

2.2 Laws of Stoichiometry

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1. Law of conservation of mass

1. State the law of conservation of mass. 2
2. Why is the law of conservation of mass called the law of indestructibility of matter? 1
3. How does Dalton's atomic theory explain the law of conservation of mass? 2
4. 12g C reacts with 32g of O to produce 44g of CO₂. Which chemical law does this data illustrate? State the law.
5. 16g of methane can be produced by combining 12g of carbon with 4g of hydrogen. Which chemical law do these data illustrate? State the law. 2

2. Law of constant proportions (Definite proportions/ constant composition) Louis Prout (1799)

6. State the law of constant composition, giving a suitable example.
7. State the law of definite proportion and give an example to support this law. 2

3. Law of multiple proportions (John Dalton, 1803)

8. State the law of multiple proportions. 2
9. Phosphorus reacts with oxygen to produce P₂O₅ and P₂O₃, respectively. Which law of stoichiometry is illustrated? State the law. 2
10. H and O react separately to give H₂O₂ and H₂O, respectively. What law of stoichiometry is illustrated? State the law. 2
11. Two oxides of a metal contain 11.9% and 21.2% of oxygen by weight, respectively. Are these figures in agreement with the law of multiple proportions? How?
12. A metal X forms two oxides A and B. 3.00 g of A and B contain 0.702g and 1.16 g of oxygen, respectively. Calculate the masses of metals that combine with one gram of oxygen in each. What chemical law do these data illustrate? State the law. 2
13. How did the law of multiple proportions encourage Dalton to introduce an atomic theory? 2
14. State and explain the law of multiple proportions. A certain element X forms three different binary compounds, with chlorine containing 59.68%, 68.95% and 74.75% chlorine, respectively. Show how these data illustrate the law of multiple proportions. 5
15. The following composition of 4 hydrocarbons was observed in an experiment.

Hydrocarbon	Carbon	Hydrogen
A	75%	
B	80%	
C		14.3%
D	92.3%	7.7%

Show how these data illustrate the law of multiple proportions. 3

4. Law of Reciprocal Proportions/Equivalent Proportions Richter 1792

16. Why is the law of reciprocal proportions called the law of equivalent proportions? 2
17. State law of reciprocal (equivalent) proportions. 2
18. Nitrogen trioxide contains 63.15% of oxygen. Water contains 88.89% oxygen. Ammonia contains 17.65% hydrogen. Which law of stoichiometry is illustrated by these data?
19. CO₂ contains 27.27% of C, CS₂ contains 25.97% C, and SO₂ contains 50% S. How do these data illustrate the law of equivalent proportions?

20. Illustrate the law of reciprocal proportions from the composition of the following compounds.

Marsh gas	75% C and 25% H
Carbon monoxide	42.66% C and 57.34% O
Water	11.11 % H and 88.89% O

5. Gay Lussac Law of Gaseous Volume (Gay Lussac, 1805)

21. State Gay-Lussac's law of gaseous volume.

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22. One volume of hydrogen reacts with 1 volume of Cl_2 , giving two volumes of HCl gas. Which law of stoichiometry is illustrated? State the law.

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