind of atom.
4. The prefix mono is usually only used for the second element.
Ex CO = carbon monoxide.
5. Certain Hydrogen compounds (those with H first in the formula) do not use prefixes.
Ex. $\text{H}_2\text{S}_{(g)}$ = hydrogen sulfide, **not** dihydrogen sulfide

Formula	Name	Formula	Name
$N_2O(g)$	dinitrogen monoxide	H_2O	water
$SO_3(g)$	sulfur trioxide	H_2S	hydrogen sulfide
$P_4O_6(s)$	tetraphosphorus hexoxide	NH_3	ammonia
N_3O_7	trinitrogen heptoxide	H_2O_2	hydrogen peroxide

