Unit 1: Chapters 1-3

The PowerPoint for unit 1 posted in Canvas and this note packet can be used together if you miss or want to review any material covered. I will also post video’s of the lecture notes/demos as we cover the learning targets in class.

## Chapter 1: Introduction to Chemistry

1. What is chemistry?­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   1. Organic-
   2. Inorganic-
   3. Analytical-
   4. Physical-
   5. Biochemistry-
2. Why study chemistry?
   1. Materials-
   2. Energy-
   3. Medicine and Biotechnology-
   4. Agriculture-
   5. The Environment-
   6. The Universe-
3. **Experimental Design**: a cycle

Observations → Hypothesis → Experiment → Law or Theory

Theory:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Law:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## Chapter 2: Matter and Change

1. **Matter:**
2. **States of Matter:**
   1. Solids:
   2. Liquids
   3. Gases:

# Two Classifications of Matter

* 1. **Substance**: uniform and definite composition; pure
     1. Elements:
     2. Compounds:
  2. **Mixtures**: a physical blend of two or more substances; not pure; can separate.
     1. Homogeneous:
     2. Heterogeneous:

c. Methods of separation:

# Describing Matter (Intensive properties-properties based on the type of matter, not the amount ex: melting point. Extensive properties-property that depends on the amount of matter in the sample-ex: mass.)

* 1. ***Physical Property****:*

Ex: color, solubility, odor, hardness, density, melting, boiling point, etc.

* 1. ***Physical change****:*

Ex: boil, freeze, melt, condense, grind, cut, split, crack, break, bend, etc.

* 1. ***Chemical Property****:*

Ex: the ability to rust, tarnish, burn, oxidize, etc.

* 1. ***Chemical Change:***

Ex: the new chemicals that were formed: reactants changing to products in a chemical reaction. Reactants and products have different physical and chemical properties.

***Video Link Demos:***

* 1. ***Conservation of Mass****:* grams before reaction = grams after reaction

or mass of reactant = mass of product

Example: Lab activity we will do next.

### Chapter 3: Scientific Measurement

1. Measurement:
   1. Qualitative:
   2. Quantitative:
   3. Scientific Notation:
      1. 602,000,000,000,000,000,000,000 Hydrogen atoms =
      2. .000235 grams of lead =
   4. Accuracy:
   5. Precision:
   6. % Error = experimental value- accepted value x 100

accepted value

1. Units of Measurement: International System of Units: SI ; standard units of measurement
   1. Metric System (pg. 74: liters, meters, \***grams**)
      1. 103\_\_\_\_\_\_\_\_ = 1 kilo\_\_\_\_\_\_\_\_
      2. 102 centi\_\_\_\_\_\_\_\_ = 1 \_\_\_\_\_\_\_\_
      3. 103 milli\_\_\_\_\_\_\_\_ = 1 \_\_\_\_\_\_\_\_
      4. 106 micro \_\_\_\_\_\_\_\_ = 1 \_\_\_\_\_\_\_\_
      5. 109 nano\_\_\_\_\_\_\_\_ = 1 \_\_\_\_\_\_\_\_

Note: refer to handout for metric conversion factors (Ex: \*103 **gram**s = 1 kilo**gram)**

* 1. Length : ruler: meter or m
  2. Volume:
     1. graduated cylinder: milliliter or ml
     2. ruler : length x width x height: cm3
     3. **1ml =1cm3**for water!!!
  3. Mass: scale or balance: gram or g
  4. Temperature: Thermometer
     1. Celsius or °C
     2. Kelvin or K (absolute zero scale)
     3. °C + 273 = K

Ex.: What is 25°C in Kelvin?

1. **How to Measure Correctly in Science**: ***Video Link***
   1. Determine the smallest interval on the measuring device: scale and units.
   2. Estimate one digit more then the smallest unit of the scale.

Example: Use rule A, B, and C to measure the height of the front of your desk from the floor. Record your measurement here.

Ruler A:

Ruler B:

Ruler C:

**Other instruments: *Video Link***

Graduated cylinder A: Graduated cylinder B:

Thermometer: Electronic Scale:

1. **Significant Figures**: significant figures are measured numbers. They include all digits that are measured plus one estimated digit.

**Rules for assigning (counting) significant figures-*count the numbers that are measured plus one estimated digit*:**

1) Every nonzero digit in a recorded measurement is significant.

2) Zeros appearing between nonzero digits are significant.

3) Zeros at the end of a number and to the right of a decimal are significant.

4) Zeros in front of all nonzero digits are not significant.

-- They are only placeholders.

5) Zeros at the end of a measurement and to the left of a decimal vary.

6) Unlimited significant Figures: counted numbers and conversion factors

**Significant Figures in Calculations**

1) When using measured data to do calculations (like finding the area of a room), the answer cannot be more precise than the least precise measurement.

2) Round answers to the correct number of significant figures

a) less than 5 = stays the same

b) greater than 5 = round up

3) *Addition and Subtraction*

Use the **least precise measurement** **(digit)** to determine significant figures.

(Do they all measure to the same digit or place….it not, you have to round to the measurement that is the least precise. If one value is measured to the ones digit (1), and another is measured to the tenths digit (.1), you must round to the least precise-the ones.)

4) *Multiplication and Division*

The answer has the same number of significant figures as the **least number** of significant figures. (If one measurement has 5 measured numbers and another has 3 measured numbers, the answer can only have 3 measured numbers.)

1. **Density**: ratio of mass to volume; heaviness or lightness of an object;

A physical property of substances. List of common densities is on pg 69 in book.

Density = Mass

Volume

Ex: Calculate the density of a 25.30 gram rock that is found to change the initial volume of water in a graduated cylinder from 12.0 ml to 17.5ml. Remember significant figures and the label.

Ex: Using the density of the rock calculated above, what would be the volume of a rock that has a mass of 1540 grams?

#### Problem Solving in Chemistry:

1. Dimensional Analysis: process of changing units of a measured value.
2. The “5” step method:

**Analyze:**

* 1. Identify the known
  2. Identify the unknown
  3. Identify the conversions needed

**Calculate:**

* 1. Solve the problem.

|  |  |  |
| --- | --- | --- |
|  |  | = |
|  |  |

**Evaluate:**

* 1. Answer, Significant Figures (same number as known), and label.

Ex:

Ex:

Ex:

Ex:

Ex: