



Dalton's Postulates

The Discovery of Atoms



Dalton's Experiment

Experiment 1

- 30 g of carbon are burned in the open air where there is plenty of oxygen. 110 g of a carbon oxide forms.

➤ How much oxygen combined with the carbon? **80 g**

Experiment 2

- 30 g of carbon are burned in a closed container under conditions of low oxygen. 70 g of a carbon oxide forms.

➤ How much oxygen combined with the carbon? **40 g**

What is the ratio of the masses of the oxygen combined with carbon in *Experiment 1* and *Experiment 2*? **$80\text{ g}/40\text{ g} = 2:1$**



Simulating Dalton's Experiment

Imagine you have two containers of nuts and bolts.

What does it mean if the mass of the bolts is the same in each container?

The number of bolts in each container is the same.

What assumptions did you make about the bolts to reach this conclusion?

The bolts are identical, and have the same mass.

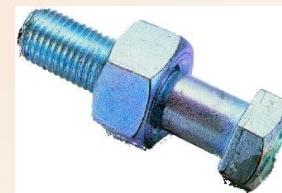
Container 1

- This is the arrangement of nuts and bolts found in *Container 1*.



Container 2

- This is the arrangement of nuts and bolts found in *Container 2*.



- How does the mass of the nuts in *Container 1* compare to the mass of the nuts in *Container 2*? **The mass is twice as much.**

- Why? **There are twice as many nuts in *Container 1***
- What assumptions did you make about the nuts to reach this conclusion? **The nuts are identical, and have the same mass.**

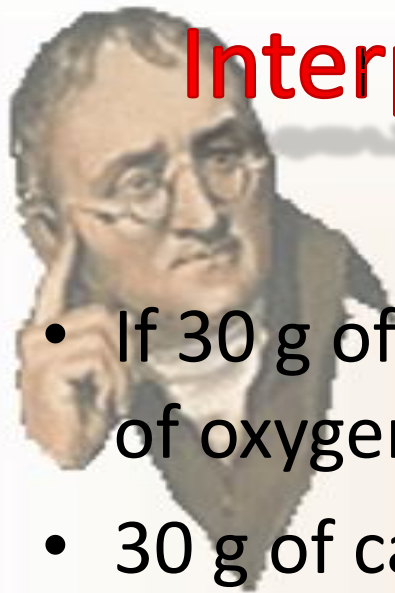


Interpreting Dalton's Experiment

- Make the same assumptions you did for “*nuts and bolts*” to interpret Dalton's results
 - If elements are made of separate particles or atoms; and
 - Atoms of an element are identical, having the same mass; then
 - Starting with the same mass of carbon means starting with the same number of atoms; while
 - Ending up with twice the mass of oxygen means using twice as many oxygen atoms.

(Continued)





Interpreting Dalton's Experiment (continued)

- If 30 g of carbon burn in the open air using 80 g of oxygen; and
- 30 g of carbon burn in a closed container using 40 g of oxygen; then
- In the first case, carbon dioxide (CO_2) forms; and
- In the second case, carbon monoxide (CO) forms.
- CO_2 has twice the mass of oxygen atoms as CO .

These results are quantitative evidence that atoms exist.





Dalton's Postulates

- Matter is made of small particles called atoms.
- Atoms are indestructible. They cannot be created or destroyed during chemical or physical changes.
- Atoms of an element are identical. They have the same mass.
- Atoms of different elements have different masses.
- Compounds are formed by combining atoms of different elements





Dalton's Model

The atom is a solid, indivisible sphere.

