The Solubility Table

It is easy to tell which ionic substances will dissolve in water and which will remain as solids by using the Solubility Table. This table is the accumulation of experiments over the years.

How to use the Solubility Table:

Example 1: NaCl

1. Split the ionic compound in question into its cation and anion

Cation: Na^+
Anion: Cl^-

2. Find the anion in the top row of the Table (found on the back of your periodic table or on pg 57)

3. Trace down to the Very soluble block of the column. The word most means that when most cations join with that anion, they will dissolve in water.

4. If you don't find the cation in the Very soluble block, move down to the second block 'slightly soluble'. The cations listed there will form a compound with the anion that will not dissolve in water, and will stay solid.

5. NaCl is soluble in water.

Example 2: Find the solubility of $CaSO_4$

s

Example 3: Find the solubility of NH_4OH

aq

*****Time Saver Tips to Remember*****

Compounds that fit the following rules will always be soluble in water.

1. If any cation from Group 1 (alkali metals) is present in a compound.

   Ex. NaCl Li_2SO_4

2. If either NH_4^+ or NO_3^- is part of the ionic compound.

   Ex. NH_4Br $Mg(NO_3)_2$

Outcome 1
Topic 4 - Molecular Compounds

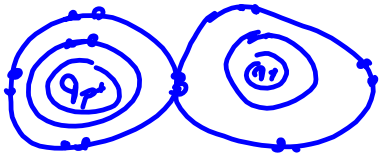
o **Molecular compounds** are compounds made up of two or more non-metal atoms.

o **Molecules** are formed when one atom shares one or more electrons with another atom to fill the valence shell of the atoms involved.

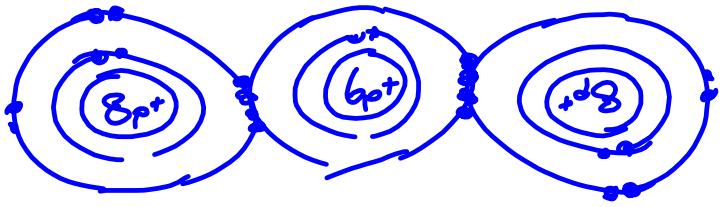
o The result is a **stable** and **neutral** compound.

o Molecular compounds do not involve ions because atoms are not losing or gaining any electrons.

Example: Chlorine Gas (Cl_2) Fluorine F_2



Example: Carbon dioxide gas (CO_2)



Molecular Elements:

Define the following terms:

Monatomic element: one atom; an element that can exist as a single atom

Molecular element: a molecule made up of only one type of atom

Diatomic: molecule that is composed of 2 atoms of one kind (O_2, Cl_2, N_2)

Polyatomic: Molecules made up of more than 2 atoms of one kind (P_4)

Monoatomic elements	**$C_{(s)}$ noble gases all metals** $Si_{(s)}$ $B_{(s)}$
Diatomic molecular elements	**$H_{2(g)}$ $N_{2(g)}$ $Cl_{2(g)}$ $F_{2(g)}$ $Br_{2(g)}$ $I_{2(s)}$ $O_{2(g)}$**
Polyatomic molecular elements	**$P_{4(s)}$ $S_{8(s)}$**

Naming Binary Molecular Compounds

- **International Union for Pure and Applied Chemistry (IUPAC)** rules for naming molecular compounds that contain two or more different atoms are similar to the rules for naming ionic compounds

- The only exception is that **prefixes** are used to indicate the number of atoms in each molecule.

Fill in the chart below

Prefix	Number
Mono	1
Di	2
Tri	3
Tetra	4
Penta	5
Hexa	6
Hepta	7
Octa	8
nona	9
Deca	10

*****The prefix mono is not used on the first element EVER*****

- Any compound that does not have a metal or ammonium caon in its formula is a molecular compound.

- The format for naming binary molecular compounds that don't contain hydrogen is:

Prefix + name of first element, followed by prefix + second element ending in …ide

Pracce naming the following molecular compounds

N_2O dinitrogen monoxide

PBr_6 phosphorous hexabromide

CO Carbon monoxide

P_2F_5 diphosphorous pentafluoride

Molecular Compounds that Contain Hydrogen

It is impossible for us to predict the formulas for these compounds because some of them get so large!!! IUPAC has come up with common names for these substances that have to be memorized!!!

Fill in the following chart…It will make it easier to memorize the formulas

IUPAC Name	Formula and State at 25C
Water	H_2O
Hydrogen peroxide	H_2O_2
Ammonia	NH_3
Glucose	$C_6H_{12}O_6$
Sucrose	$C_{12}H_{22}O_{11}$
Methane	CH_4
Propane	C_3H_8
Methanol	CH_3OH
Ethanol	C_2H_5OH
Ozone	O_3
Hydrogen sulfide	H_2S

Properes of Molecular Compounds:

1. **State:** can be solid, liquid or gas, depends on the compound

2. **Color:** varies depending on the compound

3. **Melng Point:** melng points tend to be lower than those of ionic compounds .

4. **Solublility:** varies with the compound, some are soluble, some are not, you cannot predict it...yet

5. **Electrical Conducvity:** All molecular compounds are electrically neutral (i.e. don't conduct electricity)

6. **Strength of Crystals:** crumble easily, and don't hold their shape because of weak aracve forces between molecules

Special Properties of Water:

1. **Polarity:** water has a positive and negative ends. This is because of its shape.

2. **Cohesion:** the positive and negative ends means that one water molecule attracts another.

3. **Density:** Density of solid water (ice) is less than that of liquid water.

4. **Formation of Ice:**

Why does ice float? What would happen to organisms in freshwater lakes if ice was denser than liquids?

When ice forms, water molecules spread out and line up very orderly. The fact that ice spreads out when it forms means it is less dense than water and floats.

1) $BrCl_3$	
2) BN	
3) N_2O_3	
4) NI_3	
5) SF_6	
6) XeF_4	
7) PCl_3	
8) CH_4	
9) PCl_5	
10) P_2O_5	
11) S_2Cl_2	
12) ICl_2	
13) NH_3	
14) P_4O_{10}	
15) H_2O	
16) OF_2	

1) chlorine monoxide	
2) sulfur hexachloride	
3) dinitrogen monoxide	
4) nitrogen trifluoride	
5) sulfur tetrachloride	
6) xenon trioxide	
7) carbon dioxide	
8) boron trichloride	
9) diphosphorus pentoxide	
10) phosphorus trichloride	
11) sulfur dioxide	
12) bromine pentafluoride	
13) disulfur dichloride	
14) boron trifluoride	
15) tetraarsenic decoxide	
16) silicon tetrachloride	