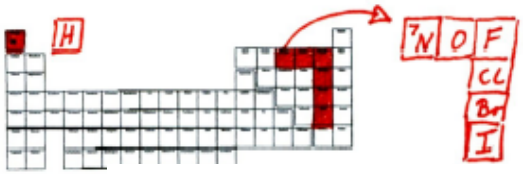
Name _____ **Date** _____ **Period**_____

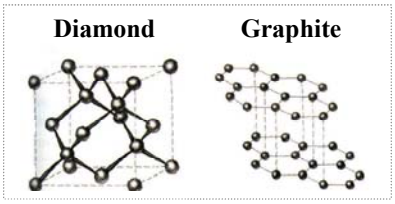
Objectives
Describe the difference between molecular and ionic compounds (see need to know sheet Chapter 5.1)
Explain the terms "hydrates", "allotropes and names the 7 elements that make diatomic molecules"
Write formulas and names for (inorganic) binary molecular compounds

Hydrates are ionic compounds bonded to water molecules.
A substance that absorbs water molecules from the air to become a hydrate is called hygroscopic.

Start at 7, make a 7 (+ hydrogen)
Most elements are composed of atoms,
but 7 exist as diatomic molecules:
Hydrogen H_2, Nitrogen N_2, Oxygen O_2,
Fluorine F_2, Chlorine Cl_2, Bromine Br_2, Iodine I_2



Allotropes
Some elements exist in different structural forms called allotropes.
Allotropes of an element have different properties.
Example: Carbon exist as diamond, graphite and other allotropes.



Molecular substances or compounds are composed of molecules, held together by covalent bonds. They are made from all nonmetals, which have no ionic charges. They have a greater variety of properties than do ionic compounds, but generally they have low melting points, low water solubility, and little or no ability to act as electrolytes. They can be gas or liquid or solid at room temperature.
Millions of molecular compounds are known and chemists either discover or make new ones all the time.
A **molecule** is an uncharged group of two or more atoms held together by covalent bonds (sharing electrons).

Naming simple molecular compounds (Binary molecular inorganic compounds)
Most molecular compounds that contain carbon (organic compounds) are named by different rules (not discussed here). Most other binary molecular compounds are named by the following easy rules:

Binary molecular compounds are named by writing the two elements in the order they are found in the formula, changing the ending of the second element to **-ide,** and adding Greek **prefixes** to the element names to indicate how many atoms of each are present.

"mono" is usually not used for the first element e.g. CO is carbon monoxide (not monocarbon monoxide)
vowel combinations *o-o* or *a-o* are shortened to o e.g. N_2O_5 is dinitrogen pentoxide (not …pentaoxide)

Prefix	Number
mono-	1
di-	2
tri-	3
tetra-	4
penta-	5
hexa-	6
hepta-	7
octa-	8
nona-	9
deca-	10

Given on quiz

Carbon monoxide CO
Carbon dioxide CO_2
Tetraiodine nonoxide I_4O_9

Sulfurtrioxide ? _____

Phosphorous pentafluoride ? _____

CCl_4 ? _____

Note that the ending for all binary compounds is still -ide

Some compounds have "**common names**", e.g. H_2O (water), NH_3 (ammonia), or acids, such as H_2SO_4 (sulfuric acid) or HNO_3 (nitric acid). It is important to know both, the formal and common names of chemicals, because both are part of the language of chemistry.
Use the flow chart on the next page to correctly name binary ionic, ternary ionic, and binary molecular compounds.

Identify the elements as

metal(s) + nonmetal(s) ⇒ Ionic compound

2 elements ⇒ Binary ionic compound

example Mg and P

Identify metal ⇒ cation (first)
and nonmetal ⇒ anion (second)

Find charges from periodic table, except groups B and group IVA

Mg^{2+} and P^{3-}

Find Formula
Criss-cross and adjust to smallest whole # ratio

Mg_3P_2

Find Name
Cation keeps the element's name
Anion changes ending to –ide

Magnesium phosphide

Roman numerals only needed for group B and group IVA cations, represents charge of cation

Fe^{3+} and P^{3-} FeP
Iron (III) phosphide

More examples:
$Na\ N \rightarrow Na^+\ N^{3-} \rightarrow Na_3N$ sodium nitride
$Ti^{4+}\ O^{2-} \rightarrow TiO_2$ titanium (IV) oxide

3 or more elements ⇒ Ternary ionic compound

example Mg, P and O

Contains polyatomic ion
Identify polyatomic ion (look up in table)
Cation first anion second
Find charges

Mg^{2+} and PO_4^{3-}

Find Formula
Criss-cross (don't change polyatomic ion; put into parenthesis if more than one)

$Mg_3(PO_4)_2$

Find Name
Polyatomic ion keeps its name (mostly -ate, -ite)
Monoatomic cation keeps its name
(Monoatomic anion changes ending to –ide)

Magnesium phosphate

Roman numerals only needed for group B and group IVA cations, represents charge of cation

Fe^{3+} and PO_4^{3-} $FePO_4$
Iron (III) phosphate

More examples:
$Sr^{2+}\ NO_3^- \rightarrow Sr(NO_3)_2$ strontium nitrate
$Fe^{3+}\ SO_4^{2-} \rightarrow Fe_2(SO_4)_3$ iron(III) sulfate

All nonmetals ⇒ Molecular compound

2 elements ⇒ Binary molecular compound

example P and O

Molecules formed by sharing electrons – no ions !!!! don't look for charges

Formula or name must be given

1 = mono- 2 = di- 3 = tri
4 = tetra- 5 = penta- 6 = hexa
7 = hepta- 8 = octa- 9 = nona

P_2O_5

Find Name
Use prefixes (pre = before) to identify the # of atoms of the following element.
First element keeps its name
Second element changes ending to -ide

Diphosphorous pentoxide

More examples:
N_2O dinitrogen oxide
CH_4 carbon tetrahydride