

# Scientific Explanations

## Lesson 2: Measurements and Scientific Tools

**Description:** a spoken or written summary of observations

- 2 types of descriptions
  - *Qualitative descriptions:* use your senses to describe observations
    - Sight, sound, smell, touch, taste
    - Color of a shirt
  - *Quantitative description:* use numbers and measurements to describe an observation
    - You need a description along with a label afterwards.
    - 70°C outside

**Explanation:** an interpretation of observations

**International System of Units (SI):** the internationally accepted system for measurement

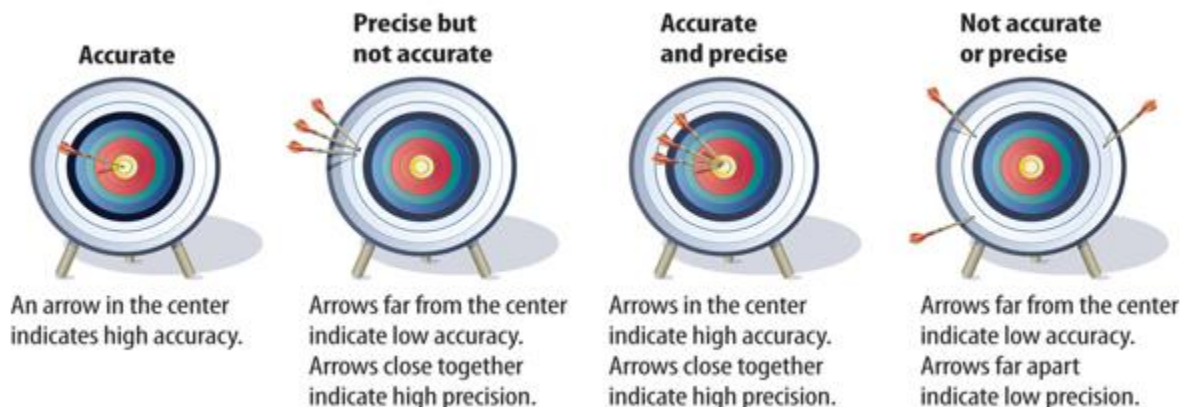
- 7 Base units listed below

Quantity Measured	Unit	Symbol
Length	meter	m
Mass	kilogram	kg
Time	second	s
Electric Current	ampere	A
Temperature	Kelvin	K
Substance amount	mole	mol
Light intensity	candela	cd

- We will do conversions next year in Earth science

Precision and Accuracy:

- **Accuracy:** a description of how close a measurement is to an accepted or true value
- **Precision:** a description of how similar or close measurements are to each other



## Mean, Median, Mode, and Range

- *Mean*: average – most common
- *Median*: middle number
- *Mode*: number that appears most
- *Range*: greatest – smallest numbers

Student Melting Point Data			
	Student A	Student B	Student C
Trial 1	183.5°C	190.0°C	181.2°C
Trial 2	185.9°C	183.3°C	182.0°C
Trial 3	184.6°C	187.1°C	181.7°C
Mean	184.7°C	186.8°C	181.6°C
Sucrose Melting Point (accepted value) 185°C			

Which student was most accurate? Precise?

## Measurement and Uncertainty:

- Measure how precise your instrument can measure
- We will focus on this more closely in Earth science.

**Significant Digits:** the number of digits in a measurement that are known with a certain degree of reliability.

- There are 4 rules.
  - Numbers 1-9 are considered significant

Example (number)	Significant Digits
12.345 kg	5
24.68 m	4

- Zeros between #1-9 are significant

Example (number)	Significant Digits
3.07 m	3
1,002 s	4

- Final zeros used after the decimal point are significant

Example (number)	Significant Digits
0.150 kg	3
18.0 m	3

- Zeros used solely for spacing the decimal point are not significant. The zeros indicate only the position of the decimal point.

Example (number)	Significant Digits
0.001 kg	1
50,600 s	3

## Scientific Tools:

- Science Journals – used to record descriptions, explanations, plans, and steps used in a scientific inquiry.
- Balances – use a triple-beam balance or electric and is measured in kilograms (kg) or grams (g)
- Thermometer – measured the temperature of substances. In the science classroom, we will measure in degrees Celsius (°C)
  - Most are made of glass so be careful. Do not stir with a thermometer.
- Glassware – used to hold, pour, heat, and measure liquids.
  - Flasks, beakers, petri dishes, test tubes, and specimen jars are containers
  - Graduated cylinders measure liquids in milliliter (mL) or liter (L)
- Compound microscope – observe small objects that you cannot observe with just your eyes (discuss more later in chapter one)
- Computers – process information
  - Hardware – monitors and keyboards
  - Software – programs you run (word processing and spreadsheets)
- **Tools used by Life Scientists**
  - Magnifying Lens – enlarges an image
  - Slide – used in microscopes
  - Dissecting tools – scalpels and scissors to examine prepared organisms
  - Pipette – similar to an eyedropper that is used to transfer liquids