Unit 3- Lesson 2

Chemistry 0

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Measurement

- Demonstrate the difference between accuracy and precision
- Identify common physical properties
- Explain the difference between mass and weight
- Work with metric prefixes
- Perform simple conversions between metric units
- Write large and small numbers in scientific notation

Certainty in measurement

- Scientists can use **accuracy** and **precision** to describe the quality of their measurements.

- **Accuracy**: refers to how close a measured value is to the true measurement (true value) of something.

- **Precision**: refers to the ability to take the same measurement and get the same result over and over.

Certainty in measurement

Example:

Precision is easier to determine. You can see how close one measurement is to another.
Accuracy is more difficult because scientists might want to measure things that are not already known.

Types of physical measurements

- **Mass**: A measure of the quantity of material in a substance.
- **Weight**: A measure of the pull of gravity between an object and the earth (or the planets.) Therefore, weight is actually a measure of force.
- **Length**: A measure of how long an object is or the distance an object spans.
- **Volume**: The amount of space that matter occupies or takes up.

Types of physical measurements

- **Temperature**: A measure of the average kinetic energy (energy of motion) of particles of matter.
- **Density**: The amount of matter per unit of volume. Density measures how much matter occupies a given amount of space.
- **Pressure**: The amount of force exerted per unit area. Force is the amount of push or pull on an object.
- **Energy**: A measure of the ability to do work or generate heat.

MEASUREMENT

Measure	What It Measures	Scientific Units	US Customary Units
Mass	The amount of matter in an object	Kilograms(kg), grams (g)	Pounds
Length	How long an object is	Meters (m)	Inches, feet, miles
Volume	The amount of space an object occupies	Liters (L), cubic meters (m^3), cubic centimeters (cm^3)	Pints, quarts, gallons
Temperature	The average kinetic energy of particles	^0C, K	^0F
Density	Ratio of mass to volume for an object	kg/m^3, g/mL	Pounds per cubic inch
Pressure	The amount of force per unit area	Pa, atm, mmHg	Pounds per square inch (psi)
Energy	The ability to do work or generate heat	J, cal, eV	BTU

International System of Units

Primary Units

Measure	Base Unit
Length	Meter (m)
Mass	Kilogram (kg)
Time	Seconds (s)
Temperature	Kelvin (K)
Amount of a substance	Mole (mol)
Electric current	Ampere (A)
Luminous intensity	Candela (cd)

Common Prefixes and the Quantities

Prefix	*Symbol*	*Numerical Value*
Tera-	T	10^{12}(1,000,000,000,000)
Giga-	G	10^{9}(1,000,000,000)
Mega-	M	10^{6}(1,000,000)
Kilo-	k	10^{3}(1,000)
Centi-	c	10^{-2}(0.01)
Milli-	m	10^{-3}(0.001)
Micro-	μ	10^{-6}(0.000001)
Nano-	n	10^{-9}(0.000000001)
Pico-	p	10^{-12}(0.000000000001)

Scientific Notation

- **Scientific notation** is the method scientists use to quickly write very large or very small number.

- It can be as easy as counting. First, move the decimal in the appropriate direction. Move the decimal to the right for small numbers and to the left for large numbers. THen count the number of places the decimal moved to figure out the correct exponent.