

SCIENCE • CLASS 9

CHAPTER 9

Atomic Foundations of Matter

NCERT SOLUTIONS



IS MASS REALLY LOST?

Pause and Ponder — Questions 1 and 2

Q1. A student burns 10 g of ethanol in an open beaker. No residue remains. Is the Law of Conservation of Mass violated? Explain.

Answer: No.

- Ethanol reacts with oxygen from the air.
- Carbon dioxide and water vapour escape into the surroundings. No residue does not mean no products.
- Count the oxygen taken in and the gases released, not just what remains in the beaker.

Total mass of reactants = Total mass of products

Q2. If 20 g of hydrogen reacts completely with 160 g of oxygen, what mass of water forms?

$$\text{Mass of water} = 20 \text{ g} + 160 \text{ g} = 180 \text{ g}$$

Answer: 180 g of water.

CALCULATING WITH MASS RATIOS

Pause and Ponder — Questions 3 and 4

Q3. A compound contains 40% sulfur and 60% oxygen by mass. What mass of oxygen combines with 20 g of sulfur?

Given mass ratio:

$$\text{Sulfur} : \text{Oxygen} = 40 : 60 = 2 : 3$$

$$\begin{aligned}\text{Mass of oxygen} &= 20 \text{ g} \times \left(\frac{60}{40}\right) \\ &= 30 \text{ g}\end{aligned}$$

Answer: 30 g of oxygen.

Q4. Carbon and oxygen combine in the mass ratio 3 : 4 in carbon monoxide. What mass of oxygen combines with 9 g of carbon?

$$\text{Carbon} : \text{Oxygen} = 3 : 4$$

$$\begin{aligned}\text{Mass of oxygen} &= 9 \text{ g} \times \left(\frac{4}{3}\right) \\ &= 12 \text{ g}\end{aligned}$$

Answer: 12 g of oxygen.

DO THE MASS RATIOS MATCH?

Pause and Ponder — Questions 5 and 6

Q5. Why does the Law of Definite Proportions apply to compounds but not mixtures?

Answer:

- In a pure compound, elements are chemically combined in a fixed mass ratio.
- In a mixture, substances are physically mixed and their amounts can vary.

So, a compound has fixed composition; a mixture need not.

Q6. Students X and Y find copper : oxygen mass ratios of 4 : 1 and 8 : 2 in copper oxide. Do these results support the law? Justify.

Answer: Yes. Both samples have the same mass ratio, so the results support the Law of Definite Proportions.

RATIO COMPARISON

<u>Student X:</u>		<u>Student Y:</u>
Cu : O = 4 : 1	=	Cu : O = 8 : 2
		= 4 : 1

Same mass ratio

DALTON: ATOM RATIO OR MASS RATIO?

Pause and Ponder — Question 7

Assertion (A):

2 g of hydrogen combines with 16 g of oxygen to form 18 g of water.

Reason (R):

According to Dalton, atoms combine in simple whole-number ratios by mass.

Question: Choose the correct assertion–reason option.

Options:

- (i) Both true; R explains A.
- (ii) Both true; R does not explain A.
- (iii) A is true; R is false.
- (iv) A is false; R is true.

Answer: (iii)

A is true: $2\text{ g} + 16\text{ g} = 18\text{ g}$.

R is false: Dalton's simple whole-number ratio refers to the NUMBER OF ATOMS, not their masses.

For water: 2 hydrogen atoms : 1 oxygen atom.



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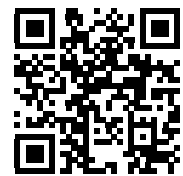


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