

### UNDERSTAND, DESCRIBE AND EXPLAIN: SOLID, LIQUID AND GAS

To compare and group materials together, according to whether they are solids, liquids or gases

To observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)

To identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

Solid	Liquid	Gas	Materials	Compare	Group
Shape	Space	Measure	Volume	Visible	Invisible

**States of matter:**

Solids, liquids and gases are called the *three states of matter*.

**States of Matter**



**Solid:**

The properties of solids include:

- Solids stay in one place and *can be held*.
- Solids *keep their shape* -they do not flow like liquids.
- Solids always take the *same amount of space*. They *do not spread out* like gases.
- Solids can be *cut* or *shaped*.
- Even though they can be poured, sugar, *salt* and *flour* are all *solids*. Each *particle* of salt, for example, keeps the *same shape and volume*.

Examples of solids include *ice, wood* and *sand*.



Solid

**THINKING POINT:**



Can you think of any other examples of solids?

**Liquid:**

The properties of liquids include:

- Liquids can *flow* or be *poured* easily. They are *not easy to hold*.
- Liquids *change* their *shape* depending on the *container* they are in.
- Even when liquids change their shape, *they always take up the same amount of space*. Their *volume stays the same*.

Examples of liquids include *water, honey* and *milk*.



Liquid

**THINKING POINT:**



Can you think of any other examples of liquids?

**Gas:**

The properties of gases include:

- Gases are *often invisible*.
- Gases *do not have a fixed shape*. They *spread out* and *change* their *shape* and *volume* to fill up whatever *container* they are in.
- Gases *can be squashed*.

Examples of gases include *steam, oxygen* and *helium*.



Gas

**THINKING POINT:**



Can you think of any other examples of gases?

### EXPLORE AND INVESTIGATE: CLASSIFYING MATERIALS

HYPOTHESISE  
ENQUIRE  
TEST  
RECORD  
REPORT  
CONCLUDE

**Classifying and grouping materials:**

Using the criteria above, what do you think the following materials would be classified as? Solid, liquid or gas? Why do you think this?

Bread flour	Black treacle	Cornflour powder	Cornflour mixture	Shaving foam
				

### KEY ASSESSMENT AND APPLICATION OPPORTUNITIES:

**EXS:**

- What are the three 'states of matter' and how are they different from one another?

**GDS:**

- John explains that sand must be a liquid because it fits the criteria of a liquid: It can be poured; it fills the space it has been poured in to; it is difficult to hold without it escaping. Explain why John is incorrect.

UNDERSTAND, DESCRIBE AND EXPLAIN: HEATING AND COOLING

To compare and group materials together, according to whether they are solids, liquids or gases

To observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)

To identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

<i>Solid</i>	<i>Liquid</i>	<i>Gas</i>	<i>Materials</i>	<i>Changing state</i>	<i>Heating</i>
<i>Cooling</i>	<i>Melting</i>	<i>Freezing</i>	<i>Degrees Celsius °c</i>		

**Changing state:**

Solids, liquids and gases **can be changed** from one state to another by **heating** or **cooling**.  
**Heat melts a solid** and **turns** it into a **liquid**.  
**Cooling freezes a liquid** into a **solid**.

**Heating:**

If ice (solid) is **heated**, it **changes** to **water** (liquid).  
This change is called **melting**.  
**Different solids melt** at different **temperatures**.  
**Ice** melts at 0 degrees Celcius (0°C).  
**Chocolate** melts at about 35°C.  
Therefore, we say that **chocolate** has a **higher melting point** than ice.



**Cooling:**

If water (liquid) is **cooled to it's freezing point (0°C)**, it **changes** to **ice**.  
This change is called **freezing**.  
**Different liquids freeze** at different **temperatures**.  
Water freezes at 0°C.

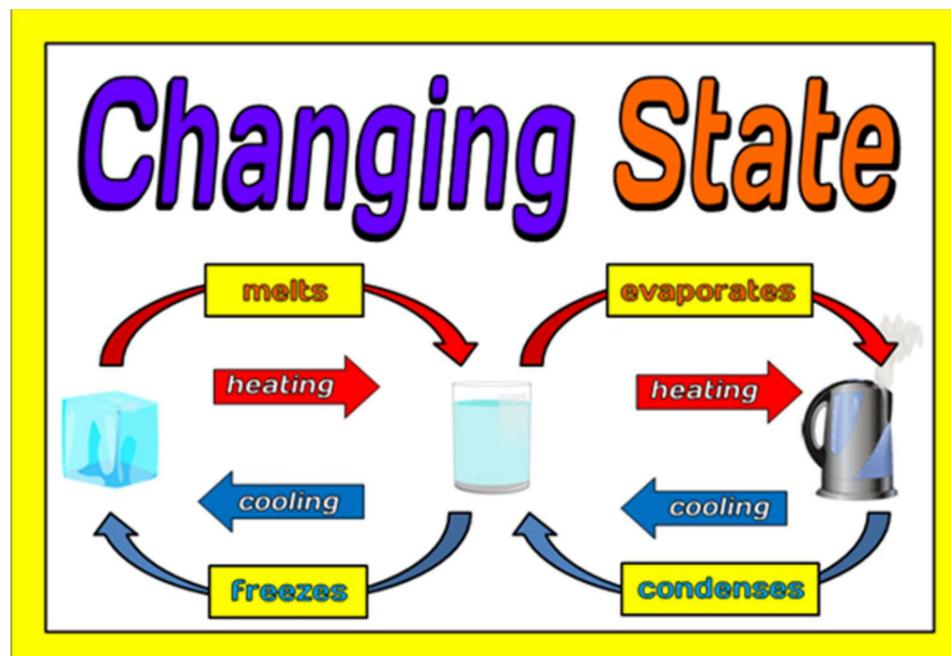


(solid).

**THINKING POINT:**

Do all materials freeze at 0°C?

Do they all melt at 35°C?



EXPLORE AND INVESTIGATE: HEATING AND COOLING

HYPOTHESISE  
ENQUIRE  
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**Investigating the impact of heating and cooling on different substances:**

**Test 1: Heating**

Place the following items in a saucepan and on the hob at a low heat.  
Observe what happens, and time how long each solid takes to change to a liquid.

Butter	Chocolate	Ice Cream	Ice
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**Test 2: Cooling**

Place the following items on a saucer and in the freezer.  
Observe what happens, and check at regular intervals to observe how long each liquid takes to change to a solid.

Melted butter	Melted chocolate	Cream	Water
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**Test 3: Room temperature (control)**

Place the following items on a saucer and in the same place of a chosen room.  
Observe what happens, and check at regular intervals to observe what happens to each substance.

Butter	Chocolate	Ice Cream	Ice
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KEY ASSESSMENT AND APPLICATION OPPORTUNITIES:

**EXS:**

1. What is the difference between heating and cooling?  
What effect can they have on different substances?

**GDS:**

1. Using the words below, explain this diagram:

<i>Heat</i>	<i>Cool</i>
<i>Evaporates</i>	<i>Condenses</i>
<i>Freeze</i>	<i>Melt</i>
<i>Evaporation</i>	<i>Condensation</i>



### UNDERSTAND, DESCRIBE AND EXPLAIN: ONDESING AND EVAPORATION

To compare and group materials together, according to whether they are solids, liquids or gases

To observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)

To identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

Solid	Liquid	Gas	Materials	Changing state	Evaporation
Condensation		Water cycle		Precipitation	Temperature

Liquids and gases can be **changed** from one **state** to another by **heating** or **cooling**.

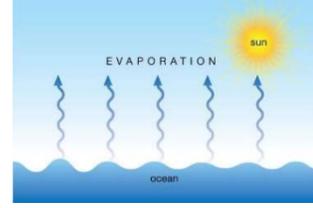
**Heating water - evaporation:**

If **water** (liquid) is **heated**, it **changes** to water **vapour or steam**, which is a **gas**.

This change is called **evaporation**.

This can happen at **any temperature above freezing point** (0°C), but is **most obvious** when water reaches its **boiling point** (100°C).

Evaporation happens at a faster rate and is more obvious to observe, when the temperature is higher.



**Cooling water – condensation:**

If **water vapour or steam** (gas) is **cooled** down, it **changes** into **water**, which is a **liquid**.

This **change** is called **condensation**.

You can often see **condensation** happening on a **cold morning**. When the **moisture** (water vapour) in the **air** touches the **cold** glass on the windows, it **condenses** back in to **liquid water**.



**THINKING POINT:**



Can you think of any times when you have observed evaporation or condensation?

**Evaporation and condensation in the water cycle:**

**Earth** has been **recycling** water for over **4 billion years!**

The world's water moves between **lakes, rivers, oceans**, the **atmosphere** and the **land** in an **ongoing cycle** called the **water cycle**. As it goes through this **continuous system**, it can be a **liquid** (water), a **gas** (vapour) or a **solid** (ice). There are **4 stages** of the **water cycle** which **continuously repeats**:

**Evaporation:**

**Energy** from the **Sun heats up** the surface of the **Earth**, causing the **temperature** of the **water** in our rivers, lakes and oceans to **rise**. When this happens, some of the water **evaporates** into the **air/atmosphere**, turning into a **gas** called **vapour**. **Plants and trees** also lose water to the **atmosphere** through their leaves: **Evapotranspiration**. **Animals (inc. humans)** also lose water to the **atmosphere** through their skin: **perspiration**.

**Condensation:**

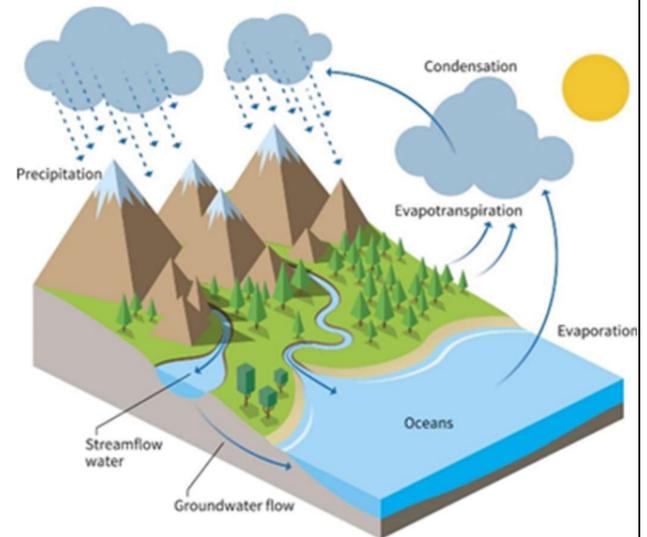
As **water vapour rises up** high into the sky, it **cools** and turns back into a **liquid**, forming **clouds**. This process is called **condensation**. **Air currents** high up in the air **move** these **clouds** around the globe.

Depending on the **temperature** and how **quickly** the **vapour condenses** or sometimes **freezes**, the vapour can turn to **rain, sleet, hail or snow**.

**Precipitation:**

When **too much** water has **condensed**, the **water droplets** in the clouds become too **big and heavy** for the air to hold them.

They **fall back down** to **Earth** as rain, snow, hail or sleet, a process known as **precipitation**.



### EXPLORE AND INVESTIGATE: EVAPORATION AND CONDENSATION

HYPOTHESISE  
ENQUIRE  
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**To observe evaporation over time:**

Leave an equal amount of water in the same type and size of container in different places.

For example:

Inside, on a windowsill	Inside a dark cupboard	Inside a fridge	In a shady part of the classroom
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At the same time each day, measure the amount of water remaining in each container. What do you observe?

How many days will it take for the water in each location to completely evaporate?

### KEY ASSESSMENT AND APPLICATION OPPORTUNITIES:

**EXS:**

- When thinking about the water cycle, what do these words mean?
  - Condensation
  - Evaporation

**GDS:**

- Using the following as subheadings, write a paragraph to explain this diagram:
  - Condensation
  - Evaporation
  - Precipitation

