

Unit 1B

- ↻ Physical Properties of Matter
- ↻ Types of Matter
- ↻ Atomic Structure
- ↻ Ionic Compounds
- ↻ Chemical Equations

Physical Properties of Matter

Physical properties are properties of a substance that can be observed without changing the make up of the substance.

Examples include

- mass - volume - color - shape
- solubility - freezing point - boiling point
- luster - conductivity - magnetic

Density

Physical property of a substance, telling how close the particles of the substance are together.

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

The density of pure water is 1.0 g/ml. What would happen to an object that was placed in water that had a density higher than water? Lower than water?

Types of Matter

1) Pure Substances:

Element - substance that cannot be separated into simpler substances.

Compound - 2 or more elements combined.

2) Mixtures:

Homogeneous - commonly called **solutions** - 2 or more pure substances without visibly different parts.

Heterogeneous - 2 or more pure substances with visibly different parts.

Types of Heterogeneous Mixtures

Colloid - Mixture in which particles stay mixed up, and do not settle. Sometimes the particles are too small to be seen with the unaided eye, so the Tyndall effect must be used.

Suspension - Mixture in which particles of one substance settle to the bottom.

Pure Substances

Atoms

- The building block of matter
- The smallest part of an element that still retains the physical properties of that element

Molecules

- Two or more atoms chemically bonded to one another.

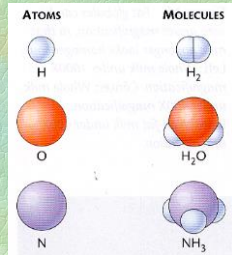
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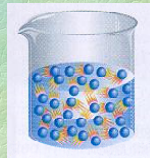


States of Matter

- 1) Solid - high density
 - non-compressible
 - has definite shape

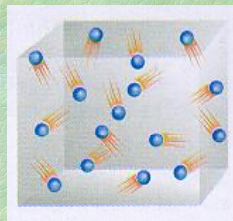


- 2) Liquid - high density
 - non-compressible
 - takes shape of container



States of Matter

- 3) Gas - low density
 - compressible
 - expands to fill container

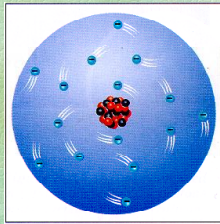


- 4) Plasma - low density
 - compressible
 - expands to fill container
 - exists only at high temp.

Phase Changes

- Solid to Liquid ---> Melting
- Liquid to Solid ---> Freezing
- Liquid to Gas ---> Vaporization
- Gas to Liquid ---> Condensation
- Solid to Gas ---> Sublimation
- Gas to Solid ---> Deposition

Modern Atomic Theory

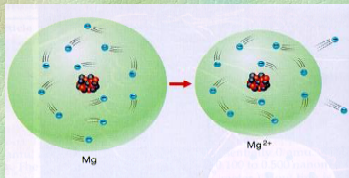


- Atoms are composed of:
- 1) protons - positively charged particles located within the nucleus.
 - 2) neutrons - uncharged particles located within the nucleus.
 - 3) electrons - negatively charged particles which orbit the nucleus.

Ions

Ions - When an atom gains or loses one or more electrons, it acquires an electrical charge.

- ⊘ If it loses electrons, it becomes more positive, and this is called a cation. (positive charge)
- ⊘ If it gains electrons, it becomes more negative, and this is called an anion. (negative charge)



Ionic Bonds

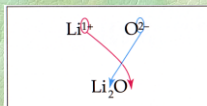
In an ionic bond, a positively charged ion is attracted to a negatively charged ion.

Ionic compounds are electrically neutral, so there must be a balance of cations and anions in a compound.

Writing Ionic Compound Formulas

There are 4 steps in writing chemical formulas:

- 1) Determine the ions listed in the name.
- 2) Write the symbols with the charges next to it. (Cation comes first)
- 3) Balance the charges so that the total charge is zero for the compound
 - determine the number of each ions needed to add up to zero charge.
 - write the number of each ion as a subscript following the symbol.
- 4) Criss-cross method.



Naming Ionic Compounds

There are 3 steps in writing the chemical names of formulas:

- 1) Determine which elements (or groups) are in your compound.
- 2) List the name of the cation as it is.
- 3) Then follow it by the element anion and replace the last syllable with -ide.

***If the cation can form more than one charge, follow the name of the cation with a roman numeral telling the size of the cation charge.

Polyatomic Ions

Frequently, atoms can combine to form polyatomic ions.

These are groups of atoms that have an overall charge that needs to be balanced.

They act the same as monatomic ions (one atom ions).

If the polyatomic ion is second, then do not change the ending to -ide.

Determining Ionic Charge

A neutral atom has equal numbers of protons and electrons, giving it a zero charge

An ion's charge can be determined by the following formula:

Charge of ion = # of protons - # of electrons

Diatomic Elements

Some elements cannot exist by themselves, even when they are isolated from any other type of atom.

Elements of this nature will combine with atoms of the same element in order to be stable. There are eight elements that form diatomic molecules:

Three Hints: "7 that make a 7 and hydrogen" or "sneeze HNOF ↓" or "GEN-u-INE"

Chemical Reactions

- ⌚ A chemical reaction is a process in which one or more substances are converted into new substances that have different physical and chemical properties.
- ⌚ In a chemical reaction, those substances present before the reaction are called the reactants. Substances produced in a chemical reaction are called the products.
- ⌚ A chemical reaction takes place when an atom can find a more stable way to be joined to other atoms.

Chemical Equations

- ⌚ Scientists represent chemical reactions in chemical equations. Chemical equations can be in words or in formulas.
- ⌚ In writing equations, many times it is important to know the state of the atom or molecule you are working with.
- ⌚ To show this, we use the following abbreviations:
 - (l) - liquid (g) - gaseous
 - (s) - solid (aq) - aqueous
- ⌚ Aqueous means dissolved in water.
