

## Chapter 5: Molecules and compounds

**Compound:** a pure substance that contains...

a fixed ratio of 2 or more elements

**Chemical formula:** ratio of elements

$H_2O$  : 2 : 1 ratio H : O

$C_{12}H_{22}O_{11}$  : 12 : 22 : 11 C : H : O

**Law of constant composition:** ratio in a compound is consistent if the compound is pure

exact ratios

**Formula unit:** atoms represented by a chemical formula

One formula unit of  $Ca_3(PO_4)_2$  contains...

3 Ca

2 P

8 O

# Molecular compounds

**Molecular compounds:** made of molecules (groups of bonded atoms)

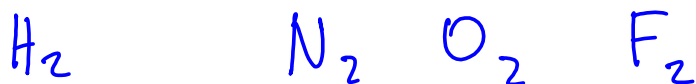
formula = all atoms in 1 molecule

Contains which type of elements? nonmetals only



H<sub>2</sub> is a **diatomic element** (exists as pairs of atoms)  
when a pure element

There are 7 diatomic elements:

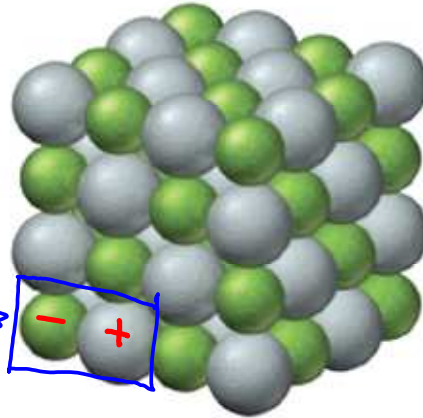


other pure elements  
are just individual  
neutral atoms

# Ionic compounds

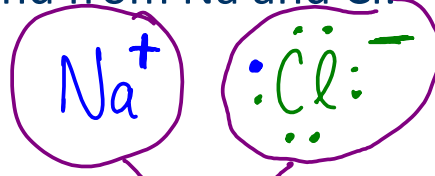
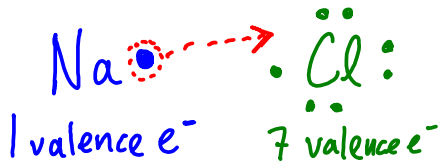
**Ionic compounds:** contain positive and negative ions

- Usually 1 metal and 1 or more nonmetals
- Forms a 3-dimensional lattice of opposite ions



formula unit:  
Smallest group of ions  
neutral

Formation of an ionic compound from Na and Cl:



attraction of oppositely-charged ions

Ionic compounds must be... neutral overall

in NaCl, need 1:1 ratio of  $\text{Na}^+$  to  $\text{Cl}^-$  to make it neutral  
 $\leftarrow$  simplified ratio of Na to Cl

What is the formula of the compound formed from calcium and chlorine?

$\downarrow$   
metal

$\downarrow$   
nonmetal

so: ionic compound

Ca forms  $\text{Ca}^{2+}$  ion

$$1 (\text{Ca}^{2+}) = 2+$$

Cl forms  $\text{Cl}^-$  ion

$$2 (\text{Cl}^-) = \frac{2-}{0 \text{ (neutral)}}$$

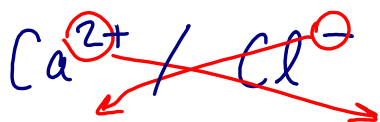
Need 1:2 ratio  $\text{Ca}^{2+} : \text{Cl}^-$  to make a neutral compound  $\rightarrow$



## Naming ionic compounds

Write the name and formula of the compound formed from calcium and chlorine

Ion pair:



formula:  $\text{CaCl}_2$

1:2 ratio

cross numbers over

Name: cation (+) name then anion (-) name

of an ionic cpd

(element name)

(element root + ide)

### Anion names:

name

VA

VIA

VIIA

Calcium chloride

$\text{N}^{3-}$  nitride

$\text{O}^{2-}$  oxide

$\text{F}^{-}$  fluoride

$\text{P}^{3-}$  phosphide

$\text{S}^{2-}$  sulfide

$\text{Cl}^{-}$  chloride

$\text{Se}^{2-}$  selenide

$\text{Br}^{-}$  bromide

$\text{I}^{-}$  iodide

Formula:

Write the name and formula of the cpd with Mg and Br:

Write the name and formula of the cpd with Ca and N: