11–14 years

Heating chocolate and egg

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Learning objectives

1. Safely heat egg white and chocolate using a Bunsen burner and record observations.
2. Describe and explain observations from a chemical reaction.
3. Categorise statements as relating to chemical or physical changes.
4. Distinguish whether a change is chemical or physical from given observations.

Chemical changes

Changes can occur in chemicals which may be physical or chemical.

A chemical change is one where **new substances are formed**. Observations of colour change, temperature change or sometimes a change of state could be a sign of this. Often these are **irreversible**.

For example,

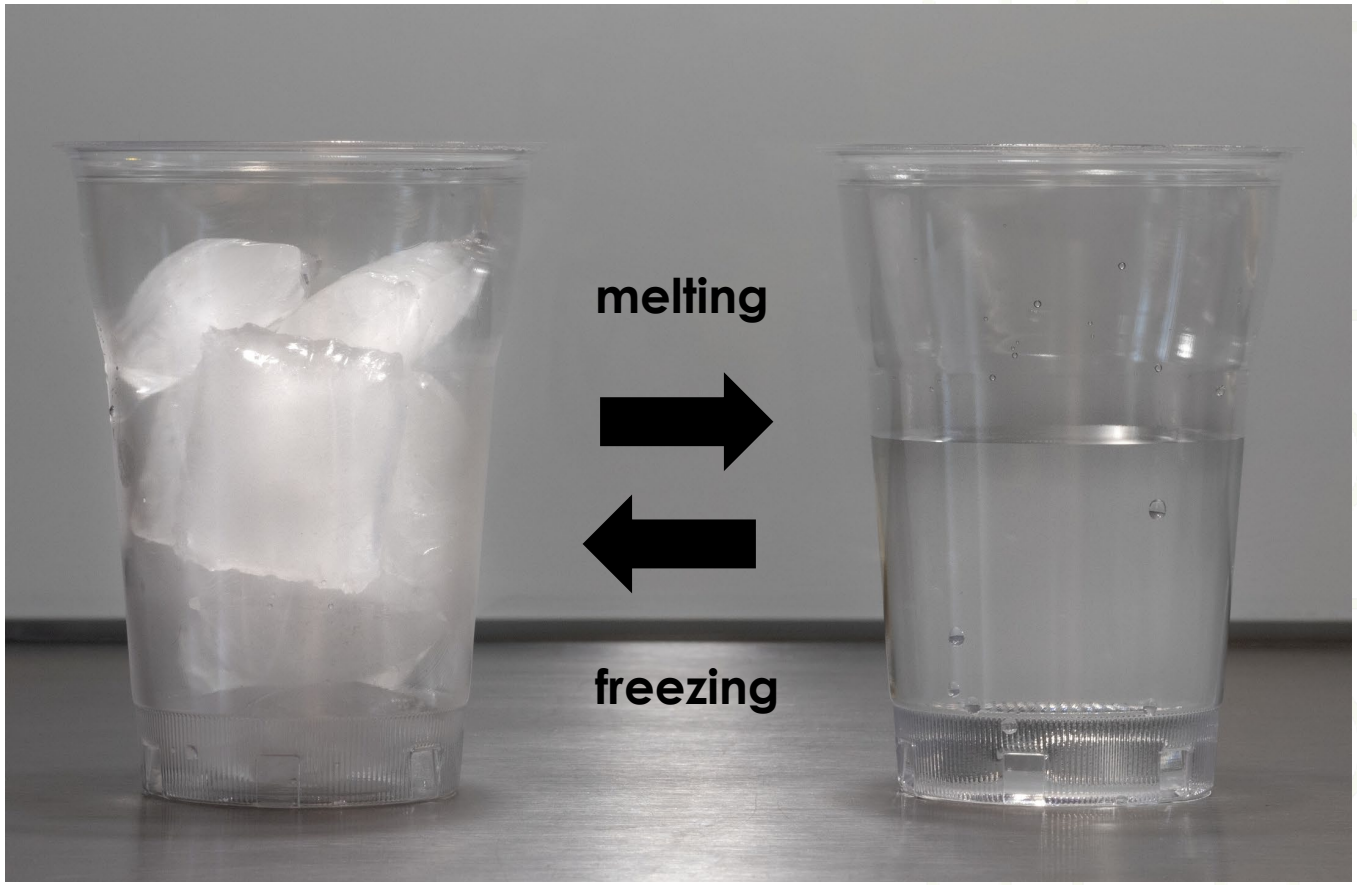
copper sulfate + magnesium ⟶ copper + magnesium sulfate

blue solution	**solid grey metal**	**solid orange/brown metal**	**colourless solution**
			

Physical changes

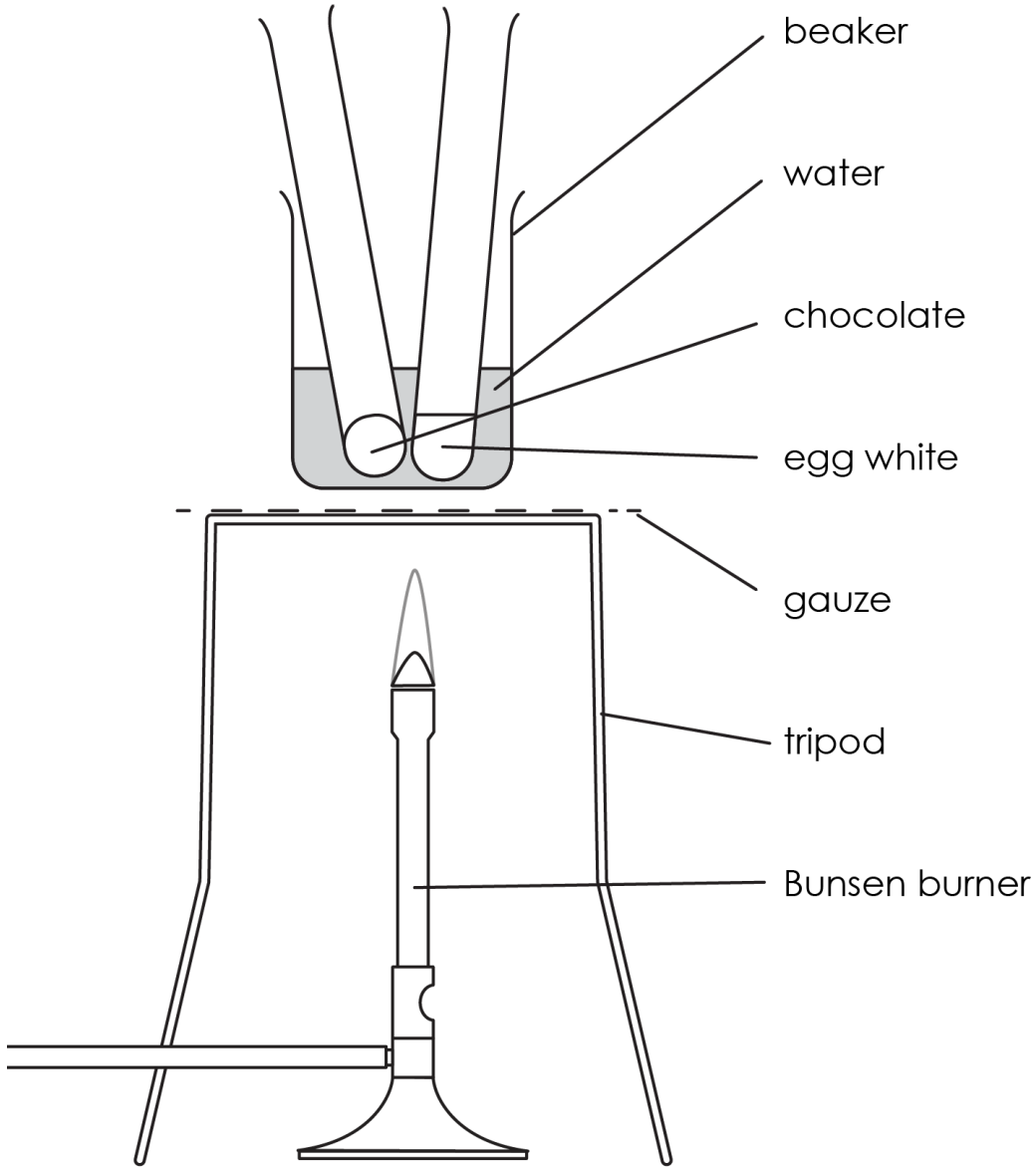
Physical changes on the other hand are **reversible** and are often associated with **changes of state.**

An example is ice melting. The liquid water can then be frozen to reverse this.



Introduction

In this experiment, you will use a Bunsen burner and water bath to investigate the different effects of heat on chocolate and egg white to determine whether they undergo a chemical or a physical change on heating.



Think, pair, share

Today you will be using a Bunsen burner to heat egg white and chocolate in a water bath.

In your pairs, take it in turns to identify hazards and risks and explain how you can minimise the risks by working safely.

Hazards, risks and preventing harm

Today you will be using a Bunsen burner to heat egg white and chocolate in a water bath.

- When using a Bunsen burner, anything that is heated will become hot. This includes the tripod, gauze and beaker. You must only touch where your teacher tells you to prevent burns.
- Hair must be tied up as it is a fire hazard.
- Safety glasses must be worn.
- You must not eat any food in a science lab.

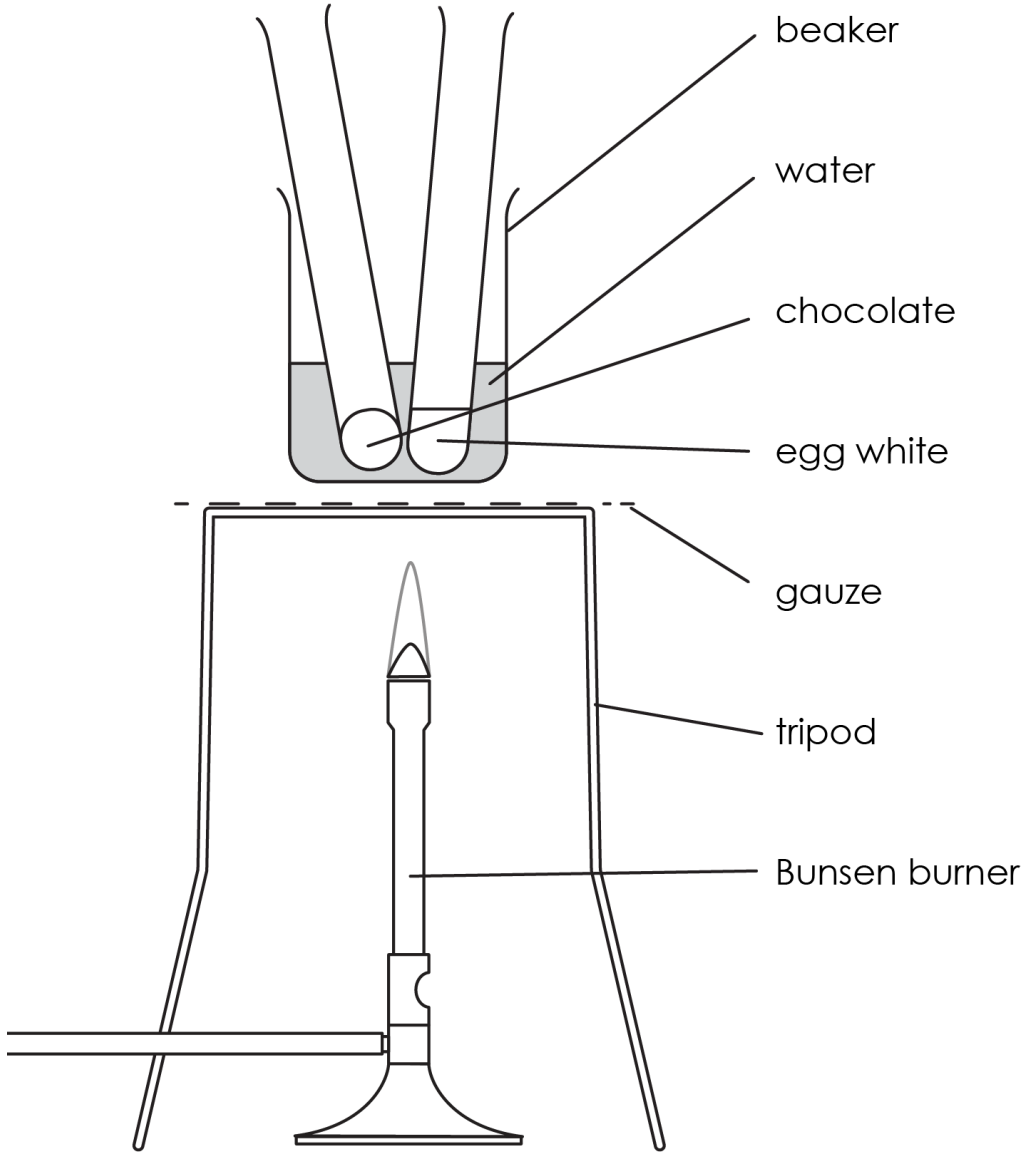
Prediction

Make a prediction about what you think will happen to the chocolate and the egg white when you heat them.

I predict that the chocolate will…

I predict that the egg white will…

Have you made the same prediction for chocolate and egg? Why or why not?



Method

1. Add cold water to the beaker until it is about one-third full and place it on the tripod and gauze.
2. Place a test tube containing egg white and a second test tube containing chocolate in the beaker.
3. Heat the beaker of water with the test tubes carefully until the water in the beaker boils. Allow the water to boil gently for about 5 minutes.
4. Watch what happens to the egg white and the chocolate in the tubes while they are being heated.
5. Turn off the Bunsen burner and use the test tube holder to transfer the tubes to the rack to cool.
6. Watch what happens to the egg white and the chocolate in the tubes as they cool.

❷Place into beaker:
- Test tube containing egg white ❑
- Test tube containing chocolate ❑

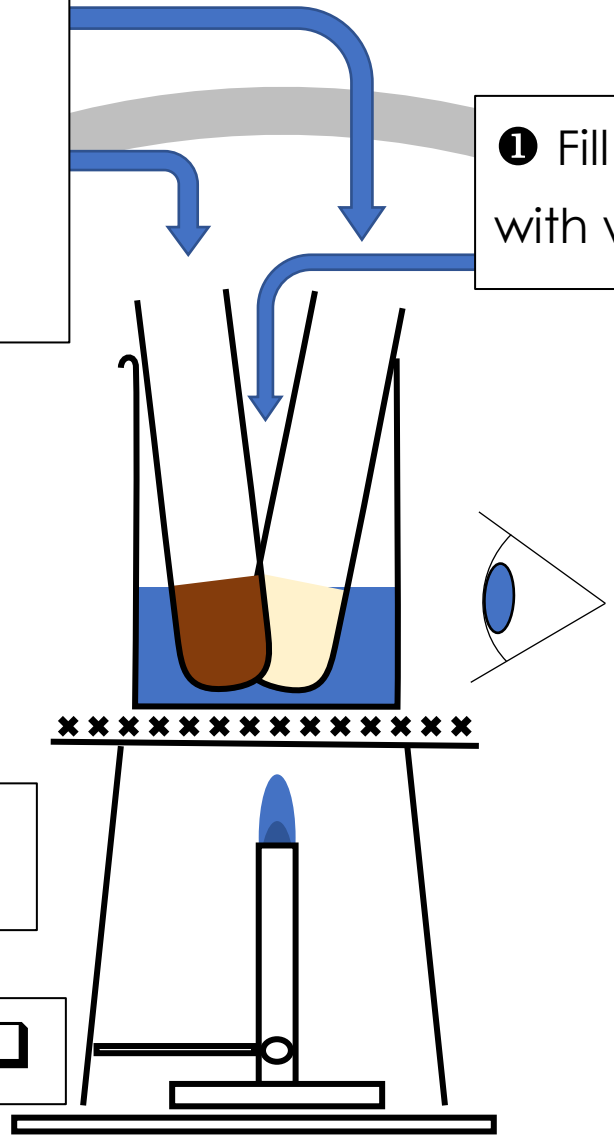
❶ Fill beaker 1/3 full with water ❑

❸ Turn on Bunsen burner ❑

❹ Boil water gently for 5 mins ❑

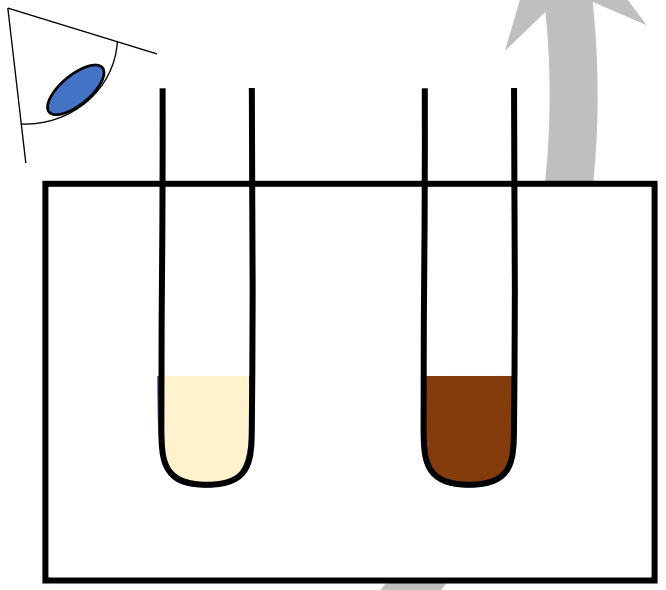
❺ Observe chocolate and egg ❑

❻ Turn off Bunsen burner ❑



❼ Transfer test tubes to rack (use test tube holders) ❑

❽ Observe chocolate and egg ❑



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Observations

Substance	Stage of practical	Observation
Egg white	Before	
	Immediately after heating	
	After cooling	
Chocolate	Before	
	Immediately after heating	
	After cooling	

Observations: answers

Substance	Stage of Practical	Observation
Egg white	Before	Colourless, thick liquid
	Immediately after heating	White solid
	After cooling	White solid
Chocolate	Before	Brown solid
	Immediately after heating	Thick, brown liquid
	After cooling	Brown solid

Follow-up questions

1. In the table below there are a series of statements. Tick the correct box to show whether they typically relate to chemical changes or physical changes.

Statement	Chemical change	Physical change
Can easily be undone (reversible)		
Cannot easily be undone (irreversible)		
No new material formed		
New materials formed that are different to the starting materials		
Heat or light given off		
Colour change (permanent)		
Change in state		

2. Determine whether heating chocolate is a chemical or physical change. Explain your answer using your practical observations.

3. Determine whether heating egg is a chemical or physical change. Explain your answer using your practical observations.

Follow-up questions

4. For each of the scenarios given below, determine whether this represents a chemical change or a physical change.

Scenario	Chemical change	Physical change
Bread being toasted	✓	
Making ice cubes		
Boiling water in a kettle		
Iron rusting		
Baking a cake		
Driving a car		
Ice cream melting		
Fireworks		

Follow-up questions

5. When an acid reacts with an alkali we can write a chemical equation. For example:

   hydrochloric acid + sodium hydroxide → sodium chloride + water

   (a) Name the reactants in this equation.

   (b) Name the products in this equation.

   (c) Explain how you know this is a chemical change.

   (d) A student wants to write a chemical equation for ice melting. Explain why this isn't possible.

Follow-up questions

6. A student adds white zinc oxide powder to a test tube and heats it strongly using a blue Bunsen burner flame. They observe a colour change to yellow, however when this solid cools down to room temperature it changes back to a white colour. Is this a chemical or physical change? Explain your answer.

7. Many homes own candles. A student suggests that when you light a candle this is an example of both a chemical change and a physical change. Explain this observation.

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Did you successfully complete all of the learning objectives?