

## Chapter 1: Chemistry, Matter and Measurement

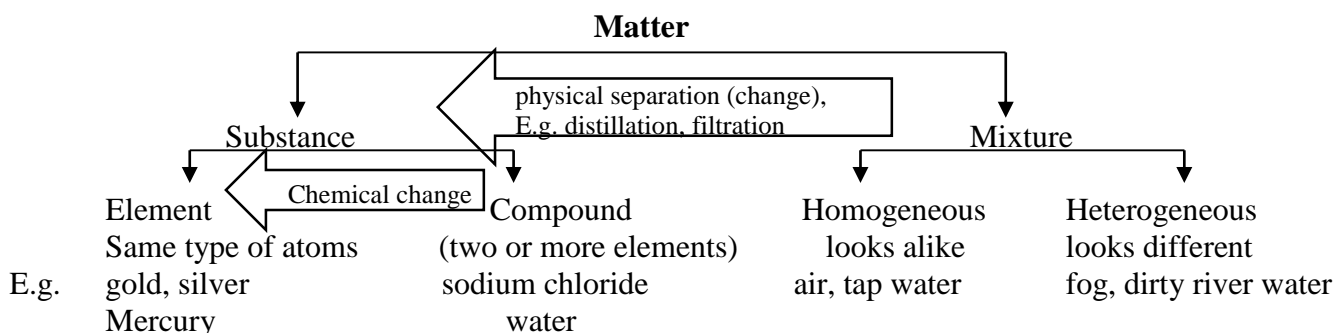
**Chemistry:** study of matter

Physical property: e.g. color, solid/liquid/gas

Chemical change: irreversible (rusting, spoiling of milk)

chemical property: e.g. reactivity

physical change (reversible): ice to water



### Scientific Method

Observation -> Hypothesis -> Experimentation (collect data), must be replicable -> Theory -> Law

### Scientific Measurements

Physical Quality	Non SI	SI
Length	Miles, feet	Meters (m)
Weight	Pounds, ounces	Grams (g)
Time	Seconds	Seconds (s)
Temperature	Degree Fahrenheit, Celsius	Kelvin (K)
Electric current	Ampere	Ampere (A)
Volume	Gallons, quarts	Liters (L)
Pressure	Atm, torr, Pascal	Newtons (N)

Giga (G)	$10^9$
Mega (M)	$10^6$
Kilo (k)	$10^3$
Deci (d)	$10^{-1}$
Centi (c)	$10^{-2}$
Milli (m)	$10^{-3}$
Micro ( $\mu$ )	$10^{-6}$
Nano (n)	$10^{-9}$
Pico (p)	$10^{-12}$

**Temperature Unit Conversions:**

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) / 1.8$$

AND

$$^{\circ}\text{F} = 1.8^{\circ}\text{C} + 32$$

### Measuring Instruments:

Length: meter stick or measuring tape

Solid Volume: meter stick

Temperature: mercury or digital thermometer

Pressure: barometer

Time: stop watch or watch

Liquid volume: measuring cylinder, beakers

Weight: electronic balance, analytic balance

### Measurement

Precision: measured values close to each other

Accuracy: measured value close to actual value

Extensive Property: dependent on amount of substance

Intensive Property: independent of amount of substance

### Significant figures (SF)

Measured value, depends on the measuring instrument and technique.

E.g. 4.335 – 4 SF

2.09 – 3 SF

200 – 1 SF

0.091 – 2 SF

2.00 – 3 SF

**Density (g/mL):**  $d = \text{g/mL}$  ( $1 \text{ cm}^3 = 1 \text{ mL}$ )