

Theoretical Description

- contain ions (charged particles)
- ions are held together by electrostatic attractions
- contain metal and non metal elements



Empirical Properties

- solids at room temperature
- solutions conduct electricity
- solutions may be coloured
- molten ionic compounds conduct electricity
- solid ionic compounds do not conduct electricity

in water

liquid

Binary Ionic Compounds

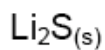
- contain only two different elements
(metal and non-metal)
- named by listing ions
(non metal ion ending is -ide)

don't care about subscripts

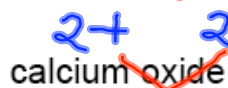
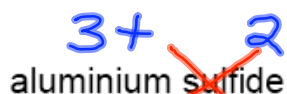
Examples



calcium chloride



lithium sulfide



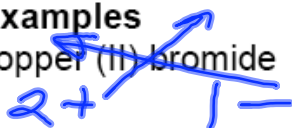
Ionic Compounds
Containing Multivalent
Metals

some metals can have more than one charge
-the Stock system uses Roman numerals to indicate the charge on the metal ion

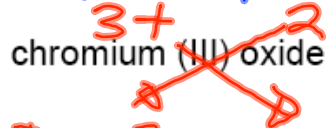
1 → I
2 → II
3 → III
4 → IV
5 → V
6 → VI

Examples

copper (II) bromide



chromium (III) oxide



$V_2O_5(s)$

$FeO(s)$



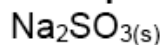
Vandium(V) oxide

IRON(II) OXIDE

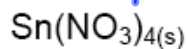
Ionic Compounds
Containing Polyatomic
Ions

polyatomic ion:
a group of non-metal atoms
that have a charge
-usually end in -ate or -ite
(except cyanide, ammonium,
hydroxide)

Examples



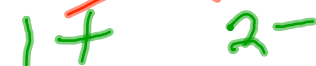
sodium sulfite



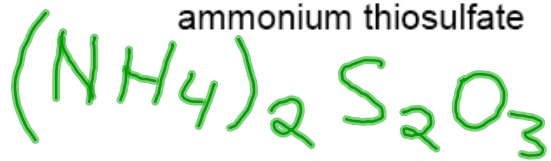
tin(IV) nitrate



~~gold (III) perchlorate~~



ammonium thiosulfate



Hydrated Compounds

-some ionic compounds contain water molecules in their crystal structure
-the number of water molecules is indicated using a prefix

ionic
poly

Example



Copper (II) sulfate
penta hydrate

prefix
mono - 1
di - 2
tri - 3
tetra - 4

penta - 5
hexa - 6
hepta - 7
octa - 8
nona - 9
deca - 10

Theoretical Description

- non-metal atoms held together by covalent bonds (these are bonds formed when atoms share electrons)
- do not contain ions
- contain non-metal atoms only

Empirical Properties

- solid liquid or gas at room temperature
- form non-conducting solutions
- form colourless solutions
- are non conductors in all phases

Binary Molecular Compounds

- contain only two types of atoms
- named by using prefixes
- if the first prefix is mono- it is omitted

Examples

N₃O₅ tri nitrogen penta
oxide

S₅O₉ penta sulfur nona oxide

P₄O₁₀ tetra phosphorus
deca oxide

1 - mono →

NO₂

nitrogen dioxide

Molecular Compounds Containing Hydrogen

-names and formulas must be memorized

$H_2O(l)$	water	
$CH_4(g)$	methane	
$CH_3OH(l)$	methanol	
$C_8H_{18}(g)$	octane	
$H_2S(g)$	hydrogen sulfide	
$H_2O_2(l)$	hydrogen peroxide	
$C_2H_5OH(l)$	ethanol	
$NH_3(g)$	ammonia	
$C_3H_8(g)$	propane	
$C_4H_{10}(g)$	butane	
$C_{12}H_{22}O_{11}(s)$	sucrose	
	glucose	
		$C_6H_{12}O_6(s)$

Molecular Elements

- some elements exist as covalently bonded molecules
- they must be memorized

O_2

hydrogen H_2
nitrogen N_2
oxygen
halogens $\rightarrow X_2$
phosphorous $P_4 (s)$
sulfur $S_8 (s)$

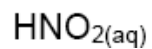
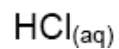
H diatomic

N	O	F
		Cl
		Br
		I
		At

Theoretical Description

-aqueous solutions containing hydrogen

Examples



Empirical Properties

- form conducting solutions
- taste sour
- react with metals to form hydrogen gas
- turn blue litmus red

$$\text{pH} < 7$$

as it
is ionic →

Acids Containing an Ion That Ends in -ide

Acid Name

hydro ____ic acid

Examples

HBr_(aq)

hydrogen bromide

hydro bromic acid

HCN_(aq)

hydrogen cyanide

hydro cyanic acid

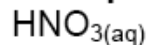
hydrochloric acid

HCl_(aq)

Acids Containing an Ion That Ends
in -ate

Acid Name
___ic acid

Examples

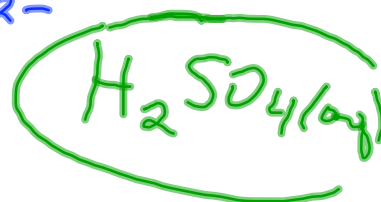
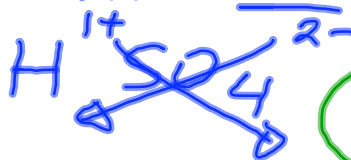


hydrogen nitrate

nitric acid

hydrogen sulfate

— sulfuric acid



chloric acid

hydrogen
chlorate



Acids Containing an Ion That Ends
in -ite

Acid Name
____ous acid

Examples
 $H_2SO_3(aq)$

hydrogen sulfite
sulfurous acid

hydrogen
nitrite

nitrous acid

$HNO_2(aq)$

chlorous acid

$HClO_2(aq)$

Bases

Theoretical Description	Empirical Properties
-aqueous solutions containing hydroxide ions (OH ⁻)	-form conducting solutions -taste bitter -turn red litmus blue
Ionic Compounds Containing OH⁻ ions Example: NaOH _(aq) (no special naming system)	Certain Molecular Compounds Example: Ammonia (no special naming system)

