

Tools, Measurement, and Safety Objectives

- Give examples of how scientists use computers and technology.
- Describe tools scientists use to observe organisms.
- Explain the importance of the International System of Units, and give four examples of SI units.

Explain proper lab safety procedures.

# I. Computers and Technology

- A. Technology is the application of sciences for practical purposes. It is the use of tools, machines, materials, and processes to meet human needs.
- B. Computers are used to create graphs, solve complex equations, and analyze and communicate data.



# II. Tools in Science

A. Stopwatches, Meter sticks, and More One way to collect data is to take measurements. To get the best measurements, you need the proper tools. Stopwatches, meter sticks, and balances are some of the tools you can use to make measurements.





# Lab Tools You Need to Know!



# III. Units of Measurement

- A. The International System of Units Began by the French Academy of Sciences in the late 1700s, the SI is used by almost all countries in the world.
- B. All SI units are based on the number 10, which makes conversion from one unit to another easy.



### **Common SI Units**

Length	meter (m)	
	kilometer (km)	1  km = 1,000  m
	decimeter (dm)	1  dm = 0.1  m
	centimeter (cm)	1  cm = 0.01  m
	millimeter (mm)	1 mm = 0.001 m
	micrometer (µm)	$1 \ \mu m = 0.000001 \ m$
	nanometer (nm)	1  nm = 0.00000001  m
Volume	cubic meter (m <sup>3</sup> )	
	cubic centimeter (cm <sup>3</sup> )	$1 \text{ cm}^3 = 0.000001 \text{ m}^3$
	liter (L)	$1 L = 1 dm^3 = 0.001 m^3$
	milliliter (mL)	$1 \text{ mL} = 0.001 \text{ L} = 1 \text{ cm}^3$
Mass 2	kilogram (kg)	
	gram (g)	1 g = 0.001 kg
	milligram (mg)	1  mg = 0.000  001 kg
Temperature	kelvin (K)	
	Celsius (°C)	0°C = 273 K
		100°C = 373 K

IV. Using the International System of Units

A. Length A meter is the basic SI unit of

B. Volume Volume is the measure of the size of an object in three-dimensional space. Volume is often given in liters or cm<sup>3</sup>
volume= length x width x h<sup>st</sup>

**C. Mass** A measure of the amount of matter in an object is mass. The kilogram is the basic unit for mass.

how much is 1 gram





A CAN OF COKE IS 355ML

### **Differences Between Mass and Weight**

### **P3**

#### Mass

- Mass is a measure of the amount of matter in an object.
- Mass is always constant for an object no matter where the object is located in the universe.
- Mass is measured by using a balance (shown below).
- Mass is expressed in kilograms (kg), grams (g), and milligrams (mg).

#### Weight

- Weight is a measure of the gravitational force on an object.
- Weight varies depending on where the object is in relation to the Earth (or any large body in the universe).
- Weight is measured by using a spring scale (shown at right).
- Weight is expressed in newtons (N).



# **Critical Thinking Time!**

- What kind of measurement is being taken?
  - A. Area B. Length
  - C. Mass D. Volume
- What is an accurate measurement of the dinosaur?



**D. Temperature** Temperature is the measure of how hot an object is. Scientists often measure temperature in degrees Celsius.



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E. Area Area is the measure of an object's surface. The units for area are square units, such as square meters.

Area= Length x Width



Area = 258mm x 309mm 79,722mm<sup>2</sup> **F. Density** The ratio of the mass to volume of a substance is density. Units often used for density are g/mL or  $g/cm^3$ .

Density=Mass ÷ Volume

### **Density Video**

**Density Video** 



# V. Safety Rules!

Follow your teacher's instructions.

Read lab procedures carefully.

Pay special attention to safety information.



## Critical Thinking Guessing Game: Mass







Unsharpened pencil: 6.9 g

One dime: 2.3 g

Male Lion: 187.5 *kg* 



US Dollar Bill: 1 gram/ 1,000mg



Length of Lamborghini Gallardo: 4,345 mm 4.345 m



### *Game card: 10 centimeters*



### Capri Sun: 200 mL



Olympic Size Swimming Pool: 2,500,000 L



Word Bank hypothesis conclusion observations scientists results scientific methods experiments

