Date _____

Expt. No. _____ Page No. _____

CHAPTER 01

SOME BASIC CONCEPTS OF CHEMISTRY

Chemistry :- Chemistry is that branch of Science in which we study the composition, properties, and interaction of any matter.

Matter :- An object that occupies space and has mass is called matter.

Example :- Book, pen, water etc.

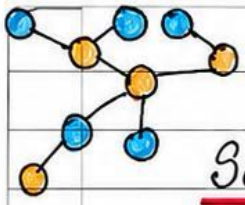
Physical states of matter

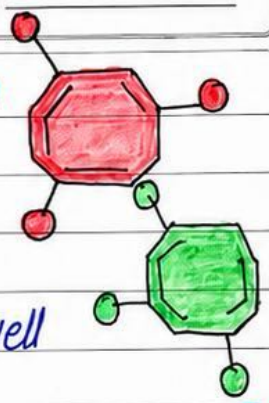
- Solid
- Liquid
- Gas

Teacher's Signature _____

Date _____

Expt. No. _____ Page No. _____





Solid :- Solid is such a physical state of matter in which particles remain very close to each other and are well arranged in an orderly manner.

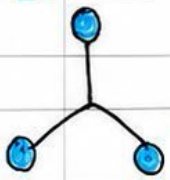
Liquid :- In liquids, particles are close to each other but these particles are motion-capable; these particles can move.

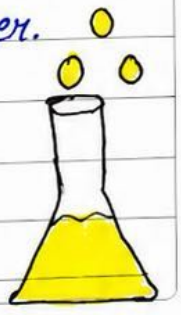
Gas :- Compared to solids and liquids, the particles of gases are very far apart. These particles can move very easily and more rapidly.

Characteristic of States of matter

(1) A solid has a definite volume and a definite shape.

(2) A liquid does have a definite volume, but its shape is not definite. A liquid changes its shape according to its container.





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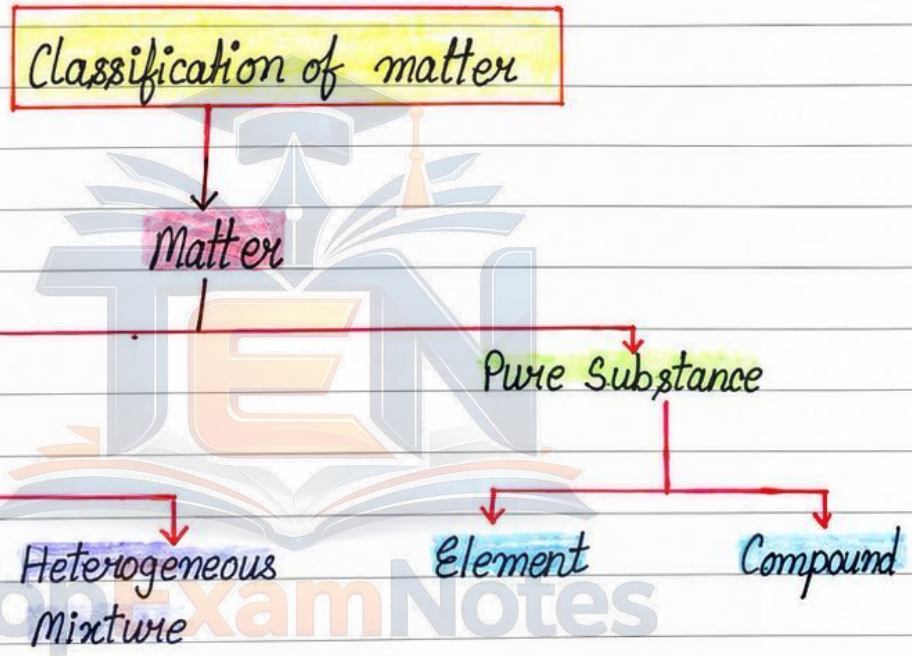
(3) Neither the volume nor the shape of a gas is fined. It completly fills the volume of any container if is placed in.

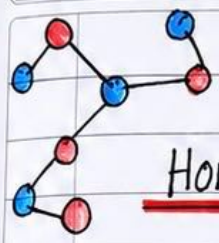


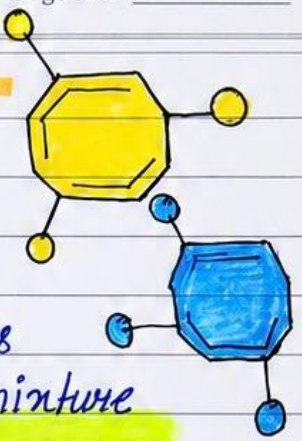
Mixture :- A substance obtained by mixing two or more substances (elements or compounds) is called a mixture.

Example :-
- Sugar and water solution.
- Lemon and water Solution.

Date _____

Expt. No. _____ Page No. _____





Homogenous Mixture :- A mixture in which substances are mixed uniformly, whose composition is uniform, and the components of the mixture do not appear separate, is called a homogenous mixture.

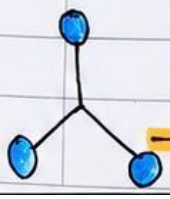
Example :- • Mixture of sugar and water.

Heterogeneous Mixture :- That mixture is called a heterogeneous mixture which is not mixed uniformly, in which non-uniformity is clearly visible.

Example :- • Mixture of water and oil.
• Mixture of water and sand.

Pure substance :- Pure substances are those substances which are made up of only one type of particles (atoms or molecules) and their composition remains constant.

Example :- Elements and Compounds.



Teacher's Signature _____

Date _____

Expt. No. _____ Page No. _____

Element :- An element is that form of a pure substance which cannot be broken down into simpler substances or separted by any physical or chemical means is called an element.

Example :- Gold (Au), Iron (Fe).

Compound :- Those pure substances which are obtained by chemically combining two or more elements in a fixed ratio / quantity are called Compound.

Example :- (H_2O) is made of Hydrogen and oxygen.

Common salt (NaCl) is made of sodium and chlorine.

- Compound
  - Organic Compound
  - Inorganic Compound

Date _____

Expt. No. _____ Page No. _____

Organic Compounds :- Those compounds in which carbon atom are primarily present and are connected to other elements like hydrogen and nitrogen through a covalent bond are called organic compounds.

Example :- Methane (CH_4), Glucose ($C_6H_{12}O_6$).

Inorganic Compounds :- Those compounds which do not contain carbon-hydrogen which do not bonds and are primarily composed of metals, non-metals and minerals. There is no C-H bond in them.

Example :- Salt ($NaCl$)
Water (H_2O)
there is no C-H Bond.

{ organic compounds and inorganic compounds are types of Compounds. }

Teacher's Signature _____

Date _____

Expt. No. _____ Page No. _____

Base Physical Quantities and their Units

Physical Quantities	S.I Units	Symbol
Length	Meter	m
Mass	kilogram	kg
Time	Second	s
Temperature	kelvin	K
Luminous Intensity	Candela	cd
Electric Current	Ampere	A
Amount of substance	Mole	mol

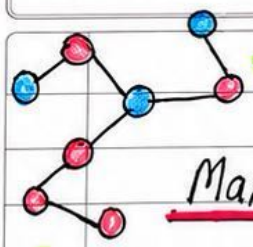
Volume:- Volume is represented by m^3, the volume depends on an object's length, width, and height.

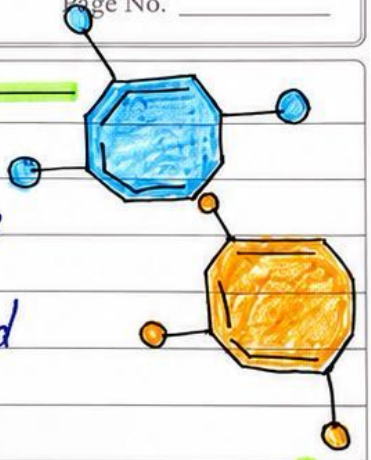
$$\text{Volume} = \text{Length} \times \text{Width} \times \text{Height} = m^3$$

Teacher's Signature _____

Date _____

Expt. No. _____ Page No. _____





Mass :- The mass of any substance or the total quantity of matter present in an object is called the mass of that object.

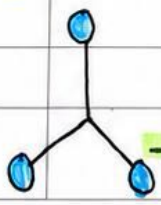
Density :- The density of any substance is the mass per unit volume of that substance.

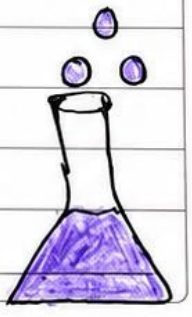
Unit of density = kgm^{-3}

Temperature :- The degree or measure of hotness or coldness of any substance or any object is called temperature. This makes us know how cold or hot any substance or object is :-

There are three scales to measure temperature :-

1. (Degree Celsius) °C
2. (Degree fahrenheit) °F
3. (Kelvin) K

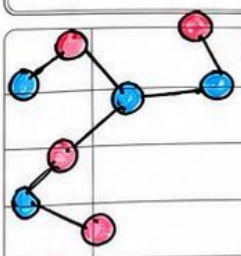


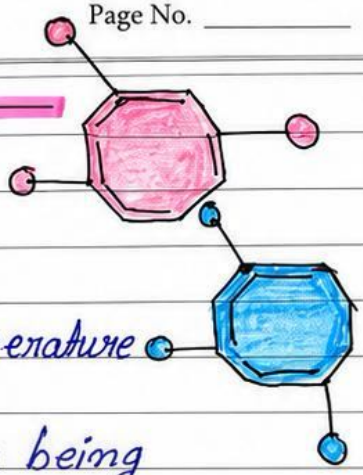


Teacher's Signature _____

Date _____

Expt. No. _____ Page No. _____





Important

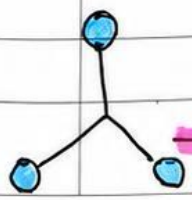
* The instrument used to measure temperature is called a thermometer.
The temperature of a healthy human being is approximately 37°C.

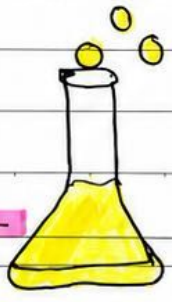
Uncertainty in Measurement :- In the study of chemistry, many times we have to focus on experimental data as well as theoretical calculations. There are also ways to handle numbers easily and to represent data with as much certainty as possible in a precise, meaningful manner.

Significant figures :- Those digits present in any physical quantity, through which physical quantities are represented with complete accuracy, are called Significant figures.

Example :- 03450789 = 3450789 = 7 (No. of significant figures)

↓ Physical quantity ↓ Significant figures





Teacher's Signature _____

Date _____

Expt. No. _____ Page No. _____

Rules of significant figures :-

(1) All non-zero digits are significant figures

(2) A zero digit coming between two non-zero digits is also a significant figure.

(3) Zero digits coming after non-zero digits are significant figures.

(4) Zero digits coming before non-zero digits are not significant figures.

Laws of chemical Combination

(1) Law of Conservation of mass :- This law was proposed by "Lavoisier" in the year 1789 A.D. According to this law, we can neither destroy mass nor create it, but it can be transformed from one form to another. In simple words, the mass of the substance participating in a reaction after the reaction is equal

Teacher's Signature _____

Date _____

Expt. No. _____ Page No. _____

to the total mass of the substances formed.

Example :- $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

(100) (56) (44)

On heating 100 grams of calcium carbonate, 56 grams of CaO and 44 grams of CO_2 are obtained.

Law of constant proportions :- This law was proposed by Joseph Proust, According to this law, the ratio of the masses of elements present in any pure chemical compound always remains constant, regardless of the source from which the compound is obtained.

Example :- In H_2O, the ratio of H and O is 1:8

$$H_2O \longrightarrow H : O = 1 : 8$$

Law of multiple proportions :- This law was proposed by Dalton, According to this law, when to elements combine with each other to form compounds, they do so in a simple ratio.

Teacher's Signature

Date

Expt. No. _____ Page No. _____

Example :- When N and O combine with each other they form N_2O, NO, N_2O_3, N_2O_4 Compounds

N_2O = 28 : 16

NO = 14 : 16 (In these, the fixed mass of N is 28.)

Gay-Lussac's Law of Gaseous volumes :- This law was proposed by Gay-Lussac in the year 1808. According to this law when gases combine or are produced in a chemical reaction, they do so in a simple ratio by volume, provided all gases are at the same temperature and pressure. This is called Gay-Lussac's law of Gaseous volumes.

Example :- Hydrogen (10 mL) + Oxigen (5 mL) → Water (10 mL)

Avogadro's Law :- This law was proposed by Avogadro in the year 1811. According to this law, equal volumes of all gases at the same temperature and pressure should contain an equal number of molecules.

Teacher's Signature