

Chapter 1: The study of changes-

Macroscopic $\Rightarrow$ Things we can see, touch, and measure directly and by naked eye.

Microscopic $\Rightarrow$ Particles and events that we can't experience without modern technology (microscope).

Scientific method $\Rightarrow$ a systematic approach to research.

$\rightarrow$ Observation $\rightarrow$ Representation $\rightarrow$ Interpretation.

Hypothesis $\Rightarrow$ a tentative explanation for a set of observations.

Law $\Rightarrow$ concise statement of a relationship between phenomena that is always the same under the same conditions.

$$F = ma \quad / \quad KE = mv^2 \quad \dots$$

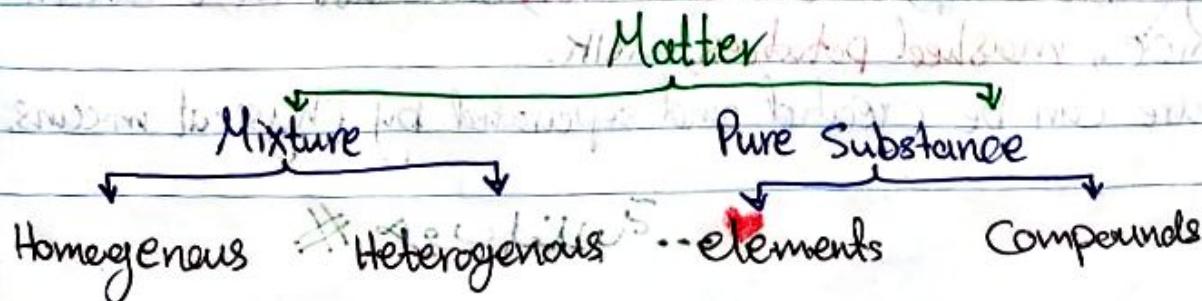
Theory $\Rightarrow$ is a unifying principle that explains a body of facts and/or those laws that are based on them.

Atomic theory.

Questioning a theory is a principle formed to explain the things already shown in data. (**True** / False)

Chemistry $\Rightarrow$ Study of matter and the changes it undergoes.

Matter $\Rightarrow$ Anything that occupies space and have mass



Substance $\Rightarrow$ is a form of matter that has a definite composition and distinct properties.

Element $\Rightarrow$ A substance that can't be separated into simpler substances by chemical means. $\rightarrow$ (The simplest form of matter that we see in the laboratory)

114 $\rightarrow$ 82 $\rightarrow$ 32
Earth $\rightarrow$ gold (Au), aluminum (Al), lead (Pb)
Oxygen (O), Carbon (C), Sulfur (S).
technetium, americium, seaborgium

Compound $\Rightarrow$ is a substance composed of atoms of two or more elements chemically united in fixed proportions, and can be separated into elements only by chemical means.

Ex: water (H_2O), (CO_2), sulfuric acid (H_2SO_4), Ammonia (NH_3), Glucose ($C_6H_{12}O_6$)
dioxide (O_2)

Mixture $\Rightarrow$ a combination of two or more substances in which the substances retain their distinct identities.

Homogenous mixture $\Rightarrow$ The composition of the mixture is the same throughout.

Ex: sugar in water, solder, soda water, sodium chloride solution (NaCl in water), vinegar, vodka, coffee, Tap water, Brass, air.

Heterogeneous mixture $\Rightarrow$ The composition is not uniform throughout.

Ex: concrete, iron filings in sand, starch solution, orange juice, wood, vegetable soup, sand and water, sandlust in water, tomato juice, mashed potatoes.
 $\Rightarrow$ Any mixture can be created and separated by physical means.

♥ جوب لئلاية... #

Three state of matters

- solid's molecules are held close together.
- liquid's molecules are close together but can move past each other.
- gas's distances between molecules are large compared with the molecule size.

Physical and chemical properties and changes

Chemical properties: reactivity with water, rusting, combustion, ^{flammability} ↑

Physical properties: boiling point, melting point, density, mass temperature, color, solubility, viscosity, dissolving.

Physical changes

- Hammering a nail into a piece of wood
- cutting an apple in half
- put yellow liquid and blue liquid to give a green one.
- freezing of water
- Tearing a piece of paper into 100 pieces.
- shiny metal melts at 500°C

Chemical changes

- combine two clear liquids and they turn cloudy white.
- Letting a nail rust.
- combustion (Burning a piece of paper)
- dropping a piece of iron into hydrochloric acid.
- burning a piece of wood.
- emission of light by a kerosene oil lamp.
- letting the cut apple sit out and it turns brown.

The following indicates that a chemical change has taken place:-

- formation of precipitate
- energy release
- color change
- gas bubbles
- change of odor
- gas formation

Extensive and intensive properties:-

extensive properties $\rightarrow$ depends on how much matter is being considered. $\rightarrow$ (قابلية التغير بالكمية)

Ex: mass, volume, length, Number of moles, weight, radius.

intensive properties $\rightarrow$ don't depend on how much matter is being considered. (لا يتغير بالكمية)

Ex: density, color, solubility, taste, magnetism, hardness, boiling p.

mass: measure of the quantity of matter. (Kg) on Earth = 9.8
weight: force that gravity exerts on an object. $\text{weight} = m \times g$
(prefixes, SI) الجداول من 11 باللاتينية

length $\rightarrow$ m, volume $\rightarrow$ m³ (1 ml = 1 cm³) (1 L = 1 dm³)

density = $\frac{\text{mass}}{\text{volume}}$ (Kg/m³)

Temperature Scales:-

between Kelvin and Celsius

$$K = ^\circ C + 273.15$$

$$^\circ C = K - 273.15$$

between Fahrenheit and Celsius

$$^\circ F = \frac{9}{5} ^\circ C + 32$$

$$^\circ C = \frac{5}{9} (^\circ F - 32)$$

Significant Figures:-

$\rightarrow$ any digit that not a zero is significant (56.3 $\rightarrow$ 3 s.f.)

$\rightarrow$ zero between nonzero digits (606 $\rightarrow$ 3 s.f., 40.501 $\rightarrow$ 5 s.f.)

$\rightarrow$ zeros to the left of nonzero digits are not sig. (0.08 $\rightarrow$ 1 s.f.)

$\rightarrow$ If the number is greater than one then all the zeros to the right of the decimal point are sign. (2.0 $\rightarrow$ 2 s.f., 40.320 $\rightarrow$ 5 s.f., 3.040 $\rightarrow$ 4 s.f.)

$\rightarrow$ If the number is less than one then all the zeros to the left are not sig. (0.00420 $\rightarrow$ 3 s.f., 0.03003 $\rightarrow$ 4 s.f., 0.090 $\rightarrow$ 2 s.f.)

$\rightarrow$ If the digit doesn't contain a decimal point then we don't know if the zeros on the right are sig. or not sig. so we use scientific notation (4 $\times 10^2 \rightarrow$ 1 s.f., 4.0 $\times 10^2 \rightarrow$ 2 s.f., 4.00 $\times 10^2 \rightarrow$ 3 s.f.)

Significant figures :-

1] Addition and subtraction.

The answer can't have more digits to the right of the decimal point than any of the original numbers.
 تتوفى الأعداد التي معنا رقم عند رقم، نأخذ أقل واحد ونخلي الناتج مثلاً.

Ex 8 $89.332 \rightarrow 3 \text{ s.f. after the decimal point}$
 $+ 1.1 \rightarrow 1 \text{ s.f.}$
 $\hline 90.432 \rightarrow \boxed{90.4}$

2.097
 $- 0.12$
 $\hline 1.977 \rightarrow \boxed{1.98}$

2] Multiplication or Division :-

The number of S.f. in the result is set by the original number that has the smallest number of sign. figures.
 تتوفى الأرقام المهمة في الأعداد المضروبة والمقسومة، ونأخذ أقل عدده من الأرقام المهمة ونخلي الناتج مثلاً.

Ex 8 $2.8 \rightarrow (2 \text{ s.f.})$
 $\times 4.5039 \rightarrow (5 \text{ s.f.})$
 $\hline 12.610 \rightarrow \boxed{13} (2 \text{ s.f.})$

$6.85 = 0.0611388 \rightarrow \boxed{0.0611} (3 \text{ s.f.})$
 112.04

$17.48 - 10.48 = 3.00 \rightarrow \boxed{2.7418}$
 $2.553 \quad 2.553 \quad \boxed{2.74} \rightarrow (3 \text{ s.f.})$

3] Exact Numbers :-

Numbers from definition or numbers of objects are considered to have an infinite number of significant figures.
 (الأعداد الناتجة من تعريف أو الأرقام المهمة)

Ex 8 $25.0 \times 5 = \boxed{125} 3 \text{ s.f.}$
 $3 \text{ s.f.} \quad \infty \text{ s.f.}$

$6.64 + 6.68 + 6.70 = 6.6733 \rightarrow \boxed{6.67} 3 \text{ s.f.}$
 $3 \rightarrow \infty \text{ s.f.}$

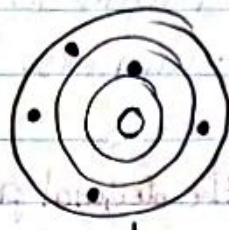
Accuracy $\Rightarrow$ How close the measurement to the true value.
 precision $\Rightarrow$ how close a set of measurements to each other.



accurate and
precise



precise, not
accurate



not accurate,
not precise.

♥ جوب، غلابة ... #