Unit One: Chapters 1 & 2

Introduction to Chemistry

Quick History…

- _____: forerunner of chemistry

- Alchemists had two goals:

    o Change metals into _____

    o Discover the "_____"

- Was practiced in the middle ages & Renaissance

- Many _____ used in modern science

What is Chemistry!?

- **Chemistry**: _____

_____

_____.

    o What is that material made of?

    o What is its make-up and internal arrangement?

    o How does it behave and change when heated, cooled, or mixed with other materials? Why?

Why is Chemistry Important!?

- Chemistry links biological and physical sciences together as both living and

  nonliving things have a _____.

http://msdowlingclass.weebly.com/lesson-plans.html

Where can we see Chemistry!?

- Chemistry is _____.

http://3.bp.blogspot.com/-
s7kkZly244M/UPBpNN5SdXI/AAAAAAAAAVM/I9q2uK
6Q3lQ /s1600/holidays-around-the-world-21.jpg

Pure Science vs. Technology

Pure Science

- The study of science alone, _____

  _____

  _____.

- Knowledge in its major disciplines
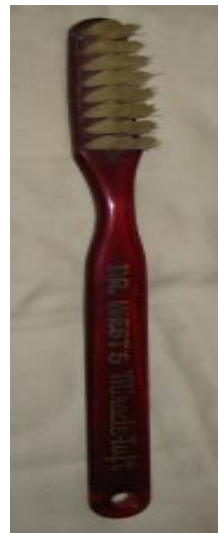 (chemistry, biology, physics, etc.)

Technology

- The application _____

  _____

  _____

  _____.

Examples of Technology

- _____
- _____
- _____
- _____

- _____
- _____
- _____
- _____

- Technology is _____.

Chemists do Research

- There are three different types of research:

    o _____ Research

    o _____ Research

    o _____ Development

_____ **Research**

- This type of research is carried out _____

_____

_____.

    o <u>Ex</u>. How and why a reaction occurs and the properties of resulting products.

- It is through _____ research that chemists come across _____

_____.

    o <u>Ex</u>. Teflon

_____ **Research**

- This type of research is carried out _____

_____

_____.

    o <u>Ex</u>. Destruction of ozone by refrigerant

_____ Development

- This type of research involves the _____

_____

_____.

- <u>Ex</u>. Computers; biodegradable materials

More about the Research!

- All three types of research go hand-in-hand. _____

_____

_____

_____.

- <u>Ex</u>. Teflon → doesn't stick to pans → new technology

Branches of Chemistry

Organic Chemistry

- Organic chemistry is _____

_____

_____.
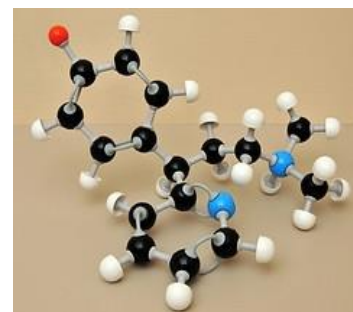
Inorganic Chemistry

- Inorganic chemistry is _____

  _____

  _____.
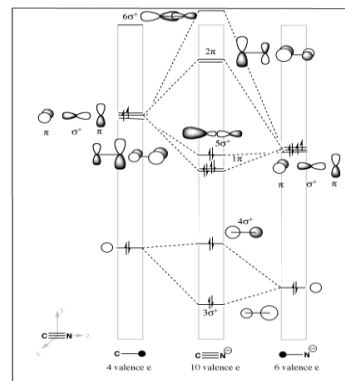
Physical Chemistry

- Physical chemistry is _____

  _____

  _____.

$$\cos x = \frac{1}{2}\left(e^{ix} + e^{-ix}\right), \qquad \sin x = \frac{1}{2i}\left(e^{ix} - e^{-ix}\right)$$

$$\int xe^{ax}\,dx = e^{ax}\left(\frac{x}{a} - \frac{1}{a^2}\right)$$

$$\int x^2 e^{ax}\,dx = e^{ax}\left(\frac{x^2}{a} - \frac{2x}{a^2} + \frac{2}{a^3}\right)$$

$$\int x^3 e^{ax}\,dx = e^{ax}\left(\frac{x^3}{a} - \frac{3x^2}{a^2} + \frac{6x}{a^3} - \frac{6}{a^4}\right)$$

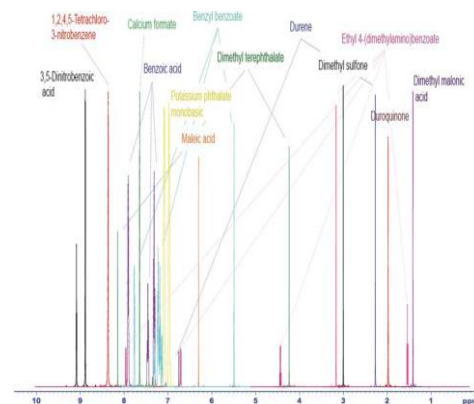$$\int \sin^2 x\,dx = \frac{x}{2} - \frac{1}{4}\sin 2x$$

$$\int \cos^2 x\,dx = \frac{x}{2} + \frac{1}{4}\sin 2x$$

Analytical Chemistry

- Analytical chemistry is _____

  _____

  _____.

  - In other words, it is the art and science of determining _____

    _____.

Biochemistry

- Biochemistry is _____

_____

_____.
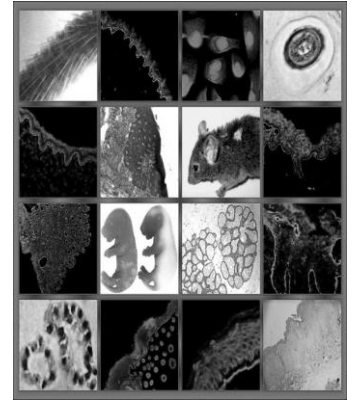
Theoretical Chemistry

- Theoretical Chemistry is _____

_____

_____

_____.

Matter!
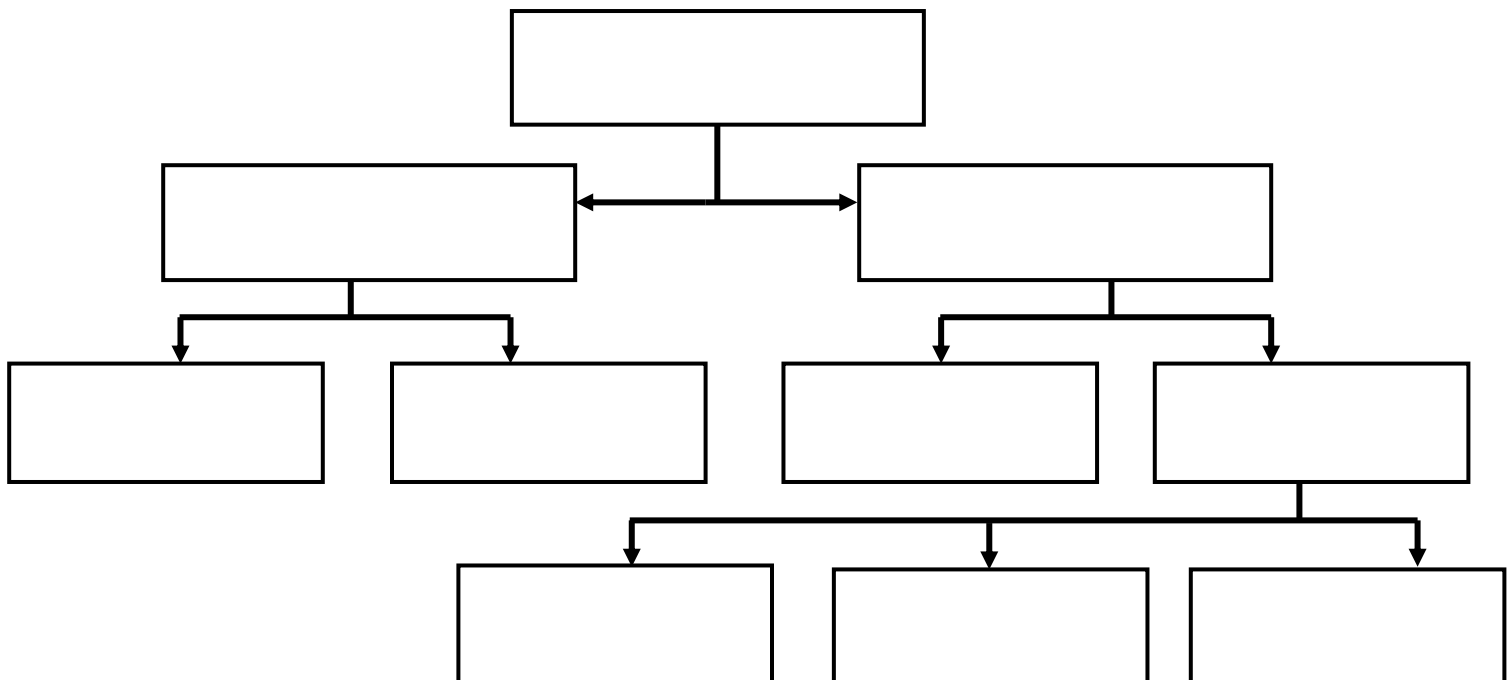
Matter

- Anything that has a _____ and _____.

Pure Substance

- _____

    _____.

Element

- _____

    _____

    _____.

    Oxygen
    8

    O

    15.9994

    Copyright © 2008 Theodore W. Gray

    o Made of _____ – the smallest particle that has the properties

        of an element.

        - Ex. Tin (Sn), Oxygen (O)

Compound

- _____

    _____

    _____.

    o Ex. Water (H_2O), Sugar ($C_6H_{12}O_6$)

Mixture

- _____

  _____

Homogeneous Mixture

- _____

  _____.

- Also called a _____ which can be defined as two or more

  substances _____ spread throughout a _____.

  - <u>Ex</u>. Salt water

Heterogeneous Mixture

- _____

  _____.

  - <u>Ex</u>. A tossed salad

Colloid

- _____

  _____.

  - <u>Ex</u>. Gelatin, whipped cream, fog, smoke, blood

Suspension

- _____

_____

_____.

  o <u>Ex</u>. Orange juice with pulp, oil & water

Emulsion

- _____

_____

_____.

  o <u>Ex</u>. Mayonnaise, lotion

Changes of State

Definite volume & definite shape

Definite volume & indefinite shape

Indefinite volume & indefinite shape
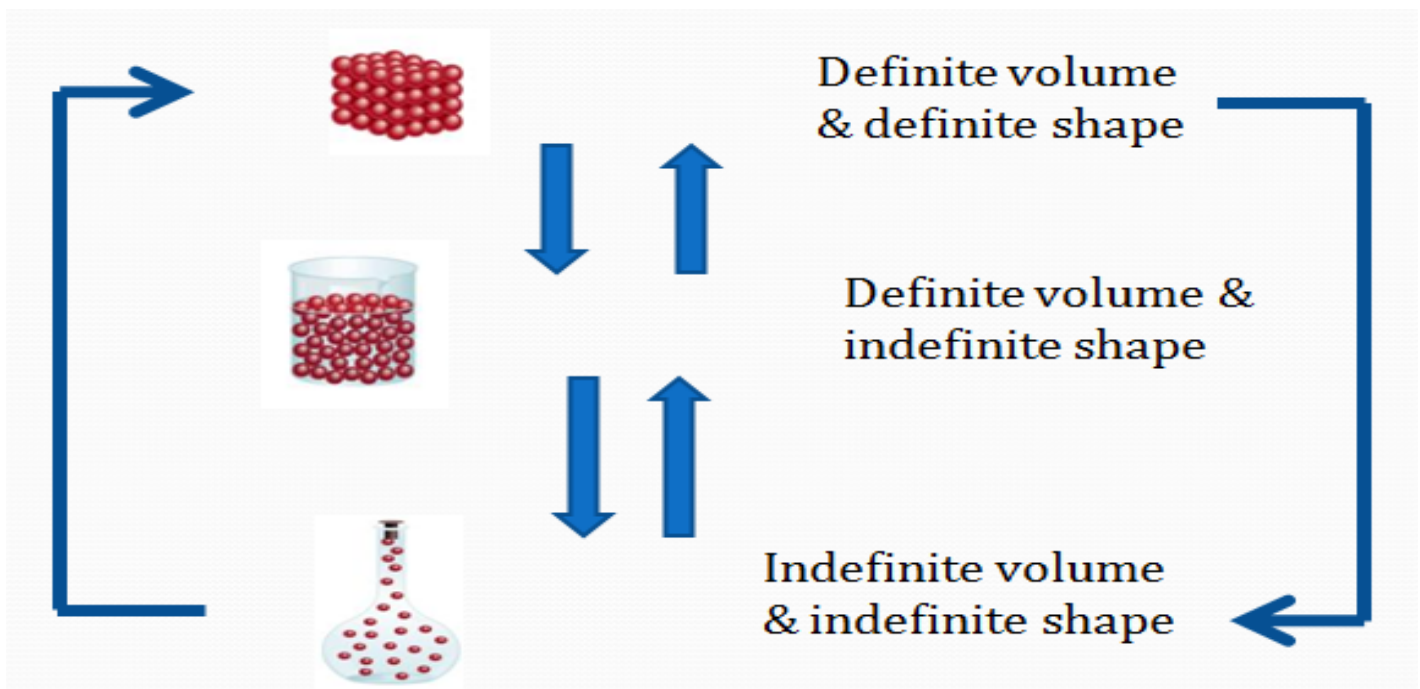
Changes in Matter

<u>Physical Change</u>

- A change in a substance that

  _____

  _____.

- _____ new substance is made.

- Examples:

  ○ _____

  ○ _____

  ○ _____

  ○ _____

<u>Chemical Change</u>

- A change in which one or more

  substances are _____

  _____

  _____.

- A new substance is made with

  _____.

- Also know known as a _____

  _____.

- Examples:

  ○ _____

  ○ When something _____

    it reacts with _____

    _____

  ○ _____

  ○ _____

Properties of Matter

<u>Physical Property</u>   <u>Chemical Property</u>

- A characteristic that can be

    observed or measured _____

    _____

    _____.

- What a substance _____

- Relates to a substance's ability to

    undergo _____

    _____

    _____.

- What a substance can _____

Physical Property

- _____ – independent of the amount of matter

    o Examples: _____

    _____

- _____– dependent of the amount of matter

    o Examples: _____

    _____

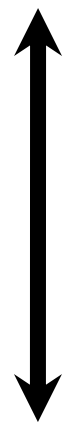## Chemical Property

- Examples:

  o Can a substance:

    - _____

    - _____

    - React with:

      ❖ _____

      ❖ _____

      ❖ _____

      ❖ _____

The Periodic Table

_____ are on the _____ side of the stair step line,

_____are on the _____ side of the stair step line, and the

elements along the stair step line are called _____.

The Periodic Table

Elements of the Periodic Table

- Metals:

    o A good conductor of _____

    o At room temperature, most metals are _____

    o Most are _____

    o Tend to be _____

- Nonmetals:

    o A poor conductor of _____

    o Many are _____ at room temperature (N_2, O_2, F_2, Cl_2)

    o Br_2 is a _____ at room temperature

    o C, P, Se, S, I_2 are _____ at room temperature and tend to be

       _____

- Metalloids (Semiconductors):

    o Elements along the _____

    o Has some characteristics of _____ and some characteristics

       of _____

    o _____ at room temperature

    o Semiconductors of _____

Parts of an Atom
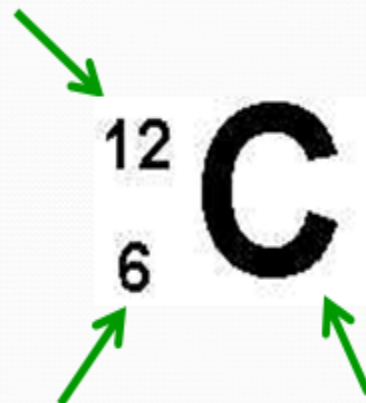
	Charge	Symbol	Location
Proton			
Neutron			
Electron			

Shorthand Notation
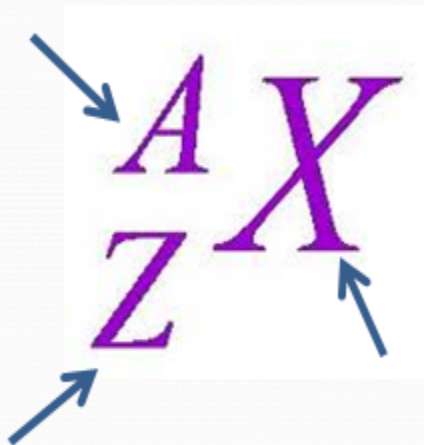
- So how do we figure out the number of neutrons?

    o # neutrons = _____

        ▪ n^0 = _____

- <u>Example</u>: Carbon

  - $n^0 =$ _____

  - $n^0 =$ _____

  - $n^0 =$ _____

  - Carbon has _____ p^+, _____ e^-, and _____ n^0

Scientific Method

- _____

- _____

- _____

- _____

- _____

- _____

International System of Units (SI)

Prefix	Symbol	Meaning	Example
Mega-	M	1 000 000	megameter(Mm)
Kilo-	k	1000	kilometer(km)
Hecto-	h	100	hectometer (hm)
Deka-	da	10	dekameter (dam)
BASE UNIT	BASE UNIT	1	meter
Deci-	d	0.1	decimeter (dm)
Centi-	c	0.01	centimeter (cm)
Milli-	m	0.001	millimeter (mm)
Micro-	μ	10^{-6}	micrometer (μm)
Nano-	n	10^{-9}	nanometer (nm)
Pico-	p	10^{-12}	picometer (pm)

SI Base Units

Quantity (Item)	Unit	Abbreviation
Length	meter	m
Mass	kilogram	kg
Time	second	s
Temperature	Kelvin	K
Amount of substance	mole	mol
Electric current	ampere	A
Luminous intensity	candela	cd

Mass vs. Weight

<div align="center">

<u>Mass</u>   <u>Weight</u>

</div>

- _____

_____

_____

_____.

- _____

_____

_____

_____.

Factor-label Method

<div align="center">

$$\frac{G}{x} \bigg| \frac{W}{C}$$

</div>

- G = _____

- W = _____

- C = _____

    o UNITS MUST BE THE SAME!

- Examples!
  - <u>Ex</u>. 1:

  - <u>Ex</u>. 2:

  - <u>Ex</u>. 3:

  - <u>Ex</u>. 4: Multiple Step Conversions

$$\frac{G \mid C_B \mid W}{C_G \mid C_B}$$

- o <u>Ex</u>. 5:

- o <u>Ex</u>. 6:

Scientific Notation

- In scientific notation, numbers are written in the form:

$$\mathbf{M} \times 10^n$$

  - o M = a number greater than or equal to _____

  - o n = _____

- <u>Ex</u>. 75 000 km = _____

- <u>Ex</u>. 75 100 km = _____

- <u>Ex</u>. 0.00075 mm = _____

- Taking numbers out of scientific notation:

    o The number in the exponent tells you _____

    _____.

    o The sign (+ or -) tells you _____.

- <u>Ex</u>. 5.218 x 10^4 kg = _____

- <u>Ex</u>. 1.23 x 10^2 cg = _____

- <u>Ex</u>. 3.2510 x 10^{-4} nm = _____
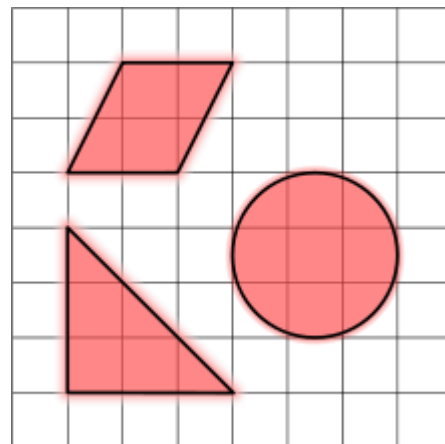
- General Rule:

A **positive** exponent tells you to move the decimal point to the **right**! It is a big number.

A **negative** exponent tells you to move the decimal point to the **left**! It is a small number.

    o _____ # (>1) = _____ exponent

    o _____ # (<1) = _____ exponent

Area, Volume, Density

Area

- _____

    _____.

- Area = _____

    o _____

- Example:
  - **Four Step Process:**
    - _____
    - _____
    - _____
    - _____

Volume

- _____.

- Volume = _____

  - _____

- Common conversions:

  - _____ mL = _____ cm^3

  - _____ L = _____ dm^3 = _____ cm^3 = _____ mL
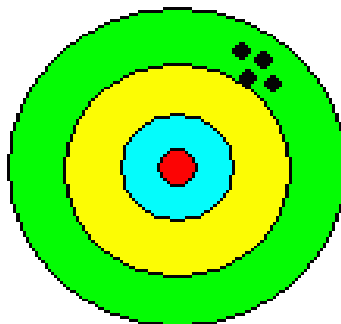
- <u>Example</u>:

Density

- _____

  _____.

- Density = _____

- D = _____

- SI units of density:

  - kg/m³

  - g/cm³

  - g/mL

- Density is an _____ property.

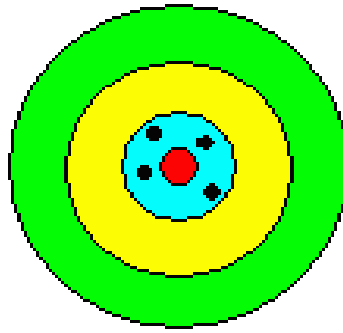- Example:

Accuracy & Precision

- Accuracy

    o How close a value or measurement is to the _____

    _____.

- Precision

    o How close measurements are _____.

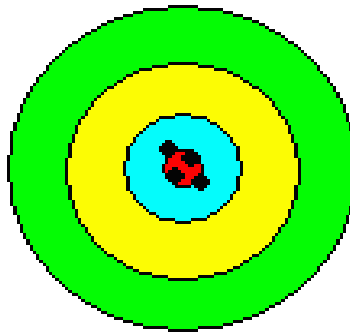- Does this show accuracy or precision?

    o _____

- Does this show accuracy or precision?

  o _____

- Does this show accuracy or precision?

  o _____

- Accuracy can be expressed by calculating the _____.

  o % _____=

  o % _____ =

o <u>Example</u>: The literature value of the atomic mass of an isotope of nickel is

_____. If a laboratory experiment determined the mass to be

_____, what is the percent error?

- Precision can be expressed by calculating the _____.

    o % _____=

    o % _____=

- o <u>Example</u>: If Student A measures the temperature to be _____ and

  Student B measures the temperature to be _____, what is their

  percent difference?

Direct & Indirect/Inverse Proportions (or Relationships)

- Direct Proportions

  - o If _____ one by the other gives a constant value.

  - o General equation:

    - ▪ _____

  - o All directly proportional relationships produce _____ graphs

    that pass through the origin.

  - o As one variable _____ the other _____ by the

    _____ amount, and vice versa when _____.

- Indirect/Inverse Proportions

  o If _____ one by the other gives a constant value.
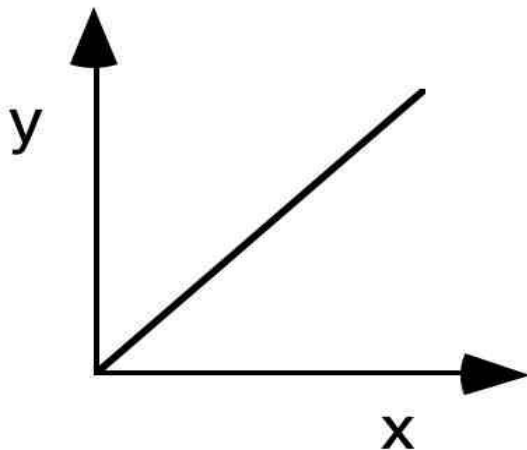
  o General equation:

    ▪ _____

  o All indirectly proportional relationships produce _____
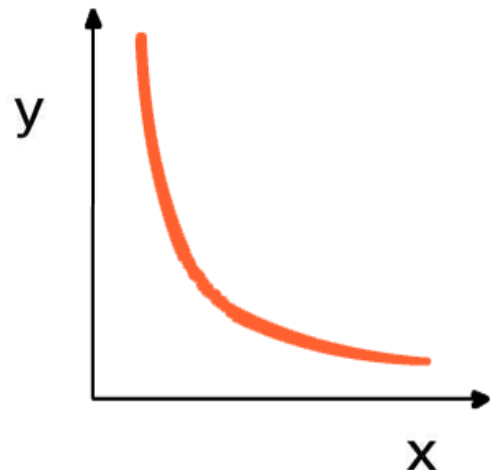
    shaped graphs.

    ▪ As one variable _____ the other

      _____ by the _____ amount, and vice versa.

<table>
<tr><td align="center">Direct</td><td align="center">Indirect/Inverse</td></tr>
</table>

Exam Date: _____

- **Matter & Change (Chapter 1)**
  - ✓ Technology / pure science
  - ✓ Matter classifications / physical & chemical changes / physical & chemical properties
  - ✓ States of Matter
  - ✓ Branches of Chemistry
- **Measurements & Calculations (Chapter 2)**
  - ✓ SI / metric system / prefixes / 7 base units
  - ✓ Unit conversions
  - ✓ Scientific notation
  - ✓ Significant figures
  - ✓ Accuracy (percent error) / precision (percent difference)
- **Element Names and Symbols**