Chem Notes

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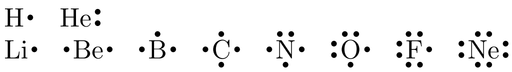

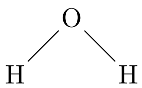

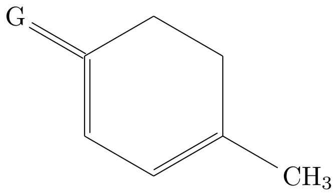

1 Solubility Rules for Ionic Compounds in Water

Ions	**Comments**
NH_4^+, Na^+, K^+, Li^+	All common salts of these ions are soluble
NO_3^-, CH_3COO^-	All common salts of these ions are soluble
Cl^-, Br^-, I^-	All common salts of these ions are soluble, _**except**_ those of Ag^+, Pb^{2+}, Cu^+, and Hg_2^+.
SO_4^{2-}	Most are soluble _**except**_ those containing $Ca^{2+}, Sr^{2+}, Ba^{2+}$, and Pb^{2+} ions
OH^-	All are insoluble, _**except**_ those with NH_4^+ ion, Group 1A, and the larger members of Group 2A beginning with Ca^{2+}
$CO_3^{2-}, PO_4^{3-}, C_2O_4^{2-}$	All common salts are insoluble, _**except**_ those of Group 1A and NH_4^+

2 Common ions and their respective charges

Ion Summary: When cations pair up with anions to form neutral ionic compounds, the word "ion" is dropped from both ion's names

Main group metals an Nonmetals: predictable charges based upon their group/column.

Name	Cation	Name	Cation
Lithium ion	Li^{1+}	Berylium ion	Be^{2+}
Sodium ion	Na^{1+}	Magnesium ion	Mg^{2+}
Potassium ion	K^{1+}	Calcium ion	Ca^{2+}
Rubidium ion	Rb^{1+}	Strontium ion	Sr^{2+}
Cesium ion	Cs^{1+}	Barium ion	Ba^{2+}
		Aluminum ion	Al^{3+}

Name	Anion	Name	Anion
Oxide ion	O^{2-}	Bromide ion	Br^{1-}
Sulfide ion	S^{2-}	Chloride ion	Cl^{1-}
		Fluoride ion	F^{1-}
Nitride ion	N^{3-}	Iodine ion	I^{1-}
Phosphide ion	P^{3-}		

Transition Metals (and other metals with d orbitals): The charge for many of these can vary. Therefore Roman Numerals are used in their written name to indicate the exact ion. If a transition metal is in the cmpd, then you need to look at the anion to determine the charge of the metal cation.

Name	Cation	Name	Cation
Cadmium ion	Cd^{2+}	Cobalt (II) ion	Co^{2+}
Zinc ion	Zn^{2+}	Cobalt (III) ion	Co^{3+}
Silver ion	Ag^{2+}	Iron (II) ion	Fe^{2+}
Gold ion	Au^{2+}	Iron (III) ion	Fe^{3+}
		Chromium (III) ion	Cr^{3+}

Name	Cation	Name	Cation
Copper (I) ion	Cu^{1+}	Tin (II) ion	Sn^{2+}
Copper (II) ion	Cu^{2+}	Tin (IV) ion	Sn^{4+}
Mercury (II) ion	Hg^{2+}	Lead (II) ion	Pb^{2+}
Manganese (II) ion	Mn^{2+}	Lead (IV) ion	Pb^{4+}
		Nickel (II) ion	Ni^{2+}

POLYATOMIC ions. These ions contain covalently bonded atoms with an overall charge. They remain together in a GROUP.

Name	Cation	Name	Anion
Ammonium ion	${NH_4}^{1+}$	Nitrate ion	${NH_4}^{1-}$
		Hydroxide ion	${OH_4}^{1-}$
		Cyanide ion	${CN_4}^{1-}$

Name	Anion	Name	Anion
Sulfate ion	${SO_4}^{2-}$	Phosphate ion	${PO_4}^{3-}$
Chromate ion	${CrO_4}^{2-}$		
Carbonate ion	${CO_3}^{2-}$	Acetate ion	${C_2H_3O_2}^{1-}$

Strong Acids are Molecular Compounds (typically the formula starts with **"H"** followed by an anion).

- HCl = hydrochloric acid
- HBr = hydrobromic acid
- H_2SO_4 = sulfuric acid
- HNO_3 = nitric acid

More bonds require more energy to break. Shorter bonds require more energy to break (i.e. smaller atoms make stronger bonds).

3 Geometry

sp = linear, sp2 = trigonal planar, sp3 = quadragonal

4 Intermolecular Forces

IMFs

5 Dynamic Equilibrium

When two opposite processes reach the same rate so that there is no gain or loss of material.

- This **does not** mean there are equal amounts of vapor and liquid; it means that they are ***changing*** by equal amounts.
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The pressure exerted by vapor when it is in dynamic equilibrium with its liquid is called the **vapor pressure**.

The weaker the attractive forces between the molecules, the more molecules will be in the vapor. Therefore,

- The weaker the attractive forces, the higher the vapor pressure.
- The higher the vapor pressure, the more volatile the liquid.

Dynamic equilibrium: Rate of vaporization = rate of condensation
Volume is increased, pressure falls. More gas vaporizes. Pressure is restored.
Volume is decreased, pressure rises. More gas condenses, pressure is restored.

5.1 Vapor pressure vs temperature

$$760\text{torr} = 1\text{atm} = 700\text{mmHg}$$

- Increasing temperature increases the number of molecules able to escape the liquid.
- The net result is that as temperature increases, the vapor pressure increases
- Small changes in temperature can make big changes in vapor pressure.
  - The rate of growth depends omn the strnegth of the intermolecular forces.
  - vapor pressure vs temperature curves graphically represent the relationship