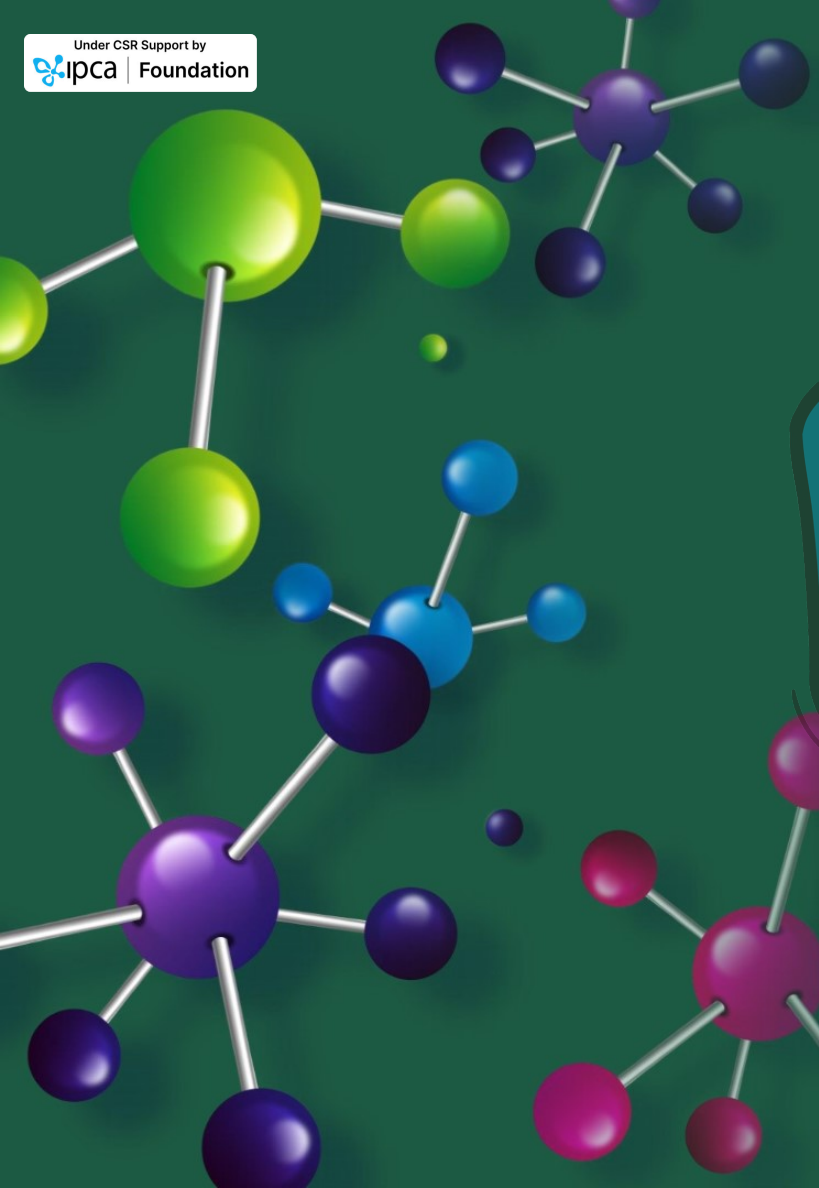
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Class–9

SCIENCE

Chapter – 3

ATOMS AND MOLECULES

Part – 1

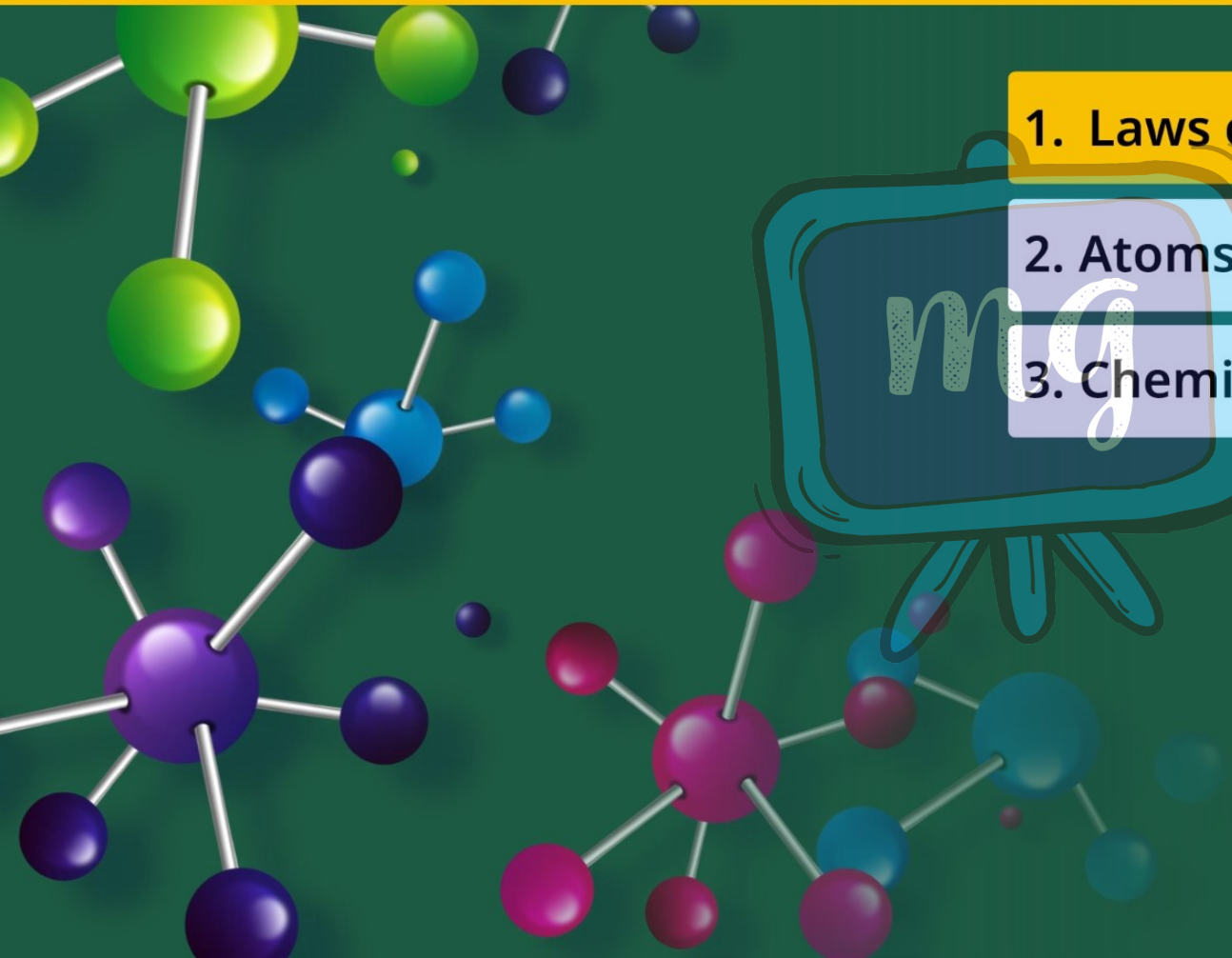
Laws of Chemical Combination

Deeksha Pahilajani

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OVERVIEW

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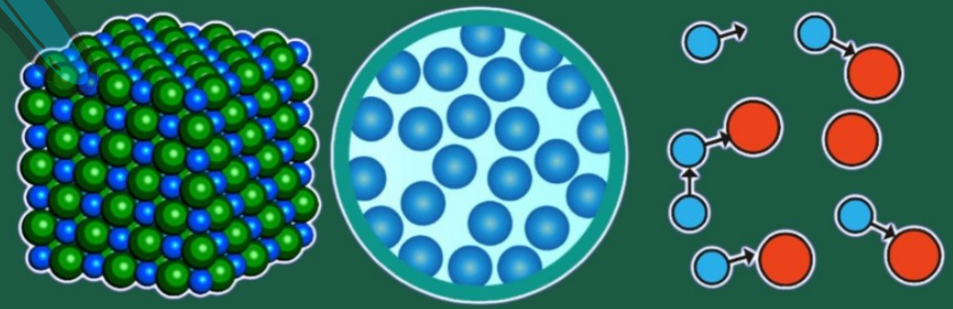
1. Laws of Chemical Combination
2. Atoms and Molecules
3. Chemical Formulae

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MATTER

- Matter is everything around us.
- Everything that has mass and takes up space or volume is matter.

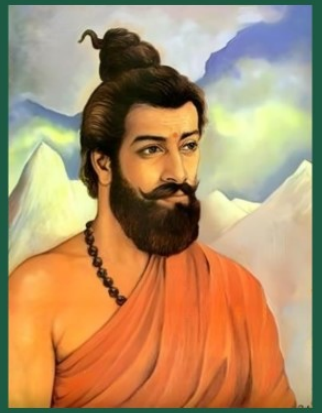


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INTRODUCTION

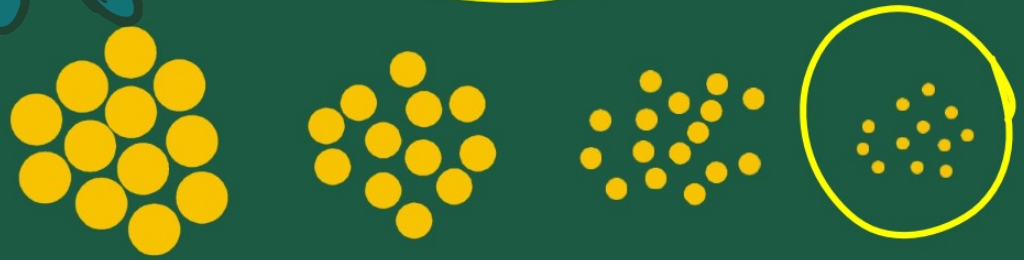
- The idea of divisibility of matter was considered long back in India by Indian philosopher Maharishi Kanad around 500 B.C.



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- He postulated that if we go on dividing matter(padarth), we will obtain smallest particle beyond which further division will not be possible. He named these particles 'parmanu'.



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- Ancient Greek philosophers-Leucippus and his pupil Democritus proposed that all matter was composed of small indivisible particles called atoms.



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WHAT IS A CHEMICAL REACTION?

- In a chemical reaction, one or more substances (reactants) change to form one or more new substances (products).

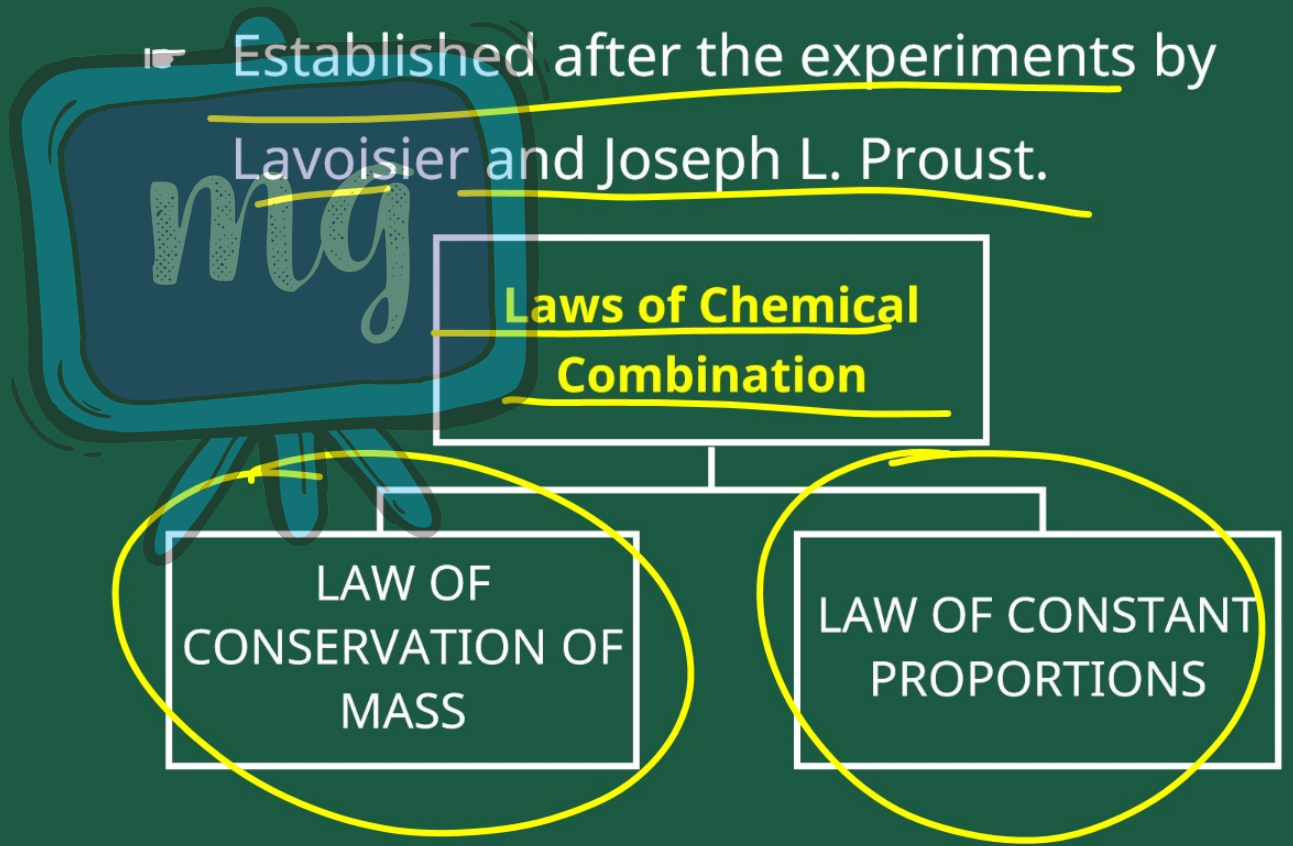


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Laws of Chemical Combination

☞ Established after the experiments by Lavoisier and Joseph L. Proust.



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Law of Conservation of Mass

- During a chemical reaction, the total mass of reactants will be equal to the total mass of the products.
- Mass can neither be created nor destroyed in a chemical reaction.

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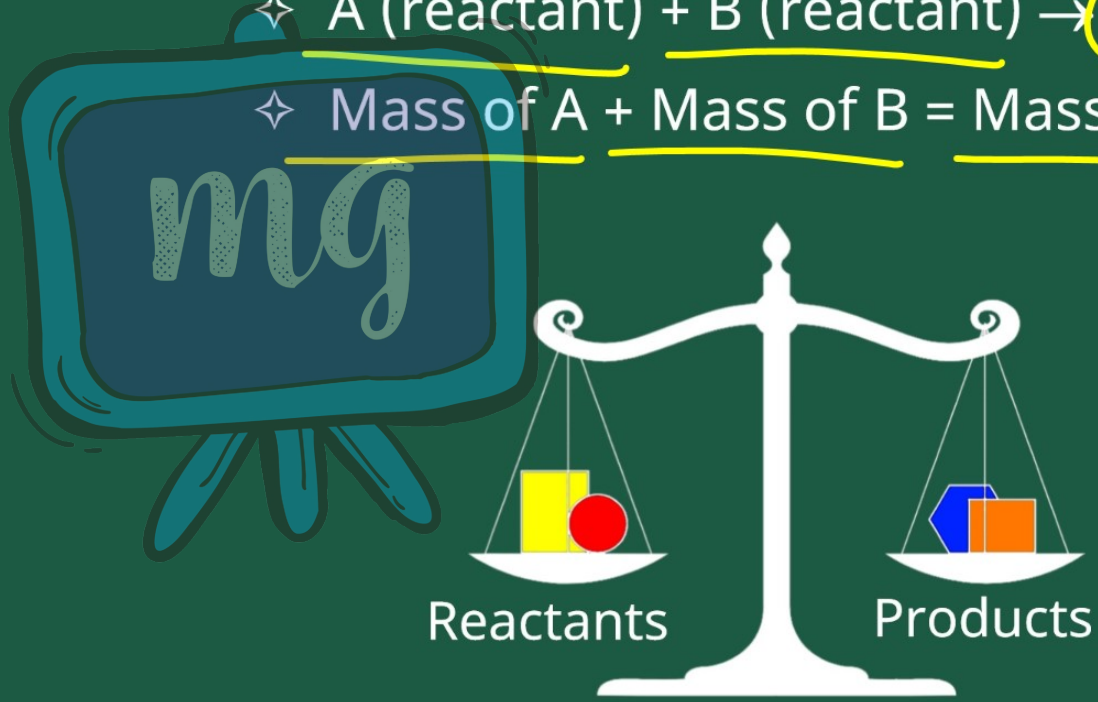
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A + D + E

☛ **Example :**

✧ A (reactant) + B (reactant) → AB

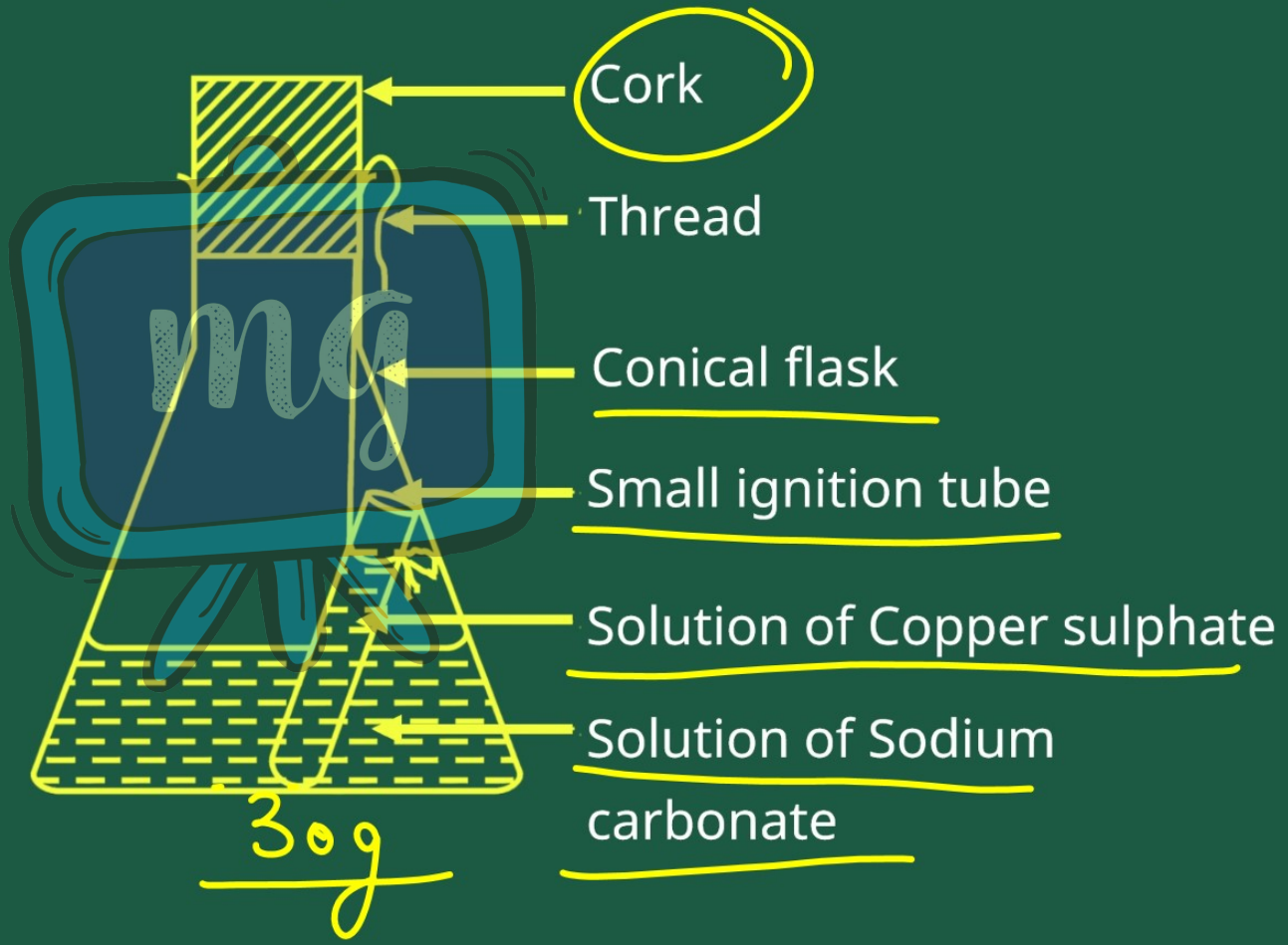
✧ Mass of A + Mass of B = Mass of AB



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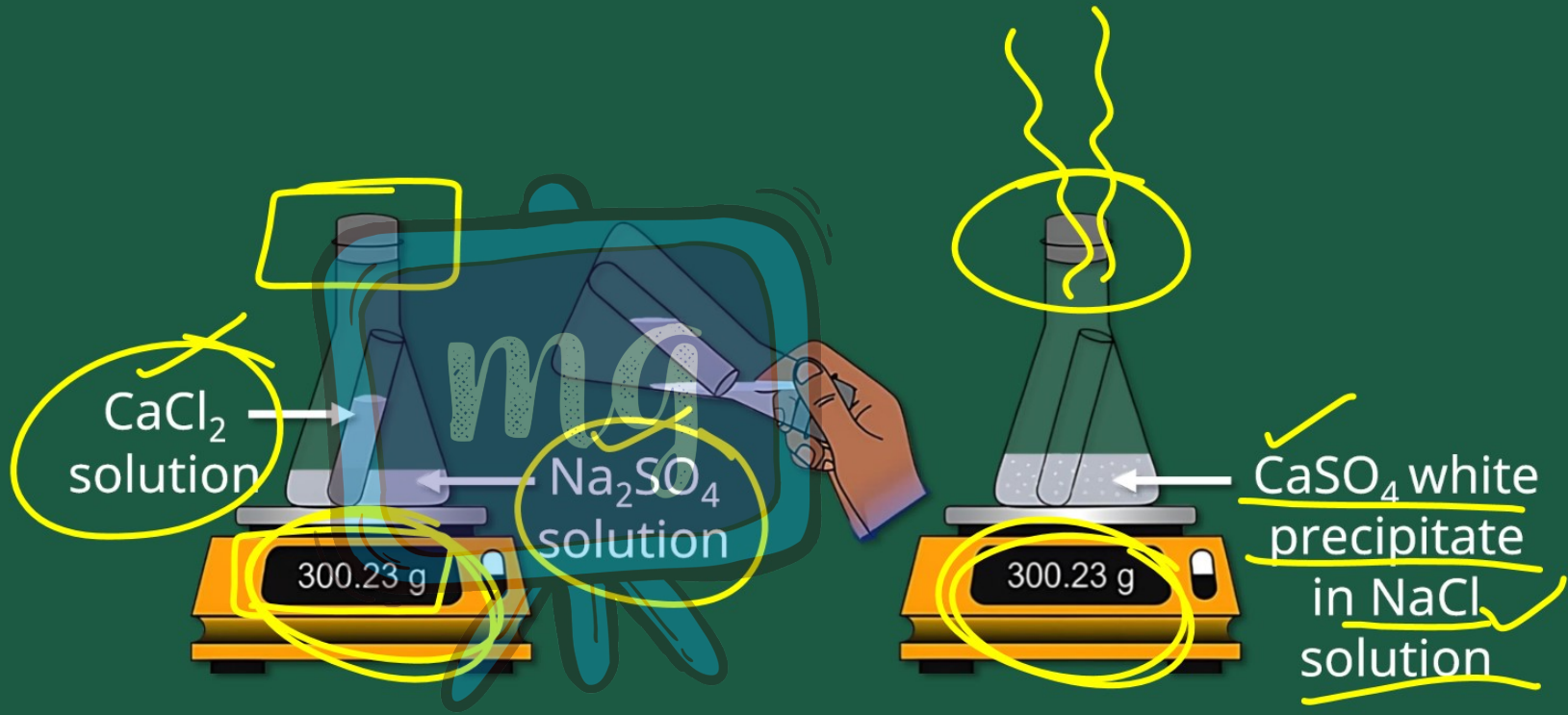
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☛ Experiment



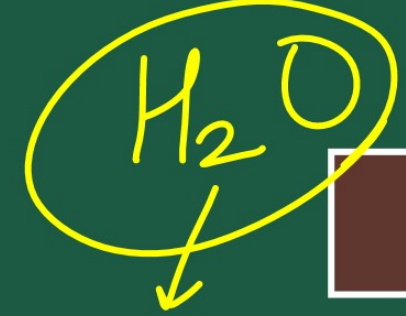
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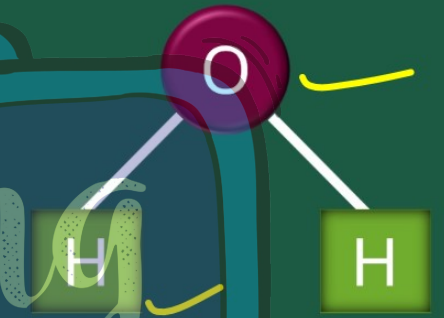
Law of Constant Proportions

- In a chemical substance (compound) the elements are always present in definite proportions by mass irrespective of their source.
- Composition of water molecule remains the same i.e. 2 hydrogen atoms and 1 oxygen atom (combined in a definite proportion).

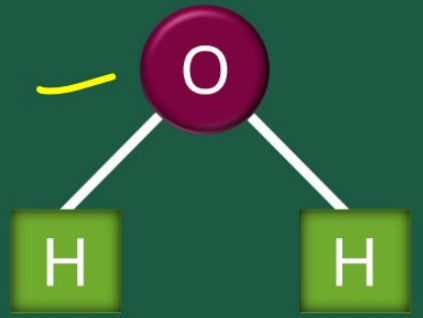
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H_2O (ocean water)



H_2O (tap water)



H_2O

$H = 1u$

$2H = 2u$

$O = 16u$

2 : 16

1 : 8

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H_2O 1 : 8

Ratio of masses :

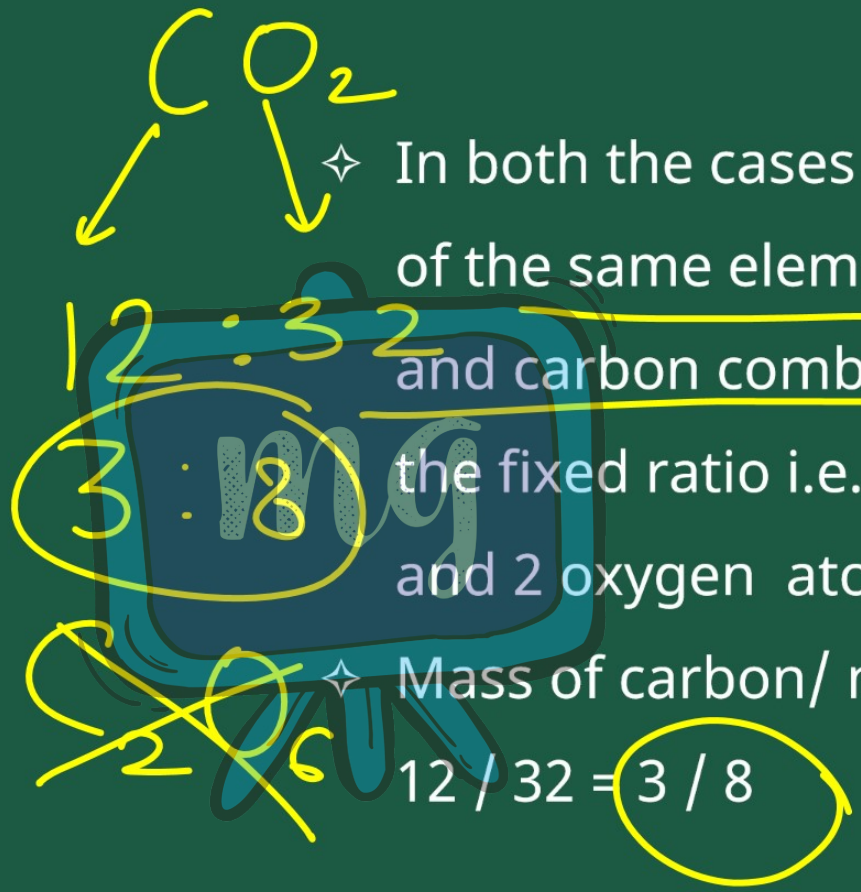
- Mass of H/ mass of O = 2/16 = 1/8
- The ratio is fixed for water - mass of hydrogen to the mass of oxygen is always 1 : 8
- Formation of carbon dioxide

$$C + O_2 \rightarrow CO_2 \quad \text{— (1)}$$

$$CaCO_3 \rightarrow CO_2 + CaO \quad \text{— (2)}$$

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- In both the cases CO_2 is made up of the same elements i.e., oxygen and carbon combined together in the fixed ratio i.e., 1 carbon atom and 2 oxygen atoms.
- Mass of carbon/ mass of oxygen = 12 / 32 = 3 / 8

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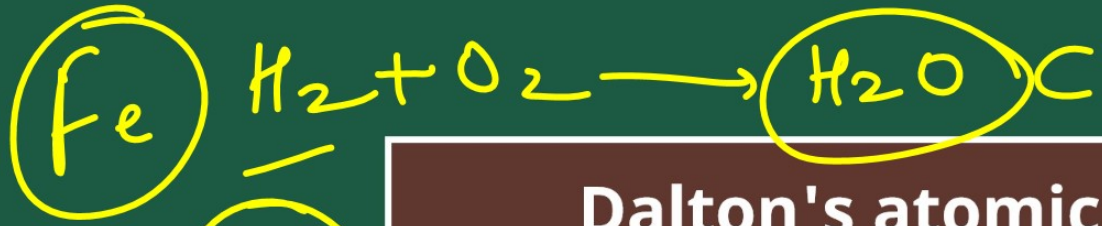
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DALTON'S ATOMIC THEORY

☞ British chemist John Dalton provided the basic theory of matter.



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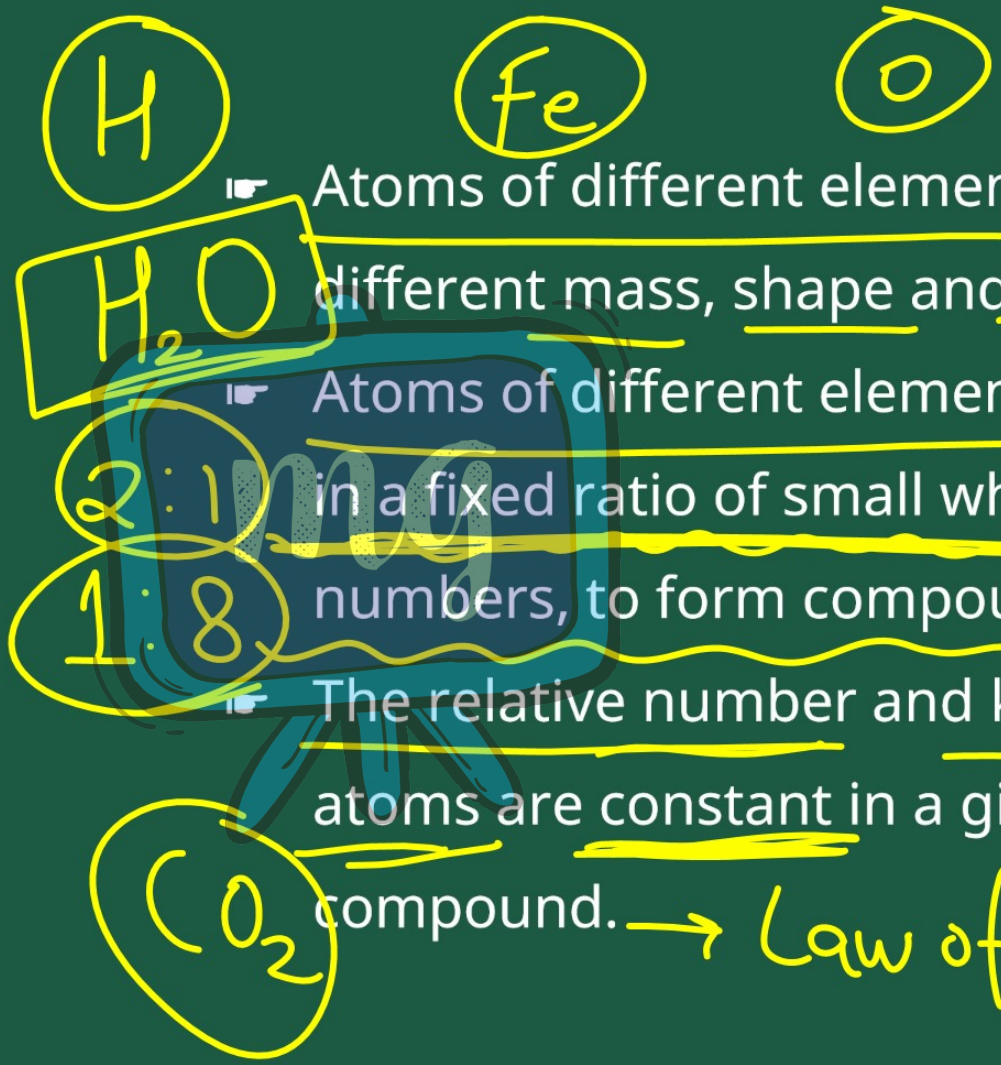
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Dalton's atomic theory

- Matter is made up of small indivisible particles, called atoms.
- Atoms can neither be created nor destroyed. → Law of cons. of mass
- Atoms of the same element are identical in all respects especially, size, shape and mass.

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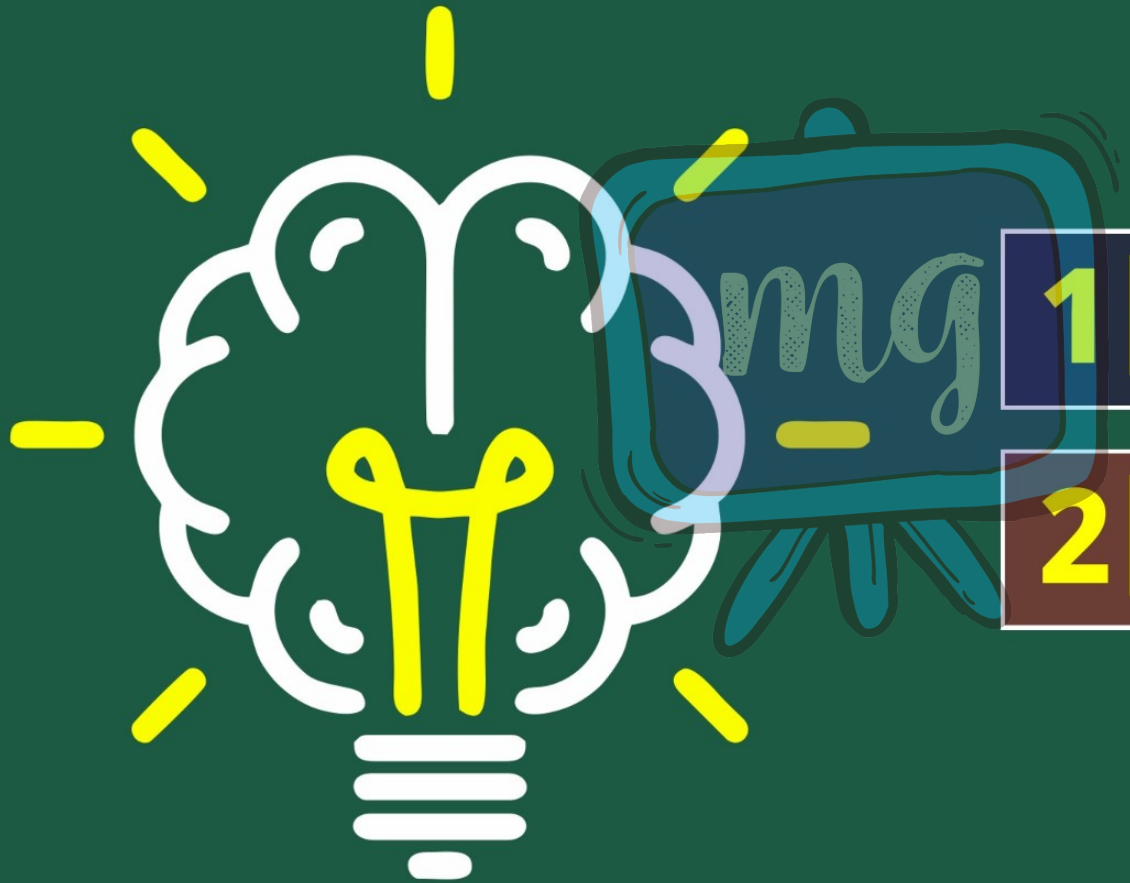


- Atoms of different elements have different mass, shape and size.
- Atoms of different elements combine in a fixed ratio of small whole numbers, to form compounds.
- The relative number and kinds of atoms are constant in a given compound. → Law of const. prop.

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LEARNING OUTCOMES

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1. Laws of chemical combination
2. Dalton's atomic theory

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ASSESSMENT

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1 | Which among the following is NOT a postulate of Dalton's atomic theory?

A. Atoms cannot be created or destroyed.

B. Atoms of different elements have different sizes, masses and chemical properties.

C. Atoms of same element are not identical.

D. Atoms of different elements combine in a fixed ratio of small whole numbers, to form molecules.

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ASSESSMENT

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2 A sample of ammonia, nitrogen and hydrogen are always present in the ratio of 14 : 3 by mass irrespective of the source from which it is obtained. This data supports:

A Law of Conservation of Mass

B Law of Multiple Proportions

C Law of Definite Proportions

D Avogadro's Law

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ASSESSMENT

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3 | 10 grams of reactant A reacts with 5 grams of reactant B. What will be the total mass of the products formed after the reaction?

A 5 grams

B 10 grams

C 50 grams

D 15 grams

10 + 5 = 15g