Physical Science Chapter 1
The Metric System

A. What is Physical Science?

1. Physical Science is the study of matter and energy.
**a. Matter** – Anything that has **mass**, takes up space and has inertia.

**States of Matter**

1. **Inertia**, an object at rest remains at rest, an object in **motion** remains in that straight line motion unless acted upon by an outside **force**.
2. **Mass** is the amount of matter and is unaffected by gravity.

a. A brick and a sponge of the same size differ in mass because have different weights. **Moon**

3. **Balance** device used to measure mass.
4. **Weight** is a unit of force measured in Newton, or the metric version of pounds and is affected by gravity.

a. Weight is the greatest at North Pole or closer to earth’s core.
b. Weight is the least at equator or up a mountain as in the 1968 Olympics.

c. Scale is a device used to measure weight.

b. Energy – Is the ability to do work.
1. **Work** - = Force x distance.

2. You push against a box with a great force but if you cannot move it no work is done.
3. Lifting a book off the floor requires work because you are moving it against gravity.

4. But if you keep the book at the same height a walk no work is done on the book since it does not move against gravity.

2. **Two Areas of Physical Science**
   
a. **Chemistry** – The study of matter and how it changes.

\[ E = MC^2 \]
1. Burning, reacting, oxidize, and inert are all chemical terms.
   a. **Burning** is a chemical change because the paper turns to ash which is a different substance.
   
   ![Image of burning forest]

   b. **Inert** means it will not react at all.
2. Physical terms like melting, boiling, freezing, evaporating, condensing, subliming, and malleable.
   a. **Melting** is when water changes from a solid to a liquid.

   ![Image of Ice Age 2 poster]

   ![Image of Gumby toy]

   b. **Malleable** is how bendable something is.
b. **Physics** – The study of energy and how it reacts with matter.

1. Physics explains why helium balloons rise.

2. It also explains how lasers, TV’s, and radios work.
3. The Tools of Physical Scientists

a. Balance – measures mass with a tool a lot like a teeter totter.

1. **Mass** is measured in **Grams** and it is not the same as weight.

2. **Weight** depends on **gravity**.
3. The farther you are from the earth the less you weigh but you do not get smaller.

b. **Thermometer** – measures temperature in either Fahrenheit or Celsius.
1. **Fahrenheit** – Freezing is 32° and boiling is 212°.

2. **Celsius** - Freezing is 0° and boiling is 100°.
c. Liquid Volume – uses many tools.

1. A Beaker is used for mixing or holding liquids, although it does have numbers on the side it will give you a close estimate of volume only.

2. Graduated Cylinder is a tall container with markings on the side that is much more accurate.
3. **Test tube** is used for heating or reacting liquids.

d. **Dry Volume** – uses a metric ruler to find L x W x H or cm³.

1. If an object has an odd shape and a ruler will not work drop it in a graduated cylinder and see how much it rises.

![Volume formulas](image)
2. This is because in metrics 1 mL = 1 cm³.
3. A **meter stick** is the tool used to measure length.

**e. Bunsen Burner** – the flame is used to heat things up.
1. A blue flame is hotter than an orange flame.

2. The flame within a flame is the hottest part.

B. Why Scientists Measure – tools are needed to make sure our eyes do not deceive us.
Two Faces... Or One?

(hint: two faces side profile&hellip;or one face front view)

Is The Book Looking Towards You... Or Away From You?

Now here's a deal send this to atleast six people and a really cool optical illusion will pop up in ur screen in the next 2 minutes "I'm telling you it is worth it"
A Face Of A Native
American... Or An Eskimo?

Horse or Frog?
Turn the picture sideways and you decide.
Old Woman...Or Young Girl?
hint: The old woman's nose is the young girl's chin.
Units of Measurements

a. Egyptians – used the **Cubit** which was the distance from the elbow to the finger tip.

b. Romans – used the **Uncia** which was the width of their thumb. The also used the **Stadia** which was the distance around the track at the coliseum.
c. **English Standard** – which is what we use in America with measures of inches, feet and etc.

d. The first units would differ from person to person.

e. Our system is difficult to remember.

2. **Systems of Measurement**

a. **The Metric System.**

b. Used World Wide

c. Changes by units of 10

d. Based on water, $1\text{ml} = 1\text{ cm}^3 = 1\text{ cc} = 1\text{ g}$

e. Uses prefixes to change by tens
Kilo Hecto Deka BASE deci centi milli
$10^3$ $10^2$ $10^1$ $1$ $10^{-1}$ $10^{-2}$ $10^{-3}$

C. Using Metric Units to Measure Length

1. Using Meters
   a. The metric system is just like using our money system.
   b. A millimeter is the smallest lines on a meter stick.
   c. A centimeter is just about a half and inch.

   \[1 \text{ centimeter (or 1 cm)} = \text{the width of some part of your smallest finger or fingernail}\]

   ![1 centimeter]

   d. A meter is just a tad longer than a yard.

   \[1 \text{ meter (or 1 m)} = \text{about a yardstick plus the length of a piece of chalk}\]

   ![1 meter and 1 yard]

   e. A kilometer is shorter than a mile.
1 kilometer (or 1 km) = a little more than half a mile (pronounced KILL-oh-meet-ur not kill-AHM-it-ur)

D. Using Metric Units to Find Area

1. **Area** is measured in L x W

2. Area is given the label of \( cm^2 \)

3. The 2 is called an **Exponent** or a power.
E. Using Metric Units to Find Volume

1. As mentioned before **Dry Volume** uses a metric ruler to find $L \times W \times H$ or $\text{cm}^3$.

2. Liquid Volume uses **Liters**.
F. Using Metric Units to Measure Mass

1. Grams are the units for mass