LESSON MAKER PRO

Where Mass Goes

Track mass through balanced reactions

HIGH SCHOOL · PHS.4.4

PHS.4.4 "Use mathematical and computational analysis to examine evidence that mass is conserved in chemical reactions using simple stoichiometry problems (1:1 mole ratio) or atomic masses to demonstrate the conservation of mass with a balanced..."

NAME _____ DATE _____

MASS STAYS THE SAME

A balanced equation has the same number of each kind of atom on both sides. When reactants react fully, their total mass equals the total mass of the products. In a 1:1 mole reaction, one mole of each reactant pairs up.

WORKED EXAMPLE

Mg + S -> MgS. If 6 g Mg and 8 g S react fully, what mass of MgS forms?

REACTANTS

Substance	Mass	Molar mass
Mg	6 g	24 g/mol
S	8 g	32 g/mol

1. Mg: 6/24 = 0.25 mol.
2. S: 8/32 = 0.25 mol. The amounts match the 1:1 ratio.
3. Add the masses: 6 g + 8 g = 14 g.

Answer: 14 g MgS

PRACTICE 4 problems

1 S + O_2 -> SO_2. If 64 g S and 64 g O_2 react fully, what mass of SO_2 forms?

ANSWER _____

2 C + O_2 -> CO_2. How much O_2 reacts with 18 g C? Use C = 12 g/mol and O = 16 g/mol.

ANSWER _____

3 CaO + CO_2 -> $CaCO_3$. If 28 g CaO makes 50 g $CaCO_3$, how much CO_2 reacted?

ANSWER _____

4 H_2 + Cl_2 -> 2HCl. If 2 g H_2 and 71 g Cl_2 react fully, what mass of HCl forms?

ANSWER _____

APPLY IT Show your work

1 A carbon-capture demo uses limewater: $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$. If 37 g $Ca(OH)_2$ and 22 g CO_2 make 50 g $CaCO_3$, how much water forms?

WORK SPACE

ANSWER _____

2 Pure carbon in a pizza oven burns: $C + O_2 \rightarrow CO_2$. If 15 g C burns fully, how much O_2 reacts, and how much CO_2 forms? Use C = 12 g/mol and O = 16 g/mol.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A student says 35 g N_2 and 40 g O_2 make 30 g NO because 1 mol NO has a mass of 30 g. Use $N_2 + O_2 \rightarrow 2NO$ to correct the claim in two sentences. Assume both react fully.

WORK SPACE AND ANSWER

Where Mass Goes

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	$S + O_2 \rightarrow SO_2$. If 64 g S and 64 g O_2 react fully, what mass of SO_2 forms?	**128 g SO_2**
2	$C + O_2 \rightarrow CO_2$. How much O_2 reacts with 18 g C? Use C = 12 g/mol and O = 16 g/mol.	**48 g O_2**
3	$CaO + CO_2 \rightarrow CaCO_3$. If 28 g CaO makes 50 g $CaCO_3$, how much CO_2 reacted?	**22 g CO_2**
4	$H_2 + Cl_2 \rightarrow 2HCl$. If 2 g H_2 and 71 g Cl_2 react fully, what mass of HCl forms?	**73 g HCl**

PART 2 · APPLY IT

1. **9 g H_2O** The reactants total 59 g. Subtract 50 g $CaCO_3$ to get 9 g H_2O.
2. **40 g O_2; 55 g CO_2** The 1:1 mole ratio gives 15/12 x 32 = 40 g O_2. The product mass is 15 g + 40 g = 55 g.

CHALLENGE

The reactants total 75 g, so they make 75 g NO. The balanced equation makes two NO molecules for each N_2 and O_2 pair, not just one mole of NO.

Accept equivalent units and calculations. In the challenge, accept any two-sentence explanation that gives 75 g NO and uses the balanced equation or conservation of mass to reject 30 g.