Chemistry IH - Study Guide

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Chapter 1

Introduction

1.1 Types of Chemistry

Inorganic Chemistry relates to the chemistry of molecules that do not contain a carbon atom

Organic Chemistry the chemistry of molecules which do contain a carbon atom. These molecules may also contain a hydrogen atom, and always contain carbon bonds.

Biochemistry the chemistry of proteins and large bio-molecules

Analytical evolving methods to identify and measure things (relating to chemistry)

Theoretical considered the *opposite* of analytical chemistry. Theoretical chemistry is focused on trying to preduct things about chemistry using calculus.

Physical uses the theory developed from the above discipline to compare it against what *actually happened*
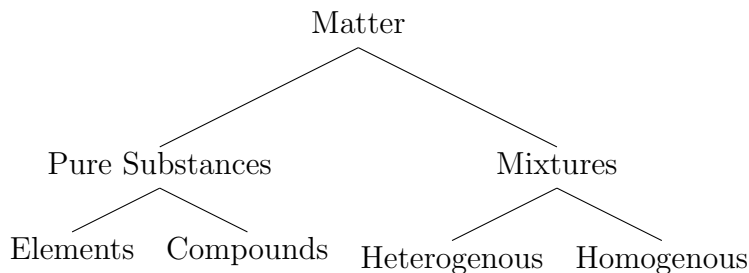
1.2 Types of Matter

Figure 1.1: The types of matter.

For each type of matter, a definition and several real-world examples are found below.

Elements matter that cannot be broken down into more pure substances *i.e., they have but only one unique type of atom*

- Carbon
- Hydrogen
- Oxygen

Compounds pure substances made ov several elements of which are *chemically* joined together

- H_2O
- CO_2

Mixtures impure combinations of two or more substances and are *not* chemically joined

Homogenous uniform content throughout
- Alloys of metal
- Filtered air

Heterogenous non-uniform content throughout
- Non-pasturized apple juice

1.3   Separation of a Mixture

Filtration used on a heterogenous mixture by means of a porris barrier. Exploits the physical size difference *ex., using a coffee filter to make coffee.*

Distillation used on homogenous mixtures and takes advantange of temperature differences. *ex., alcohol boils at temperature A, water boils at temperature B. A temperature between the two is picked to boil off one compound, and then condense it later.*

Chromatography used on both types of mixtures to determine properties of compounds to seperate. In practice, a mixture is placed on the end of a piece of paper, and water draws out all the compounds contained within it.

1.4   General Properties of Substances

Intensive properties of substances which are not related to the amount of that substance which is present

- Boiling point
- Specific heat

- Density

Extensive properties of substances which are functions of the amount of that substance which is present

- Mass
- Volume
- Quantity of atoms

1.4.1 Chemical vs. Physical

Chemical observed when something changes into a new substance

- Bond
- Toxicity
- Reactivity
- Flamability

Physical observed without changing chemical properties

- Color
- Density
- Temperature

1.5 SI Units

The SI-system is the unit of measurements most widely used by scientists. It defines a prefix-base system which is useful in representing both large and small numbers.

1.5.1 Base Units

Length meter m

Mass kilogram kg

Time second sec

Teperature kelvin k

Amount of Substance mole mol

1.5.2   Derived Units

Area m^2

Volume m^3

Density kg/m^3

Molar Mass kg/mol

Concentration mol/L

Molar Volume L/mol

Velocity m/s

Force m/s^2

1.5.3   Prefix System

	Symbol	Modifier
mega	M	10^6
kilo	K	10^3
centi	c	10^{-2}
milli	m	10^{-3}
micro		10^{-6}
nano	n	10^{-9}

1.5.4   Significant Figures

Significant Figures define a set of rules for maintaing percision while doing math. This system ensures that the answer to a problemset accurately reflects the degree of percision of all sub-compounds.

1. Zeros between non-zero digits are considered significant

2. Zeros in front of a number are not significant

3. Zeros to the end of a number and to the right of a decimal place are considered significant

4. Zeros to the right of non-zeros *may* be considered significant. 1000 has one digit of significance, while 1000 has four. Similarly, 1 00e3 has three digits of significance.

1.5.5 Rules for Arithmetic

When using digits of significance in arithmetic problems, it is important to maintain a correct number of significant digits in the answer. When adding and subtracting numbers, the result has the minimum of the digits of significance between the two products. The same rules apply to both multiplication and division.