

GENERAL CHEMISTRY

CHEMICAL SUBSTANCES

Chemical Formulas

- ✓ Molecular Substances
- ✓ Ionic Substances

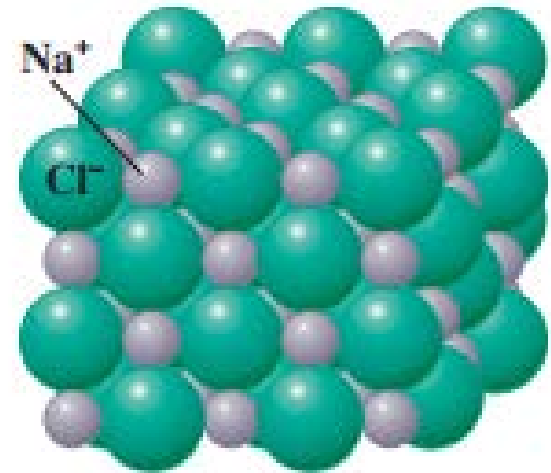
Organic Compounds

Naming Simple Compounds









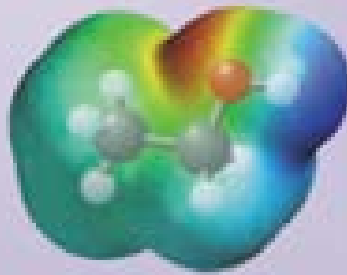
- ✓ Ionic Compounds
- ✓ Binary molecular Compounds
- ✓ Acids and Corresponding Anions
- ✓ Hydrates

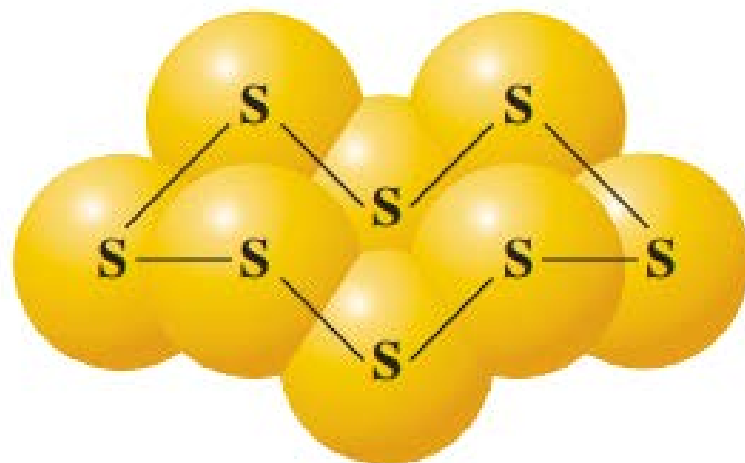
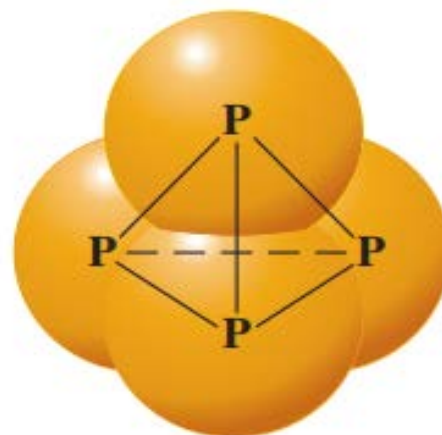
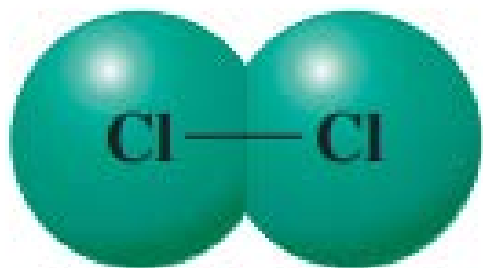
Chemical Reactions: Equations

- ✓ Writing Chemical Equations
- ✓ Balancing Chemical Equations

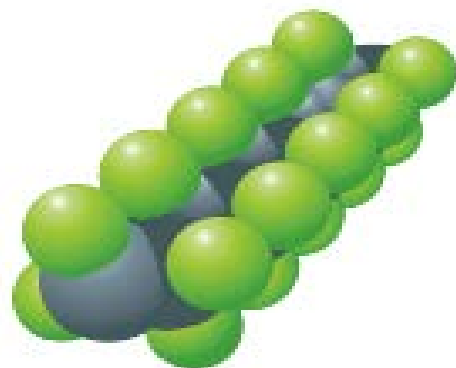
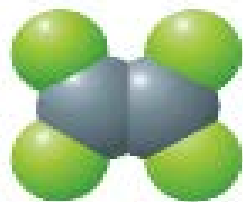


Molecular Substances

	Water	Ammonia	Ethanol
Molecular formula	H_2O	NH_3	C_2H_6O
Structural formula	$H-O-H$	$\begin{array}{c} H-N-H \\ \\ H \end{array}$	$\begin{array}{c} H & H \\ & \\ H-C & -C-O-H \\ & \\ H & H \end{array}$
Molecular model (ball-and-stick type)			
Molecular model (space-filling type)			
Electrostatic potential map			

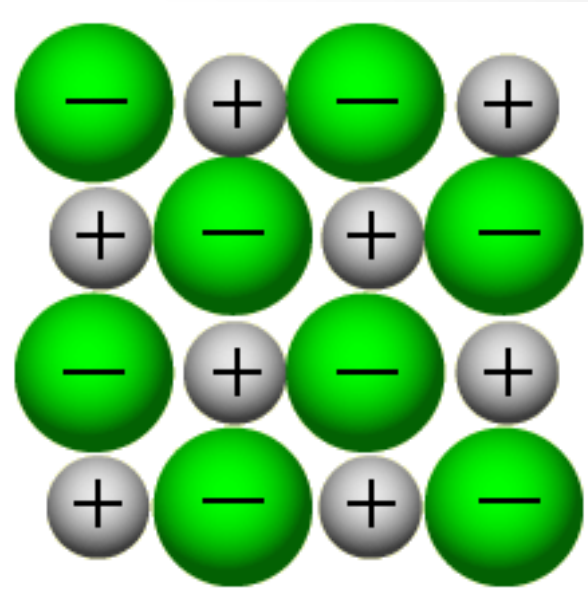


Molecular models of some elementary substances

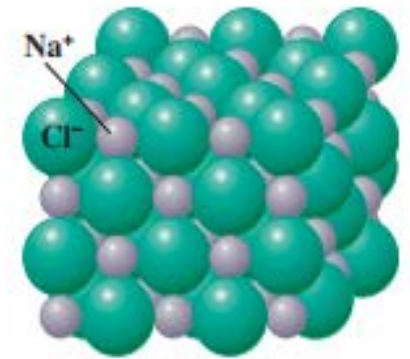
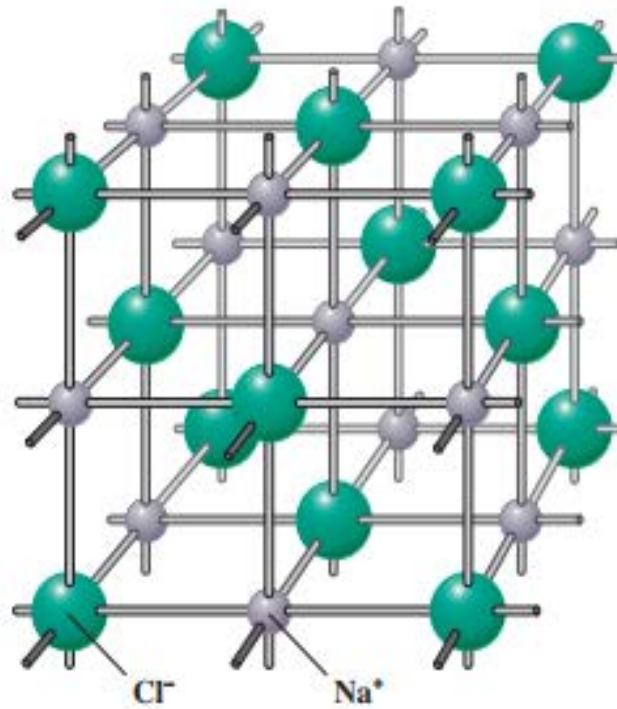


F₂C=CF₂ monomer and Teflon[®]





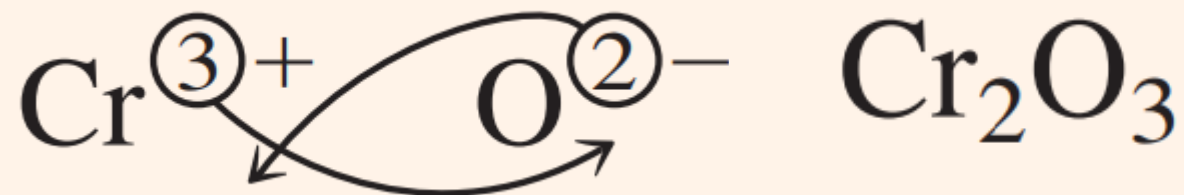
Ionic Substances

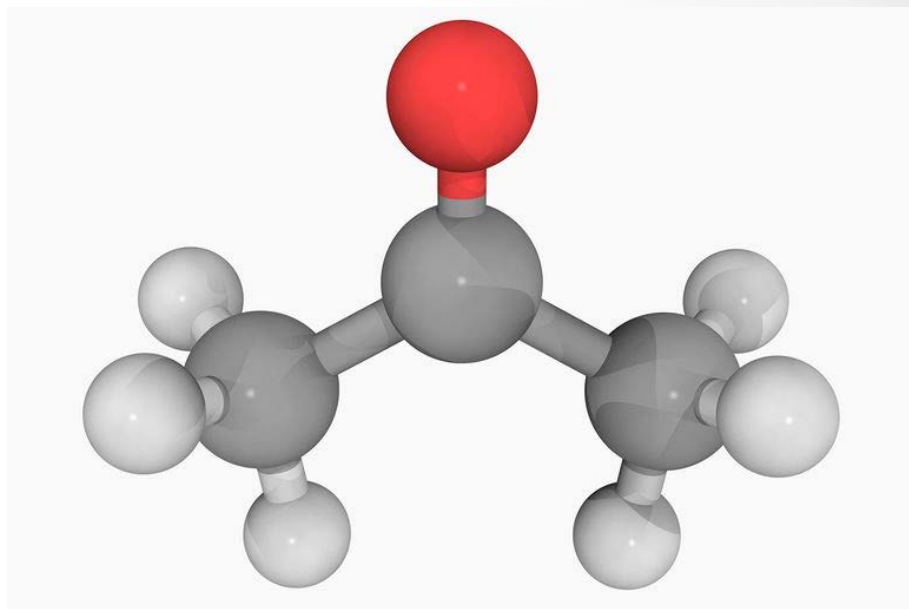


The sodium chloride crystal



Cr^{3+} and O^{2-} ions.

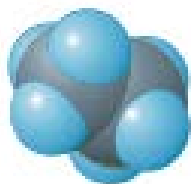




Organic Compounds



CH_4
Methane



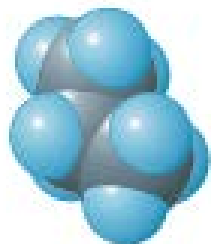
C_2H_6
Ethane



C_6H_6
Benzene



CH_3OH
Methanol



C_3H_8
Propane



C_2H_2
Acetylene



$\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$
Diethyl ether



Molecular model of urea ($\text{CH}_4\text{N}_2\text{O}$)

Example of organic functional groups

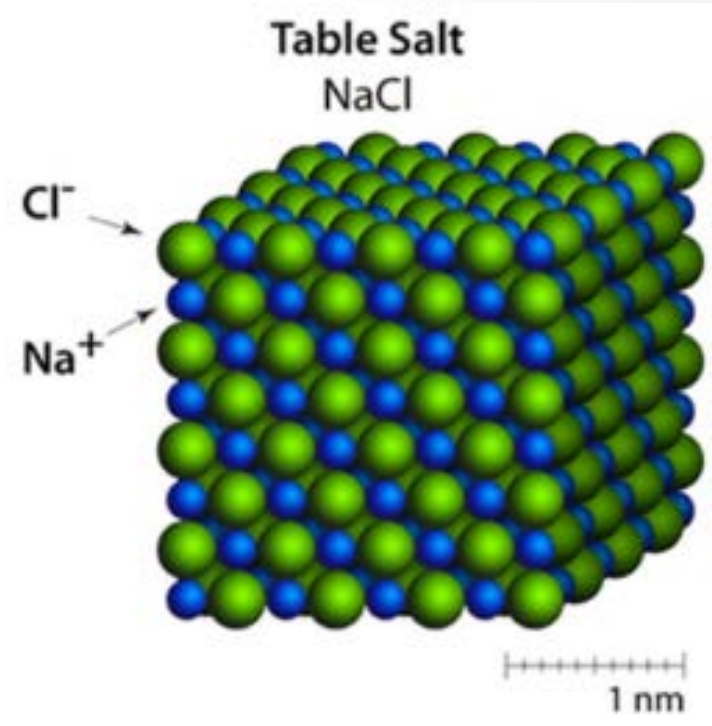
Functional Group	Name of Functional Group	Example Molecule	Common Use
—OH	Alcohol	Methyl alcohol (CH ₃ OH)	Windshield washer
—O—	Ether	Dimethyl ether (CH ₃ OCH ₃)	Solvent
—COOH	Carboxylic acid	Acetic acid (CH ₃ COOH)	Acid in vinegar

NUMBER	PREFIX	EXAMPLE
1	NONE	CHLORIDE
2	DI-	DICHLORIDE
3	TRI-	TRICHLORIDE
4	TETRA-	TETRACHLORIDE
5	PENTA-	PENTACHLORIDE
6	HEXA-	HEXACHLORIDE
7	HEPTA-	HEPTACHLORIDE
8	OCTA-	OCTACHLORIDE
9	NONA-	NONACHLORIDE
10	DECA-	DECACHLORIDE

Naming Simple Compounds

Naming simple compounds

Element 1	Element 2	Name of Compound
iron	<u>sulphur</u>	iron <u>sulphide</u>
magnesium	nitrogen	magnesium nitride
sodium	chlorine	sodium chloride
tin	oxygen	tin oxide
<u>aluminium</u>	bromine	<u>aluminium</u> bromide
nickel	iodine	nickel iodide
zinc	<u>sulphur</u>	zinc <u>sulphide</u>
lithium	nitrogen	lithium nitride



Ionic Compounds

Common Monatomic Ions of the Main-Group Elements*

	IA	IIA	IIIA	IVA	VA	VIA	VIIA
Period 1							H ⁻
Period 2	Li ⁺	Be ²⁺	B	C	N ³⁻	O ²⁻	F ⁻
Period 3	Na ⁺	Mg ²⁺	Al ³⁺	Si	P	S ²⁻	Cl ⁻
Period 4	K ⁺	Ca ²⁺	Ga ³⁺	Ge	As	Se ²⁻	Br ⁻
Period 5	Rb ⁺	Sr ²⁺	In ³⁺	Sn ²⁺	Sb	Te ²⁻	I ⁻
Period 6	Cs ⁺	Ba ²⁺	Tl ⁺ , Tl ³⁺	Pb ²⁺	Bi ³⁺		

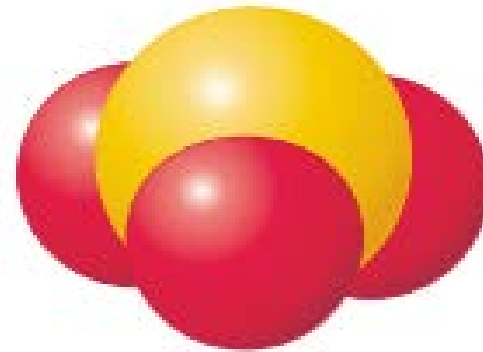
*Elements shown in color do not normally form compounds having monatomic ions.

- ✚ Monatomic cations are named after the element if there is only one such ion.
- ✚ If there is more than one monatomic cation of an element, Rule 1 is not sufficient.
- ✚ The names of the monatomic anions are obtained from a stem name of the element followed by the suffix *-ide*.

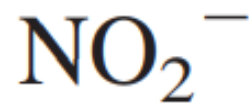
Ion	Ion Name	Ion	Ion Name	Ion	Ion Name
Cr^{3+}	Chromium(III) or chromic	Co^{2+}	Cobalt(II) or cobaltous	Zn^{2+}	Zinc
Mn^{2+}	Manganese(II) or manganous	Ni^{2+}	Nickel(II) or nickel	Ag^{+}	Silver
Fe^{2+}	Iron(II) or ferrous	Cu^{+}	Copper(I) or cuprous	Cd^{2+}	Cadmium
Fe^{3+}	Iron(III) or ferric	Cu^{2+}	Copper(II) or cupric	Hg^{2+}	Mercury(II) or mercuric

Some Common Polyatomic Ions

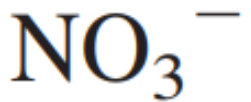
Name	Formula	Name	Formula
Mercury(I) or mercurous	Hg_2^{2+}	Permanganate	MnO_4^-
Ammonium	NH_4^+	Nitrite	NO_2^-
Cyanide	CN^-	Nitrate	NO_3^-
Carbonate	CO_3^{2-}	Hydroxide	OH^-
Hydrogen carbonate (or bicarbonate)	HCO_3^-	Peroxide	O_2^{2-}
Acetate	$\text{C}_2\text{H}_3\text{O}_2^-$	Phosphate	PO_4^{3-}
Oxalate	$\text{C}_2\text{O}_4^{2-}$	Monohydrogen phosphate	HPO_4^{2-}
Hypochlorite	ClO^-	Dihydrogen phosphate	H_2PO_4^-
Chlorite	ClO_2^-	Sulfite	SO_3^{2-}
Chlorate	ClO_3^-	Sulfate	SO_4^{2-}
Perchlorate	ClO_4^-	Hydrogen sulfite (or bisulfite)	HSO_3^-
Chromate	CrO_4^{2-}	Hydrogen sulfate (or bisulfate)	HSO_4^-
Dichromate	$\text{Cr}_2\text{O}_7^{2-}$	Thiosulfate	$\text{S}_2\text{O}_3^{2-}$



Sulfate and sulfite oxoanions



nitrite ion



nitrate ion



hypochlorite ion



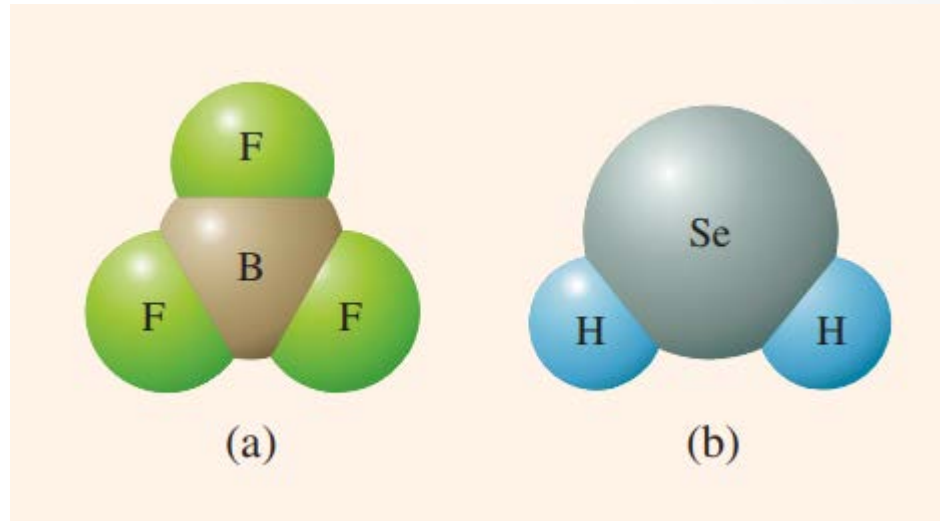
chlorite ion



chlorate ion



perchlorate ion



Binary Molecular Compounds

Element	<u>B</u>	<u>Si</u>	<u>C</u>	<u>Sb</u>	<u>As</u>	<u>P</u>	<u>N</u>	H	<u>Te</u>	<u>Se</u>	<u>S</u>	<u>I</u>	<u>Br</u>	<u>Cl</u>	O	F
Group	IIIA	IVA		VA					VIA			VIIA				

SF_4 sulfur tetrafluoride

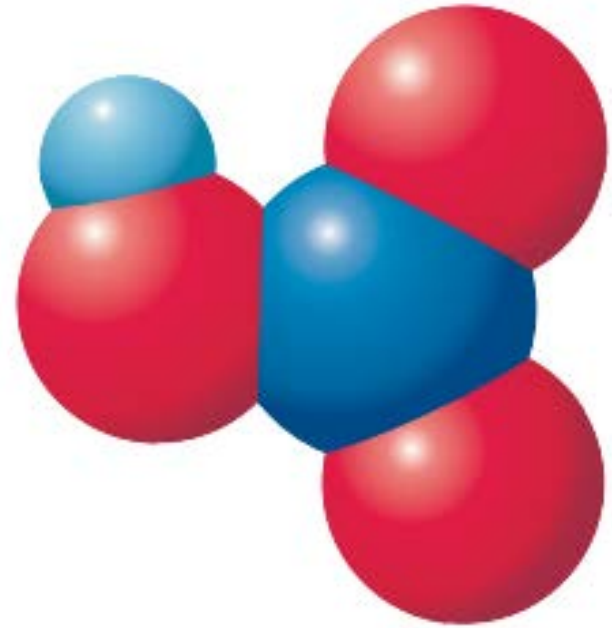
ClO_2 chlorine dioxide

SF_6 sulfur hexafluoride

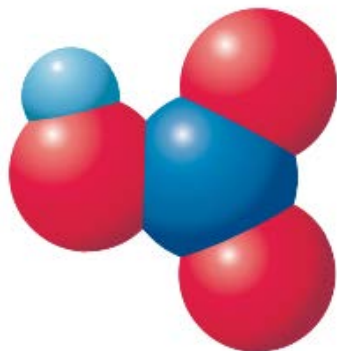
Cl_2O_7 dichlorine hept(a)oxide

Greek Prefixes for Naming Compounds

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



Acids and Corresponding Anions



Anion Suffix

Acid Suffix

-ate

-ic

-ite

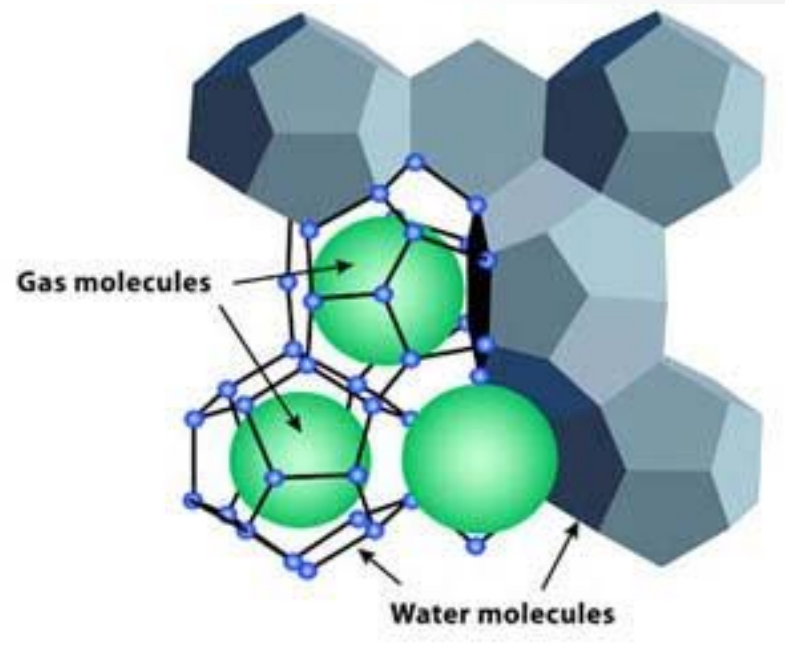
-ous

Molecular model of nitric acid

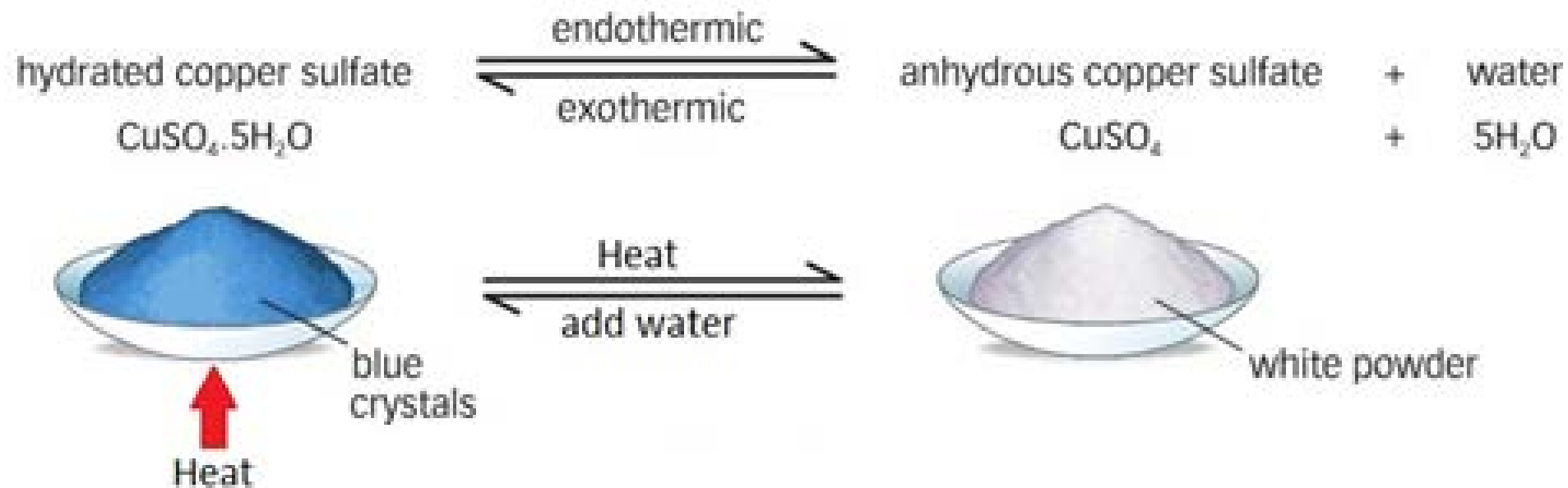
Acid	Contains	Name
HNO_3	<p>nitrate anion therefore nitric acid</p> <p>ate to ic</p>	
HNO_2	<p>nitrite anion therefore nitrous acid</p> <p>ite to ous</p>	

Some Oxoanions and Their Corresponding Oxoacids

Oxoanion		Oxoacid	
CO_3^{2-}	<i>Carbonate ion</i>	H_2CO_3	<i>Carbonic acid</i>
NO_2^-	<i>Nitrite ion</i>	HNO_2	<i>Nitrous acid</i>
NO_3^-	<i>Nitrate ion</i>	HNO_3	<i>Nitric acid</i>
PO_4^{3-}	<i>Phosphate ion</i>	H_3PO_4	<i>Phosphoric acid</i>
SO_3^{2-}	<i>Sulfite ion</i>	H_2SO_3	<i>Sulfurous acid</i>
SO_4^{2-}	<i>Sulfate ion</i>	H_2SO_4	<i>Sulfuric acid</i>
ClO^-	<i>Hypochlorite ion</i>	HClO	<i>Hypochlorous acid</i>
ClO_2^-	<i>Chlorite ion</i>	HClO_2	<i>Chlorous acid</i>
ClO_3^-	<i>Chlorate ion</i>	HClO_3	<i>Chloric acid</i>
ClO_4^-	<i>Perchlorate ion</i>	HClO_4	<i>Perchloric acid</i>



Hydrates



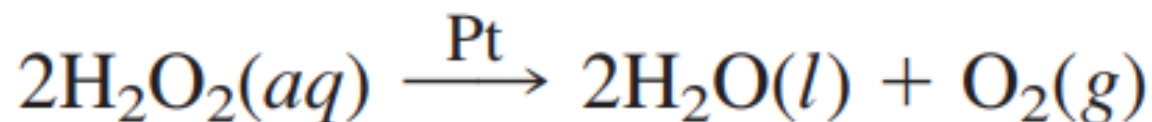
Copper(II) sulfate

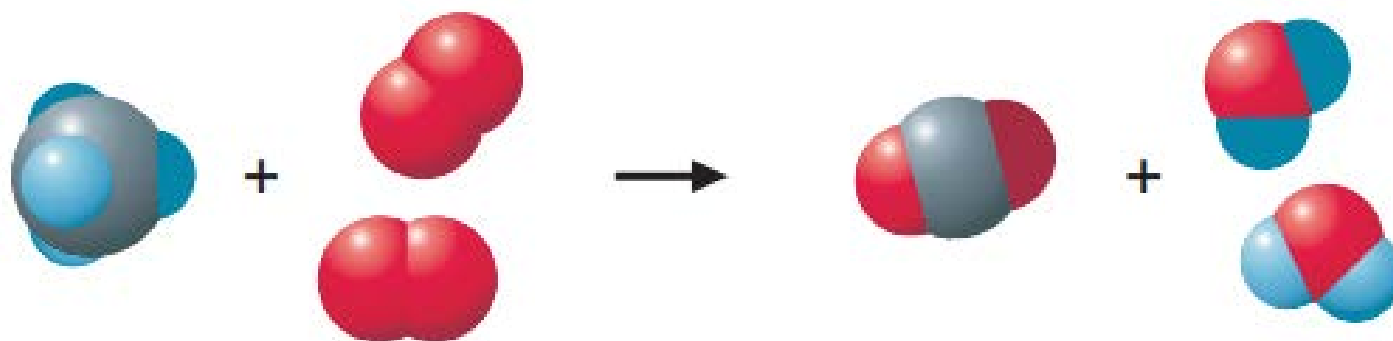
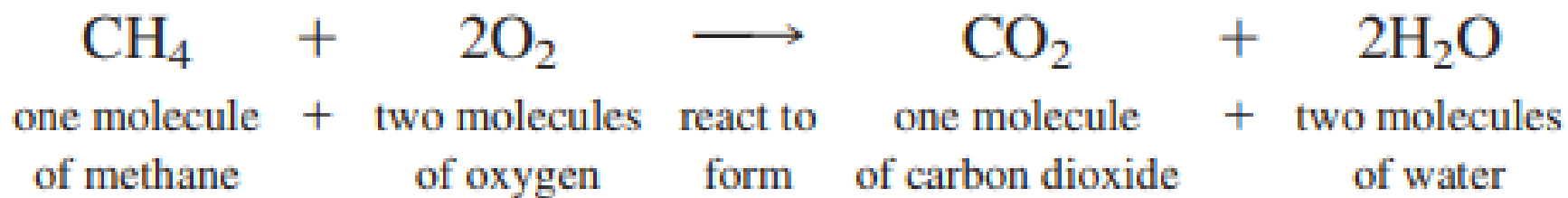


Writing Chemical Equations

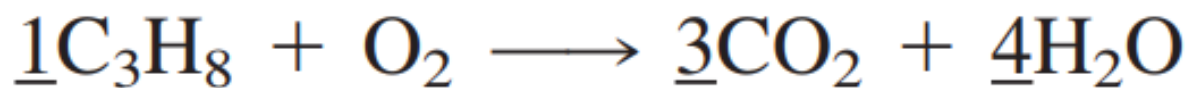
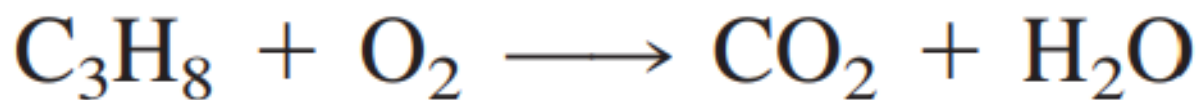
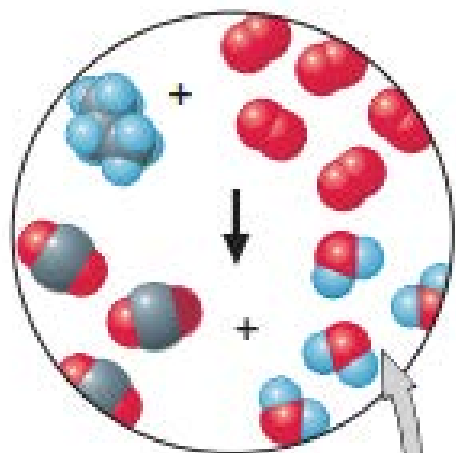


(*g*) = gas, (*l*) = liquid, (*s*) = solid, (*aq*) = aqueous (water) solution





The Burning the Propane Gas



azizochka1964@gmail.com