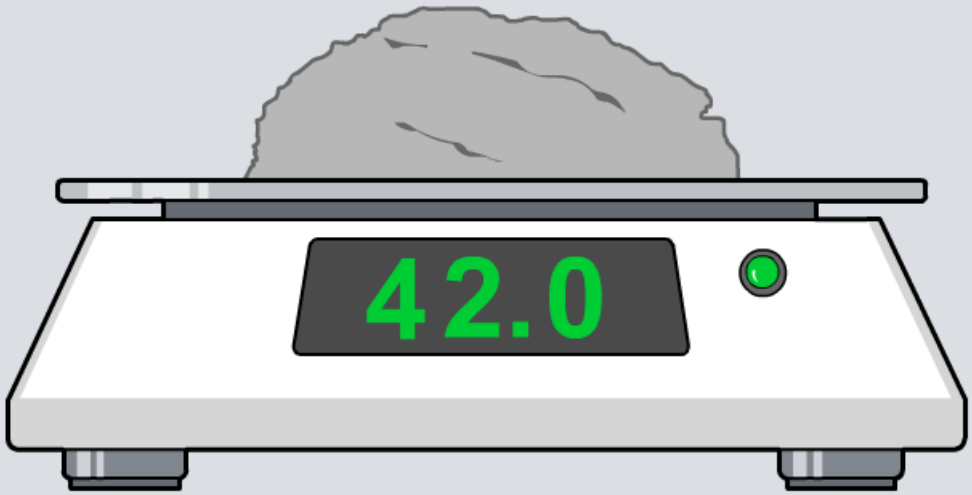
Reacting Masses



Introduction to reacting masses

My asthma inhaler uses a chemical called salbutamol. Millions of people have asthma, so how do manufacturers work out how to make enough salbutamol?

Many useful substances are made by chemical reactions. Scientists decide how much product they want to make and then figure out the amount of reactants needed.

The first step is to write a **balanced symbol equation** for the reaction.

Symbol equations – balanced or not?

Are these symbol equations balanced or not balanced?

balanced	not balanced

$K + O_2 \rightarrow K_2O$

solve

Balancing symbol equations

Why are balanced equations useful?

The balanced equation for a chemical reaction shows the **ratio of reactants and products** involved.

magnesium + oxygen → magnesium oxide

$$2Mg + O_2 \rightarrow 2MgO$$

The balanced equation for this chemical reaction shows that the ratio of **Mg : O_2 : MgO** is **2 : 1 : 2**.

This ratio can be used to calculate the masses of reactants needed and the mass of product that will be made.

These amounts are called the **relative reacting masses**.

Using reacting masses – example 1

If you have 48 grams of magnesium, what mass of oxygen will react with this?

magnesium + oxygen → magnesium oxide

$$2Mg + O_2 \rightarrow 2MgO$$

- The balanced equation shows the ratio of **Mg : O_2** is **2 : 1**.
- The relative atomic mass of **Mg = 24** and the relative formula mass of **O_2 = 32**.
- Combining these two sets of information gives the ratio of reacting masses.
  Mg : O_2 = (2 x 24) : (1 x 32) = 48 g : 32 g

So, 48 g of magnesium will react with 32 g of oxygen.

Using reacting masses – example 2

If you have 48 grams of magnesium, what mass of magnesium oxide will be produced?

magnesium + oxygen → magnesium oxide

$$2Mg + O_2 \rightarrow 2MgO$$

- This equation shows the ratio of **Mg : MgO** is **2:2**.
- The relative atomic mass of **Mg = 24** and the relative formula mass of **MgO = 24 + 16 = 40**.
- Combining these two sets of information gives the ratio of reacting masses.
  Mg : MgO = (2 x 24) : (2 x 40) = 48 g : 80 g

So, 48 g of magnesium will produce 80 g of magnesium oxide.

Reacting masses

What are the masses involved in these reactions?

Balanced equations, relative atomic masses and relative formula masses are used to calculate the ratio of reacting masses.

Remember to include the **ratio of reactants and products** from the balanced equation in your calculations.

Click "**start**" to begin.

start

Using reacting masses – example 3

If you have 480 grams of magnesium, what mass of magnesium oxide will be produced?

magnesium + oxygen → magnesium oxide

$$2Mg + O_2 \rightarrow 2MgO$$

- From previous calculations, the ratio of reacting masses for **Mg : MgO = (2 x 24) : (2 x 40) = 48 g : 80 g**.
- Starting with 480 g of magnesium means you have to figure out the scale factor for the ratio of reacting masses. **scale factor = 480 g ÷ 48 g = 10**
- Applying this scale factor to the amount of magnesium oxide in the ratio of reacting masses gives the answer. **mass of MgO to be produced = 80 g x 10 = 800g**

What are the rules for reacting masses?

The rules for finding **reacting masses** are:

- **Step 1**. Write down the balanced symbol equation.
- **Step 2**. Write down the relative atomic/formula masses of the reactants and products.
- **Step 3**. Use the balanced equation to write down the ratios of reactants and products.
- **Step 4.** Convert to ratio of reacting masses.
- **Step 5**. Calculate the scale factor and apply this to the ratio of reacting masses.

Reacting masses – example 4

If 28 g of iron reacts with copper sulphate solution, what mass of copper will be made?

- **Step 1**. Write down the balanced symbol equation.

$$Fe + CuSO_4 \rightarrow Cu + FeSO_4$$

- **Step 2**. Write down the relative atomic/formula masses.

Fe = 56 **Cu = 64**

- **Step 3**. Write down the ratio of reactants and products.

Fe : Cu = 1 : 1

- **Step 4.** Convert to ratio of reacting masses.

Fe : Cu = 1 : 1 = 56 g : 64 g

- **Step 5**. Calculate the scale factor and apply this to the ratio of reacting masses.

scale factor = 38 g / 56 g = 0.5

mass of Cu made = 64 g x 0.5 = 32 g

Reacting masses and scale factors

What are the masses involved in these reactions?

Balanced equations, relative atomic masses and relative formula masses are used to calculate the ratio of reacting masses.

Remember to calculate the **scale factor** and apply this to the ratio of reacting masses in your calculations.

Click "**start**" to begin.

start