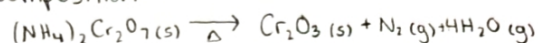
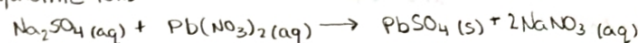


Writing and Balancing (by Inspection) Chemical Equations

Decomposition



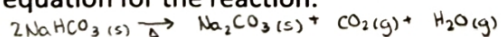
Polyatomic ions



Decomposition of $NaHCO_3(s)$

A 1.00 g sample of $NaHCO_3(s)$ is to be heated in an open container. It decomposes to form $Na_2CO_3(s)$, $H_2O(g)$ and $CO_2(g)$.

- a. Write the balanced, completely annotated chemical equation for the reaction.



- b. What should be the mass lost after 1.00 g of $NaHCO_3(s)$ is completely decomposed?

- i. Find moles of $NaHCO_3(s)$ (84.01 g/mol) present initially

$$1g \cdot \frac{1 \text{ mol}}{84.01 g} = 0.0119 \text{ mol}$$

Decomposition of NaHCO_3 (s)

- ii. Find moles of CO_2 (g) produced.

$$0.0119 \text{ mol} \cdot \frac{1 \text{ CO}_2}{2 \text{ NaHCO}_3} = 0.005952 \text{ mol}$$
- iii. Find moles H_2O (g) produced.

$$0.0119 \text{ mol} \cdot \frac{1 \text{ H}_2\text{O}}{2 \text{ NaHCO}_3} = 0.005952 \text{ mol}$$
- iv. Find mass (g) of CO_2 (g) (44.01 g/mol) produced.

$$0.005952 \text{ mol} \cdot \frac{44.01 \text{ g}}{1 \text{ mol}} = 0.2619 \text{ g}$$
- v. Find mass (g) H_2O (g) (18.01 g/mol) produced.

$$0.005952 \text{ mol} \cdot \frac{18.01 \text{ g}}{1 \text{ mol}} = 0.1072 \text{ g}$$
- vi. Total mass lost =

$$0.2619 + 0.1072 = 0.3691 \text{ g}$$

Decomposition of NaHCO_3 (s)

A sample containing NaHCO_3 (s) was heated in an open container. The mass lost from the system was 0.30 g. Calculate the mass of NaHCO_3 (s) that decomposed.

- a. Relate mass to moles.

$$0.30 \text{ g} = \text{mol CO}_2 \cdot \frac{44.01 \text{ g}}{1 \text{ mol}} + \text{mol H}_2\text{O} \cdot \frac{18.01 \text{ g}}{1 \text{ mol}} = x(44.01 + 18.01)$$
- b. Calculate the number of moles of CO_2 (g) and H_2O (g) produced.

$$x = \frac{0.3}{44.01 + 18.01} = 0.004837 \text{ mol}$$
- c. Calculate the mass (g) of NaHCO_3 (s) that reacted.

$$0.004837 \cdot \frac{2 \text{ NaHCO}_3}{1 \text{ CO}_2} \cdot \frac{84.01 \text{ g}}{1 \text{ mol}} = 0.8127 \text{ g}$$