

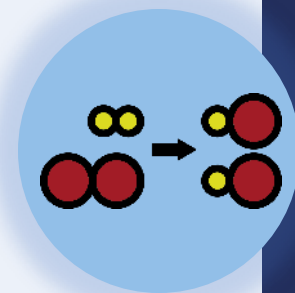
# Conservation of Mass

Answer the questions below.

1. What is the ratio of nitrogen to hydrogen in  $\text{NH}_3$ ?  
**1 nitrogen: 3 hydrogen or 1:3**
2. What is meant by the law of conservation of mass?  
**The mass of reactants = mass of products in any chemical reaction.**
3. Describe the following equation in words ( $\text{MgO}$  is magnesium oxide).  
$$2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$$

**Magnesium reacts with oxygen gas to form magnesium oxide**

4. State the  $A_r$  of silicon.  
**28**
5. Calculate the relative formula mass of  $\text{LiF}$  (Lithium fluoride)  
**26**



# Conservation of Mass

C3.2.4

Science  
**Mastery**



C3.2.1 Prior Knowledge Review

C3.2.2 Relative Formula Mass

C3.2.3 Percentage by Mass

➤ **C3.2.4 Conservation of Mass**

C3.2.5 Balancing Equations

C3.2.6 Uncertainty

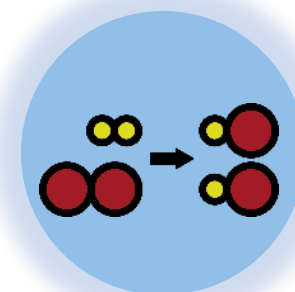
C3.2.7 Introducing Concentration

C3.2.8 Concentration Calculations

C3.2.9 Soluble Salts

C3.2.10 Making Soluble Salts

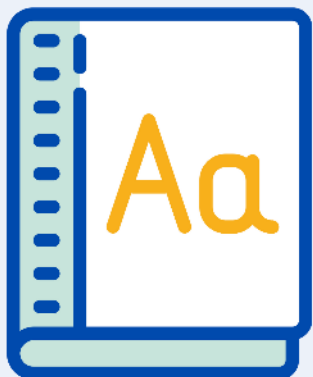
C3.2.11 Making Soluble Salts 2



## Following this lesson, students will be able to:

- Recognise state symbols.
- State the law of conservation of mass.
- Explain why the overall mass of a reaction sometimes appears to change.

## Key Words:



**products**

**balanced equation**

**conservation of mass**

**reactants**

# This is the fix-it portion of the lesson

The **fix-it** is an opportunity to respond to gaps in knowledge, especially those identified by the previous lesson's exit ticket.

- The teacher should customise this slide as needed, to facilitate
  - **reteach, explanation, demonstration** or **modelling** of ideas and concepts that students have not yet grasped or have misunderstood.
  - **practise** answering specific questions or of key skills.
  - **redrafting** or **improving** previous work.

Answer the questions below.

1. What is the relative formula mass for  $\text{NH}_3$ ? ( $A_r$ : N = 14; H = 1)
  - ☒ A. 17
  - ☐ B. 15
  - ☐ C. 45
2. Calculate the percentage by mass of carbon in  $\text{C}_2\text{H}_4$ .
  - ☐ A. 28%
  - ☒ B. 85.7%
  - ☐ C. 42.8%
3. Calculate the percentage by mass of carbon in carbon monoxide (CO).
  - ☐ A. 18%
  - ☒ B. 43%
  - ☐ C. 0.43%

Exit ticket

# State Symbols

State symbols give more information about the **state** of reactants and products in a chemical equation.

(s) = solid

(l) = liquid

(g) = gas

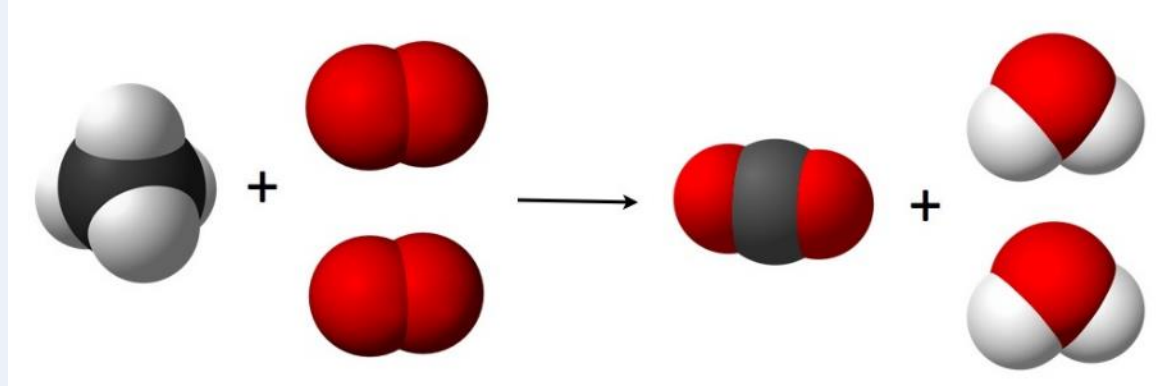
(aq) = aqueous (dissolved in water)

State symbols are always written **subscript**



# Conservation of Mass

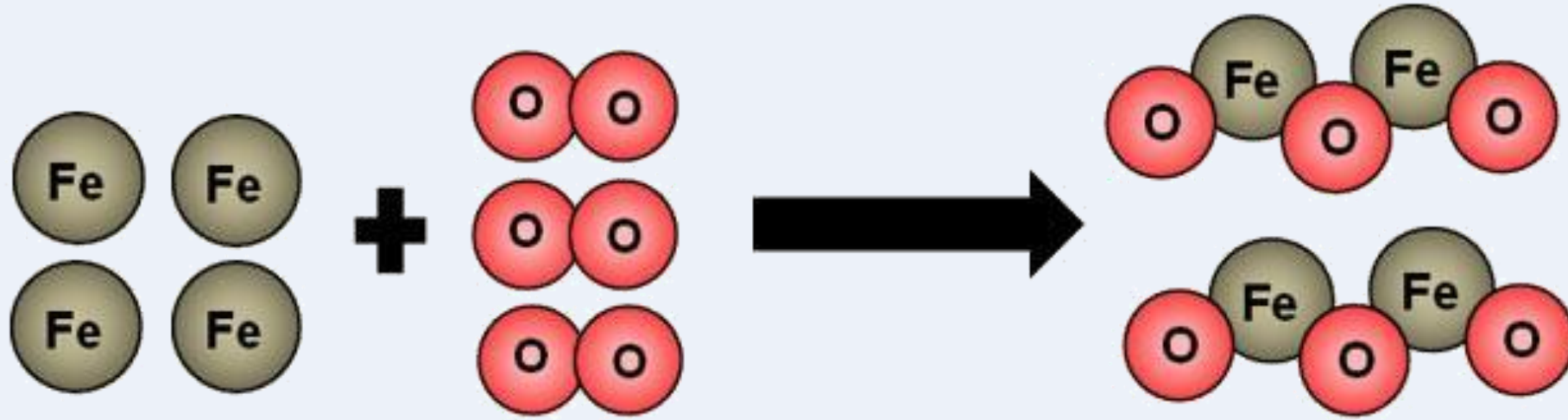
The **law of conservation of mass** states that matter cannot be created or destroyed, only transferred from one form to another.



Example sentences

1. There are the same number of each type of atom at the end of a reaction as there were at the start because of the law of conservation of mass.
2. The law of conservation of mass means that if you have 20 grams of reactants then you will have 20 grams of products.
3. Conserving mass means understanding that it cannot be created or destroyed.

Does this diagram agree with the law of conservation of mass?



This diagram does agree with the law of conservation of mass because

**What is the law of conservation of mass?**

- ☐ A. Atoms cannot be destroyed, just created
- ☐ B. Atoms can be made from one form into another
- ☒ C. Atoms cannot be created or destroyed, just changed from one form to another.

# Does mass change when chemicals react?



What will happen to the mass on the balance during the reaction?

**The mass on the balance will decrease.**

But, **no atoms are lost or made** during a chemical reaction. So why has the mass decreased?

- **Hydrogen gas is being produced.**
- **The hydrogen gas will move out of the flask.**
- **The decrease in mass on the balance will equal the mass of H<sub>2</sub> gas.**

So, **mass of products = mass of reactants**

This is why chemical reactions are represented by **symbol equations** which are **balanced** in terms of the **number of atoms of each element**.

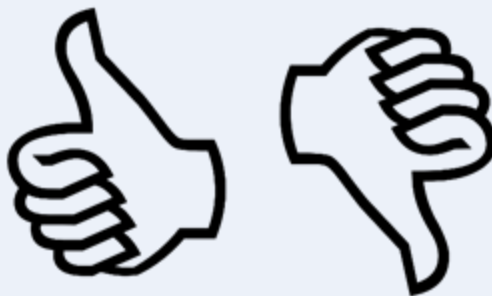




## Fill in the blanks to show the meaning of the state symbols

State symbol	Meaning	Example
(g)	gas	H <sub>2</sub>
(l)	liquid	H <sub>2</sub> O
(s)	solid	Mg
(aq)	Aqueous (dissolved in water)	CuSO <sub>4</sub>

## True or false?

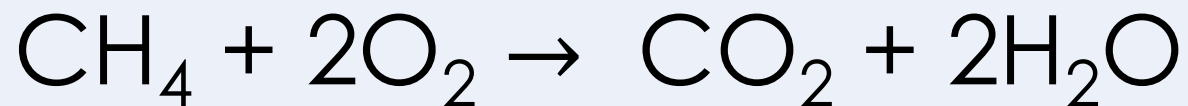
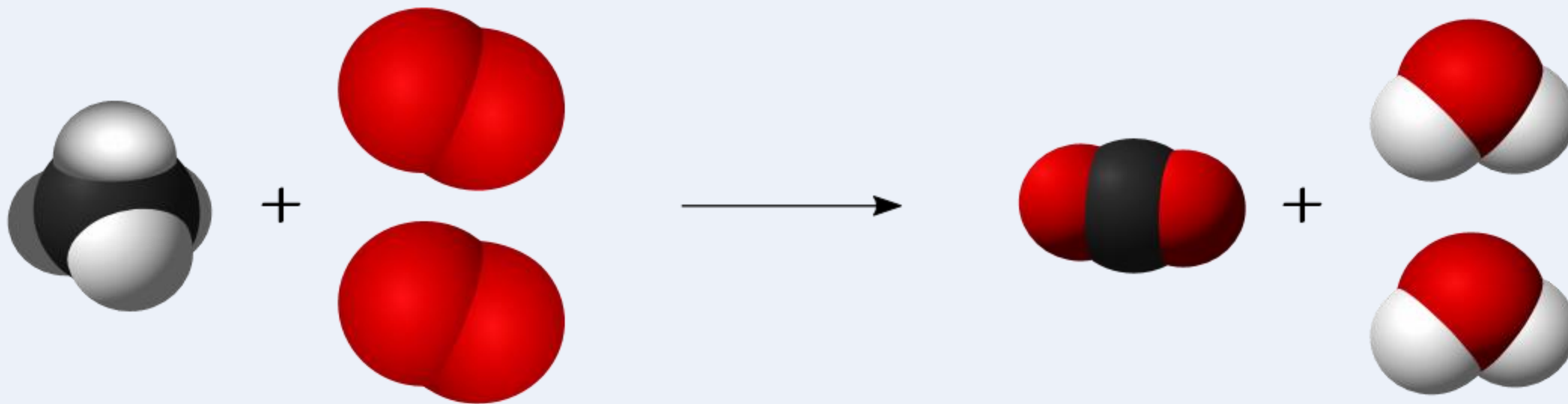


True

False

1. During a chemical reaction the atoms are rearranged. **True**
2. The mass of an ice cube decreases when it melts. **False**
3.  $2\text{Al}_{(s)} + 3\text{Cl}_{2(g)} \rightarrow 2\text{AlCl}_{3(s)}$  is a balanced equation. **True**
4. Gases have no mass. **False**
5. Mass is always conserved in chemical reactions. **True**

What is being shown in this image?



**Words to use:** conservation, atoms, molecule, two, reactants, products

# Drill

1. What is the state symbol for gas?
2. What is the state symbol for liquid?
3. What is the state symbol for solid?
4. What is the state symbol for aqueous?
5. What does aqueous mean?
6. Where must you position the state symbol when writing chemical formulae?
7. What is the law of conservation of mass?
8. If I use 400 g of cake ingredients, mix them and they then undergo a chemical reaction in the oven, what will the mass of the cake be?
9. If 100 g of  $\text{CaCO}_3$  is heated in the chemical reaction below, 66 g of  $\text{CaO}$  is produced. What mass of  $\text{CO}_2$  will be produced?
10. If the same reaction was done on a mass balance, it would show 66 g. Why?

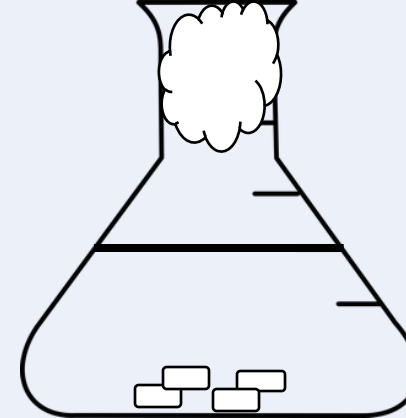


# Drill answers

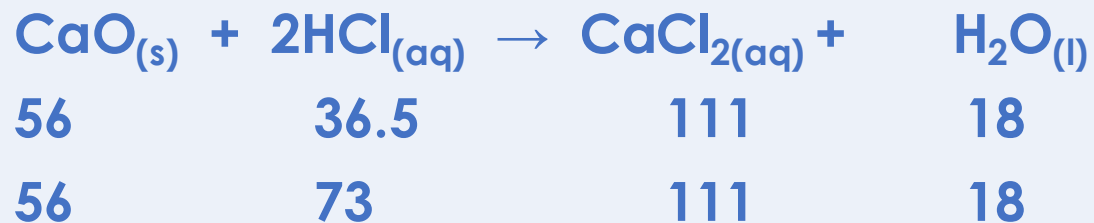
1. (g)
2. (l)
3. (s)
4. (aq)
5. Dissolved in water
6. Subscript, after the chemical formula
7. Matter cannot be created nor destroyed, only transformed from one to another
8. 400g
9. 44g
10.  $\text{CO}_2$  is a gas and it escaped from the container

# I: Conservation of mass

**56g of calcium oxide reacts with 73g of hydrochloric acid.**



1. What is the word equation for this reaction?  
**Calcium oxide + hydrochloric acid → calcium chloride + water**
2. The formula for calcium chloride is  $\text{CaCl}_2$ . What is the balanced symbol equation for this reaction? Include state symbols
3. What are the relative formula masses for each reactant and product? Write these below the symbol equation.
4. Now write the mass for each substance below the symbol equation



# We: Conservation of mass

**4.8g of Magnesium reacts with oxygen, producing 8g of Magnesium oxide (MgO).**

What is the word equation for this reaction?

**Magnesium + oxygen → Magnesium oxide**

1. What is the balanced symbol equation for this reaction? Include state symbols
2. What are the relative formula masses for each reactant and product? Write these below the symbol equation.
3. Now write the mass for each substance below the symbol equation
4. Why is the mass of oxygen 3.2 g?



<b>24</b>	<b>32</b>	<b>40</b>
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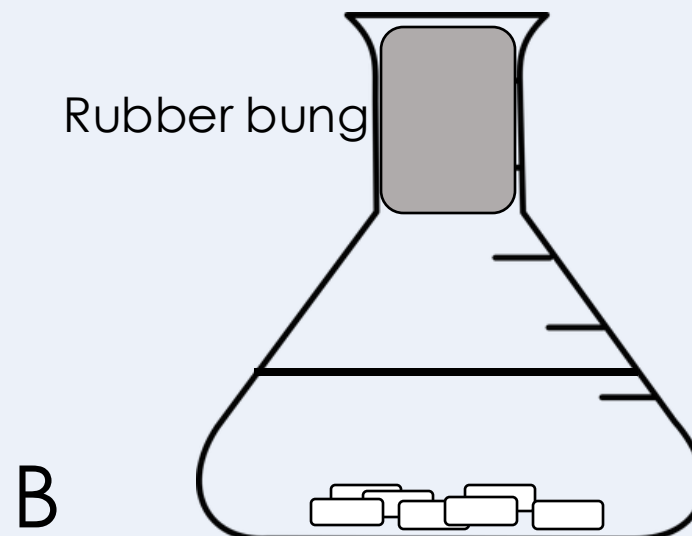
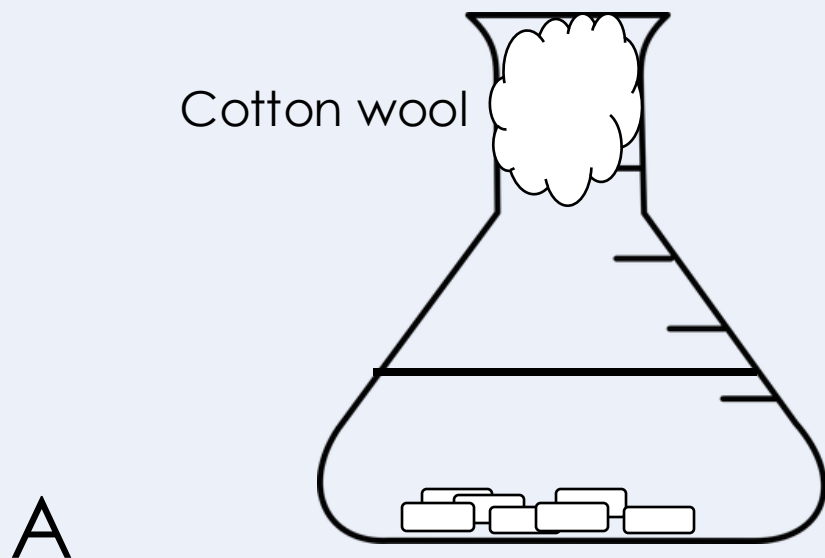
<b>4.8</b>	<b>3.2</b>	<b>8.0</b>
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The mass of the reactants = Mass of the products.  $4.8 + 3.2 = 8.0$

## You: Conservation of mass

There is a gas involved in the reaction below, which apparatus can prove the law of conservation of mass?

Explain your answer.



B is better because the bung will prevent any gases from escaping and so you can find the mass of them. The cotton wool will allow gases to escape because the gas particles are so small they can make their way through the cotton wool.



## Answer the questions below.

1. If 3 g of copper oxide and 2 g of carbon dioxide were produced, how many grams of copper carbonate was broken down?



- ☐ A. 1 g
- ☐ B. 6 g
- ☒ C. 5 g

2. When copper carbonate is heated, the mass recorded on a balance decreases. Which of the following is **false**?

- ☒ A. The loss in mass is due to a change in state.
- ☐ B. The loss in mass is due to a formation of gas.
- ☐ C. The mass of products equals the mass of reactants.

3. Which of the following is **correctly balanced**?

- ☐ A.  $2\text{P} + 5\text{O}_2 \rightarrow 2\text{P}_2\text{O}_5$
- ☐ B.  $2\text{P} + 5\text{O}_2 \rightarrow \text{P}_2\text{O}_5$
- ☒ C.  $4\text{P} + 5\text{O}_2 \rightarrow 2\text{P}_2\text{O}_5$

## Lesson C3.2.4

What was good about this lesson?

What can we do to improve this lesson?

[Send us your feedback by clicking this link](#)  
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Thank you!