Conservation of Mass

Aim

- describe what happens to the mass during a chemical change

Notes

Matter is neither created nor destroyed

★ During a chemical reaction the mass does not change

★ The equation shows conservation of mass

Example

★ $AgNO_3(aq) + NaCl(aq) \rightarrow NaNO_3(aq) + AgCl(s)$

Silver Nitrate **$AgNO_3$**			*Sodium Chloride* **NaCl**			*Sodium Nitrate* **$NaNO_3$**			*Silver Chloride* **AgCl**		
Ag =	1 × 108 =	108	Na =	1 × 23 =	23	Na =	1 × 23 =	23	Ag =	1 × 108 =	108
N =	1 × 14 =	14	Cl =	1 × 35 =	35	N =	1 × 14 =	14	Cl =	1 × 35 =	35
O =	3 × 16 =	48			58	O =	3 × 16 =	48			143
		170						85			

$AgNO_3(aq)$	+	$NaCl(aq)$	→	$NaNO_3(aq)$	+	$AgCl(s)$
170	+	58	=	85	+	143
		228		=		228

Balancing the equation to show conservation of mass

★ Example

☆ The following equation does *not* show conservation of mass

$$H_2 + O_2 \rightarrow H_2O$$
$$2 + 32 \neq 18$$

☆ *but* starting with two molecules of hydrogen, as shown below by writing a **coefficient** 2 in front of the hydrogen and forming two molecules of water as shown below by writing a **coefficient** 2 in front of the water shows conservation

$$2H_2 + O_2 \rightarrow 2H_2O$$
$$2(2) + 32 = 2(18)$$
$$36 = 36$$

☆ Coefficients are used to **balance** equations

- ★ coefficients make the number of atoms of each type the same on the reactant and product side
- ★ coefficients make the mass the same on the reactant and product side of the equation

Answer the questions below by circling the number of the correct response

1. If 46 g of ***X*** combines with 16 g of ***Y*** to form ***Z***, how much ***Z*** is formed? (1) 30 g (2) 2.9 g (3) 724 g (4) 62 g

2. The formula mass of sulfuric acid (H_2SO_4) is (1) 194 amu, (2) 98 amu, (3) 50 amu, (4) 192 amu

3. Which of the following equations does *NOT* show conservation of mass? (1) $C + O_2 \rightarrow CO_2$ (2) $Mg + S \rightarrow MgS$ (3) $H_2 + S \rightarrow H_2S$ (4) $H_2 + O_2 \rightarrow H_2O$

4. If 6 g of hydrogen burns to produce 54 g of water, how much oxygen was used? (1) 48 g (2) 60 g (3) 9 g (4) 324 g

5. During a chemical change, the total mass (1) increases, (2) decreases, (3) remains the same.

6. Which of the following is ***NOT*** a balanced equation?
   (1) $Cu + 2AgNO_3 \rightarrow 2Ag + Cu(NO_3)_2$
   (2) $3BaCl_2 + Fe_2(SO_4)_3 \rightarrow 2FeCl_3 + 3BaSO_4$
   (3) $4Na + 2H_2O \rightarrow 4NaOH + H_2$
   (4) $2KClO_3 \rightarrow 2KCl + 3O_2$

Balance each of the equations below and write the *SUM* of the coefficients in the appropriate place on the answer sheet.

7. $Al + HCl \rightarrow AlCl_3 + H_2$

8. $Li + H_2O \rightarrow LiOH + H_2$

9. $H_2 + N_2 \rightarrow NH_3$

10. In the equation $4Al + 3O_2 \rightarrow 2Al_2O_3$, the number 4 is a (1) subscript, (2) oxidation state, (3) formula mass, (4) coefficient.

11. When the equation $H2 + N_2 \rightarrow NH_3$ is completely balanced using smallest whole numbers, the sum of all the coefficients will be (1) 6 (2) 7 (3) 3 (4) 12

12. When the equation $H_2 + Fe_3O_4 \rightarrow Fe + H_2O$ is completely balanced using *smallest* whole numbers the coefficient of H_2 would be (1) 1 (2) 2 (3) 3 (4) 4

13. When the equation $C_2H_4 + O_2 \rightarrow CO_2 + H_2O$ is correctly balanced, using *smallest* whole-numbered coefficients, the sum of all the coefficients is (1) 16 (2) 12 (3) 8 (4) 4

14. When the equation $NH_3 + O_2 \rightarrow HNO_3 + H_2O$ is completely balanced using smallest whole numbers, the coefficient of O_2 would be (1) 1 (2) 2 (3) 3 (4) 4

15. When the equation $C_2H_4 + O_2 \rightarrow CO_2 + H_2O$ is balanced using smallest whole numbers, what is the coefficient of the O_2? (1) 1 (2) 2 (3) 3 (4) 4

16. When the equation $Na(s) + H_2O(\ell) \rightarrow NaOH(aq) + H_2(g)$ is correctly balanced using smallest whole numbers, the coefficient of the water is (1) 1 (2) 2 (3) 3 (4) 4

17. When the equation $Al(s) + O_2(g) \rightarrow Al_2O_3(s)$ is correctly balanced using the smallest whole numbers, the coefficient of Al(s) is (1) 1 (2) 2 (3) 3 (4) 4