LESSON MAKER PRO

Where Mass Goes

Track atoms and mass through chemical reactions

HIGH SCHOOL · CHE.6.4

CHE.6.4 "Use mathematics and computational analysis to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. Give real-world examples (e.g., burning wood)."

NAME _____ DATE _____

THE BIG IDEA

A chemical reaction rearranges atoms but does not create or destroy them. The total mass of the reactants equals the total mass of the products, even when a gas escapes and is hard to see.

WORKED EXAMPLE

In a sealed container, 56 g of iron reacts completely with 32 g of sulfur to make iron sulfide. Find the mass of iron sulfide.

1. Add the reactant masses: 56 g + 32 g = 88 g.
2. Set the product mass equal to the total reactant mass.

Answer: 88 g of iron sulfide

PRACTICE 6 problems

1 Carbon reacts completely with oxygen to form carbon dioxide. Find the mass of carbon dioxide made from 6 g of carbon and 16 g of oxygen.

ANSWER _____

2 When 20 g of calcium carbonate breaks down, it forms 11.2 g of calcium oxide and carbon dioxide. Find the mass of carbon dioxide.

ANSWER _____

3 Hydrogen and oxygen react to make 9 g of water. If 1 g of hydrogen reacts completely, find the mass of oxygen used.

ANSWER _____

4 A sample of 24 g of magnesium reacts completely with oxygen to make 40 g of magnesium oxide. Find the mass of oxygen used.

ANSWER _____

5 A sample of 45 g of water breaks down into 40 g of oxygen and hydrogen. Find the mass of hydrogen.

ANSWER _____

6 For the balanced reaction $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$, count the oxygen atoms on each side. Give the reactant count and the product count.

ANSWER _____

APPLY IT Show your work

1 In a sealed fire-test chamber, 15 g of wood burns using 25 g of oxygen. The products include 3 g of ash. Find the combined mass of the other products, including gases.

WORK SPACE

ANSWER _____

2 A camping stove burns 11 g of propane using 40 g of oxygen. The reaction produces 18 g of water and carbon dioxide. Find the mass of carbon dioxide.

WORK SPACE

ANSWER _____

CHALLENGE One step up

In a sealed chamber, 21 g of wood burns using 39 g of oxygen. The products are 4 g of ash, 14 g of liquid water, and gases. Calculate the mass of the gases. Then explain why the ash weighs less than the wood even though mass is conserved.

WORK SPACE AND ANSWER

Where Mass Goes

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Carbon reacts completely with oxygen to form carbon dioxide. Find the mass of carbon dioxide made from 6 g of carbon and 16 g of oxygen.	**22 g**
2	When 20 g of calcium carbonate breaks down, it forms 11.2 g of calcium oxide and carbon dioxide. Find the mass of carbon dioxide.	**8.8 g**
3	Hydrogen and oxygen react to make 9 g of water. If 1 g of hydrogen reacts completely, find the mass of oxygen used.	**8 g**
4	A sample of 24 g of magnesium reacts completely with oxygen to make 40 g of magnesium oxide. Find the mass of oxygen used.	**16 g**
5	A sample of 45 g of water breaks down into 40 g of oxygen and hydrogen. Find the mass of hydrogen.	**5 g**
6	For the balanced reaction $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$, count the oxygen atoms on each side. Give the reactant count and the product count.	**10 oxygen atoms on the reactant side; 10 oxygen atoms on the product side**

PART 2 · APPLY IT

1. **37 g** The reactants have a total mass of 15 g + 25 g = 40 g. Subtract the 3 g of ash to get 37 g of other products.
2. **33 g** The reactants total 51 g. Subtract 18 g of water to get 33 g of carbon dioxide.

CHALLENGE

The gases have a mass of 42 g because 21 g + 39 g - 4 g - 14 g = 42 g. The ash weighs less than the wood because atoms from the wood and oxygen are also in the water and gases.

Accept equivalent wording that correctly includes all products when accounting for mass. For the atom-count problem, students must give 10 oxygen atoms on each side.