



## 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

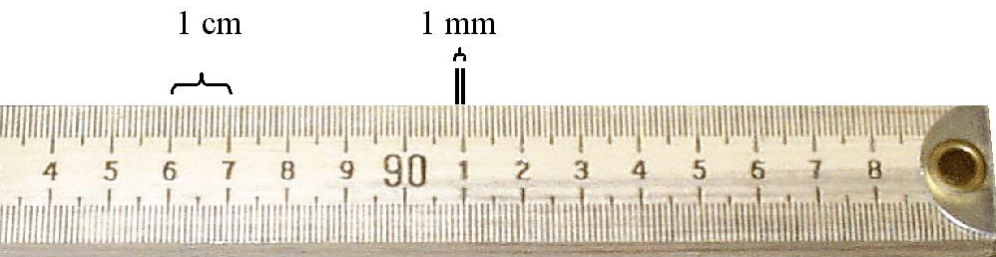
- A. **Technology** is the application of sciences for practical purposes. It is the use of tools, machines, materials, and processes to meet human needs.
- B. Computers are used to create graphs, solve complex equations, and analyze and communicate data.



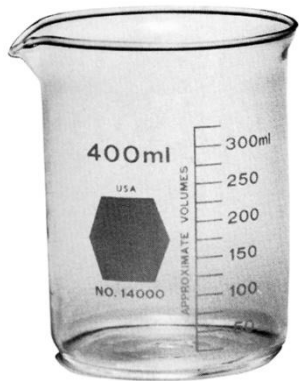


## II. Tools in Science

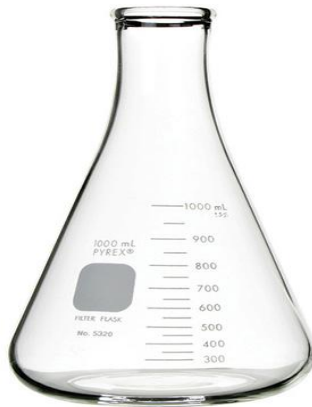
**A. Stopwatches, Meter sticks, and More** One way to collect data is to take measurements. To get the best measurements, you need the proper tools. Stopwatches, meter sticks, and balances are some of the tools you can use to make measurements.



# Lab Tools You Need to Know!



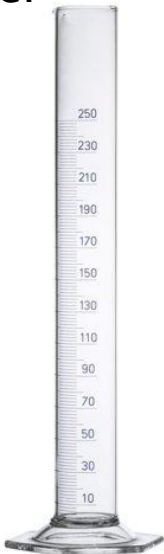
Beaker



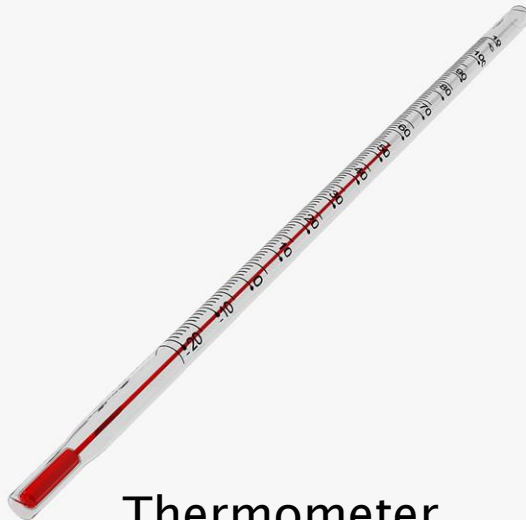
Erlenmeyer  
Flask



Triple Beam  
Balance



Graduated  
Cylinder



Thermometer



Pipette



Spring  
Scale





# 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.



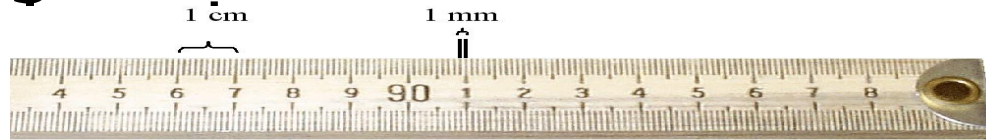


## Common SI Units

<b>Length</b> 	<b>meter (m)</b> 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 μm = 0.000001 m nanometer (nm)      1 nm = 0.000000001 m
<b>Volume</b> 	<b>cubic meter (m³)</b> cubic centimeter (cm³)      1 cm³ = 0.000001 m³ liter (L)      1 L = 1 dm³ = 0.001 m³ milliliter (mL)      1 mL = 0.001 L = 1 cm³
<b>Mass</b> 	<b>kilogram (kg)</b> gram (g)      1 g = 0.001 kg milligram (mg)      1 mg = 0.000 001 kg
<b>Temperature</b> 	<b>kelvin (K)</b> Celsius (°C)      0°C = 273 K 100°C = 373 K

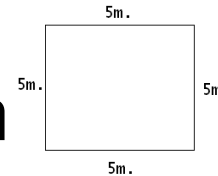
# IV. Using the International System of Units

**A. Length** A meter is the basic SI unit of



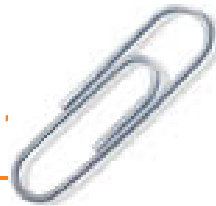
**B. Volume** Volume is the measure of the size of an object in three-dimensional space. Volume is often given in liters or  $\text{cm}^3$

▶ volume = length x width x h



**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

## 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).





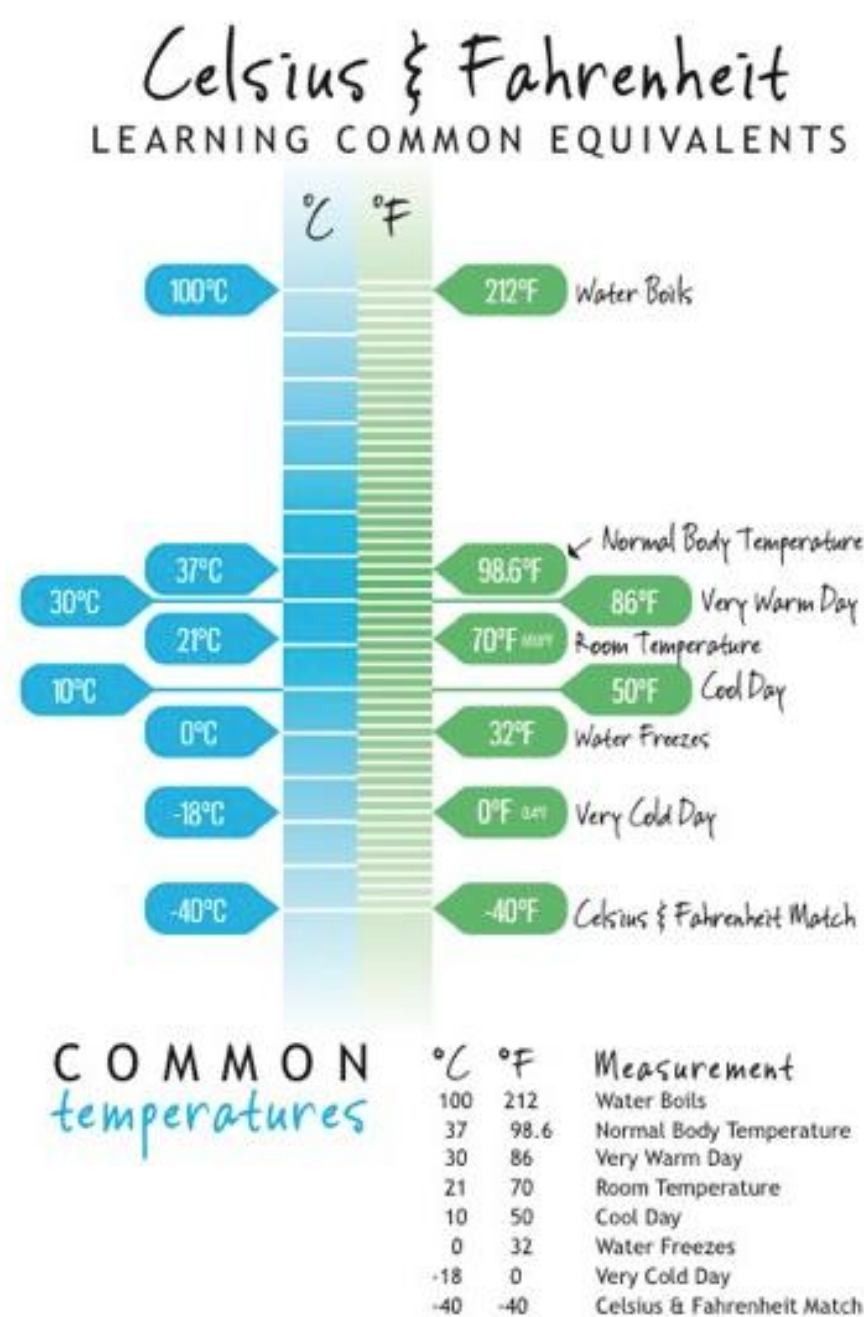
# Critical Thinking Time!

- ▶ 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.



**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



$$\begin{aligned}\text{Area} &= 258\text{mm} \times 309\text{mm} \\ &79,722\text{mm}^2\end{aligned}$$

**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<sup>3</sup>.

▶ 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.

## Safety Symbols



Eye Protection



Clothing Protection



Hand Safety



Heating Safety



Electric Safety



Sharp Object



Chemical Safety



Animal Safety



Plant Safety



# Critical Thinking Guessing Game:

## Mass



One dime: 2.3 g



Male Lion: 187.5 kg



Unsharpened pencil: 6.9 g



US Dollar Bill: 1 gram/  
1,000mg



Length of Lamborghini Gallardo: 4,345 mm  
4.345 m



*Game card: 10  
centimeters*

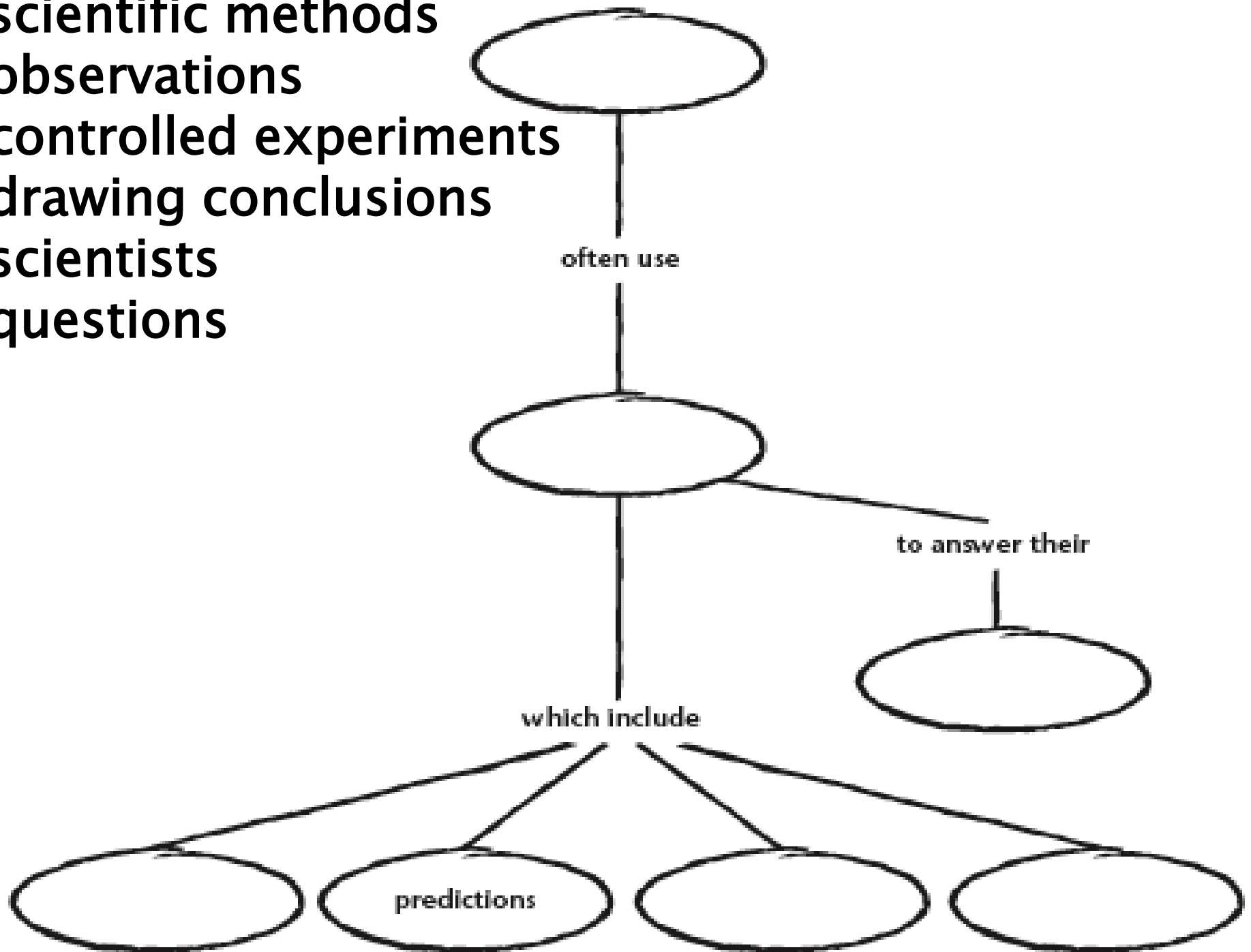


Capri Sun: 200 mL



Olympic Size Swimming Pool: 2,500,000 L

scientific methods  
observations  
controlled experiments  
drawing conclusions  
scientists  
questions





## Word Bank

hypothesis

conclusion

observations

scientists

results

scientific

methods

experiments

