

Metric System (SI), Lab Safety, Lab Equipment, Scientific Method Study Guide

Scientists use a single, standard system of measurement. The official name of the measurement system is **SYSTEME INTERNATIONAL d'UNITES** (International System of Measurements) or **SI**.

The metric system is based on the number 10. Main Units of Measurement

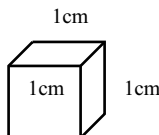
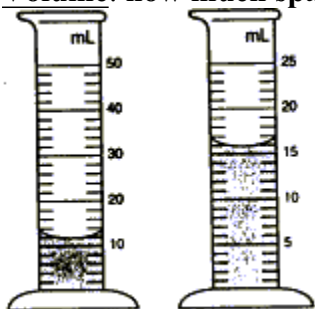
Length	Mass			Volume	Temperature		
meter (m)	gram (g)			liter (l)	Celsius (C°)		
Prefix Name	Kilo- (K)	Hecto (H)	Deka/ Deca (D)	Base Unit (m, l, g)	deci- (d)	Centi- (c)	Milli- (m)
Times larger or smaller than base	x 1000	x 100	x 10	meter, gram, liter	÷10	÷100	÷1000
Units compared to base	1000	100	10	1	.1	.01	.001
Fractions				1	1/10	1/100	1/1000

Using the above values (meter, liter, & gram) as the base*, their value can be increased or decreased by moving the decimal point to the right (lowers the value) or left (raises the value). *Celsius has no prefixes.

Definitions:

Mass: the amount of matter in an object; the quantity of matter in an object regardless of its volume or of any forces acting on it. The term should not be confused with **weight, which is the measure of the force of gravity acting on a body.** Under ordinary conditions the mass of a body can be considered to be constant; its weight, however, is not constant, since the force of gravity varies from place to place.

Volume: how much space an object takes up; measure of space or capacity, usually expressed in cubic



centimeters or in liquid measure, such as liters.

Cubic centimeter: The volume of a solid can be measured in cubic centimeters.

Each side is equal to 1 cm.

1 cubic centimeter (cc) = 1 milliliter (ml)

Formula: V = L x W x H

(volume equals length x width x height).

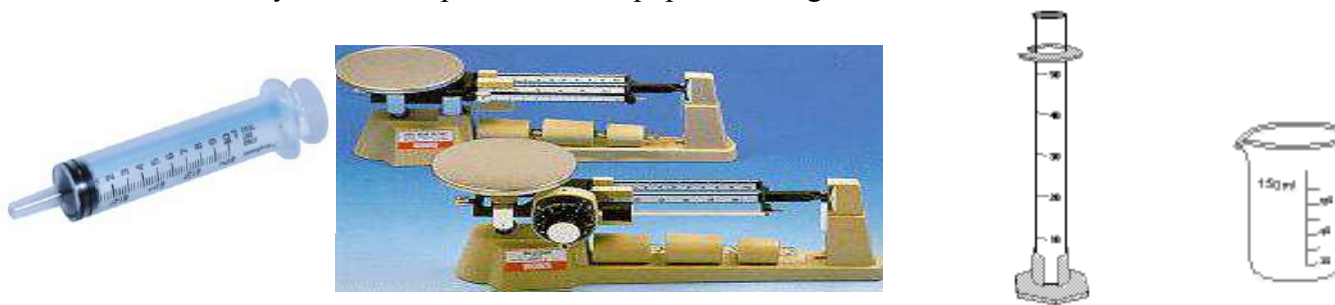


Meniscus: the curved surface of liquid in a graduated cylinder- Always read the measurement from the lowest part of the dip in the curved surface.

GPS Information:

Units of study in all subjects are based on *standards* created by the Georgia Department of Education. Each standard may be broken into smaller parts called *elements*. In science there are 2 types of standards. CS (*Characteristics of Science*) are standards that are designed to teach how to think and act as a scientist. *Content standards* describe the different fields to be studied, for example Geology includes the study of rocks which is part of Content Standard # 5.

Be able to correctly label these pieces of lab equipment using the scientific name.



1. syringe

2. triple beam balance

3. graduated cylinder

4. beaker

Lena Mae Moses M.S. Lab Safety Rules

- Follow all instructions given by the teacher.
- Know the location of safety and first aid equipment.
- Perform only those activities assigned and approved by my teacher.
- Wear eye protection at all times when instructed to do so.
- Notify my teacher immediately of an emergency.
- NEVER work alone with laboratory equipment or materials.
- NEVER work without the supervision of the teacher.
- Fasten long hair, secure loose clothing, and remove dangling jewelry before beginning lab activities.
- Never take any lab supplies or substances out of the science classroom without the teacher's permission.
- No eating, drinking, or chewing gum in the science classroom.
- NEVER smell or taste substances during a lab activity unless instructed to do so by the teacher.

Steps of the Scientific Method

1) **Purpose:** The first step in the scientific method is to decide on a *problem* or *question* to solve.

2) **Research:** Research your topic.

3) **Hypothesis:** Predict what the outcome of your experimenting will be.

4) **Experiment:** Design a procedure which tests the hypothesis. This procedure should clearly indicate the materials to be studied in the experiment and the measurements to be taken. There must be two groups included in the experimental procedure. The **control** contains all the parts of the experiment **except** the factor being tested. The **variables** are the different factors that **vary** or change in an experiment. Variables contain all the factors of the control group as well as the **one factor** that is being tested. This is sometimes also called the experimental group. A well designed procedure tests only one variable. The control group acts as a basis to compare with the variable group. **Constants** are those variables from both groups that remain **constant** or do not change. There are two types of variables in an experiment. The **independent variable** (sometimes called the **manipulated variable**) is the variable which is changed or manipulated by the investigator. The **dependent variable** (sometimes called the **responding variable**) is the variable being **measured** which is responding or being influenced by changes in the independent variable. For example: An experiment to test the best fertilizer for tomato plants would include different fertilizers (independent variable), several of the same kind of tomato plants, same amount of water and sunlight (constants), a group of plants where no fertilizer was given (control group) and measurements of growth would be taken from all plants (dependent variable).

5) Analysis: The fourth step of the experiment is to organize the **results or data** collected. This may involve the use of data charts, graphs, tables, or drawings. When a variable is manipulated in an experiment, the data must include the changes in the independent and dependent variables. The scientist will then review these results. This often leads to new hypotheses being formed and additional scientific investigation.

6) Conclusion: The final step of an investigation may be to form a conclusion based upon the data. Using the trends in your experimental data and your experimental observations, the conclusion should try to answer the original problem.

7) Communicate Results: Scientists should share information through presentations, collaboration, and reports.