States of matter

Can materials change state?

Lesson 3: What happens when liquids *freeze*?



Grammarsaurus

Scientific enquiry types and skills



Scientific enquiry types

- Testing
- Researching
- **Observing** ✓
- Pattern seeking
- Identifying & classifying
- Problem solving

Working scientifically skills

- Asking questions
- Making predictions
- Setting up tests
- Observing & measuring
- **Recording data** ✓
- Interpreting & communicating results
- Evaluating

Can materials change state?



Lesson 1: What are solids, liquids and gases?

Lesson 2: How can we change solids into liquids?

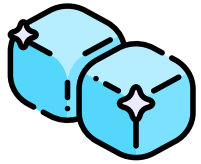
Lesson 3: What happens when liquids freeze?

Lesson 4: How do liquids evaporate?

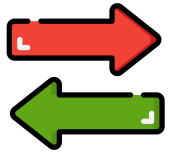
Lesson 5: How does the water cycle work?



Key vocabulary for this lesson



freeze – when a liquid turns into a solid state by cooling



reverse – to go back to how it was before



observe – to watch carefully and notice what happens

Observing



Hi, I'm Jordan, a food scientist. I develop new ideas for making delicious desserts by balancing the **frozen** and **liquid** states of different ingredients. My job is to **observe** how different foods change as they **melt** and **freeze**. Imagine a dessert that is both frozen and liquid at the same temperature!

I need to **observe** freezing and melting temperatures and measure them precisely until I achieve the perfect balance for my desserts.

Let's explore how different solids behave as they cool!





Let's discuss



Discuss the following question with your learning partner.

What happens when we put **water** in the **freezer**?

Be ready to share your feedback with the class.

Use the following sentence starters to help you.

"When water is put in the freezer…"

"It changes from…"

"We call this…"

Let's discuss

answers

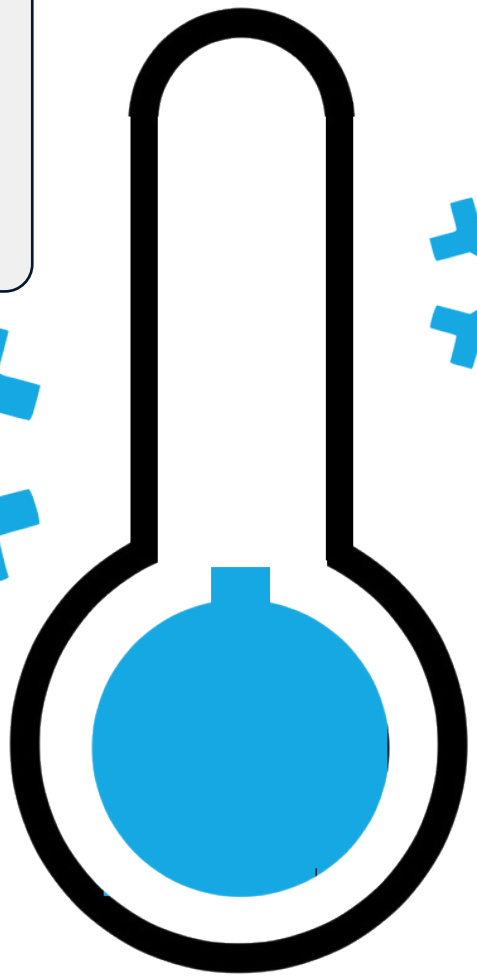


When water is put in the freezer, it **cools down** until it **freezes**. It **changes** from a **liquid** state to a **solid** called **ice**. We call this **freezing**.



ice in the freezer







Freezing



We can change **matter** from one **state** to another.

One way we can do this is by **cooling** the **matter**.

Cooling can ***freeze***  a liquid into a **solid**.



heat

cool



Freezing point

New word alert!
freezing point – the temperature at which a liquid changes to a solid state

Different liquids ***freeze*** at **different temperatures**.

The temperature at which a liquid turns into a solid state is its ***freezing point***.



Water *freezes* at **0 degrees Celsius** (0°C).



Coconut oil *freezes* at **about 24 degrees Celsius** (24°C).



Olive oil *freezes* at **about -6 degrees Celsius** (-6°C).

Melting point

We know **water freezes** at **zero** degrees Celsius.

We know **ice melts** at **zero** degrees Celsius.



What does this tell us about the freezing and melting points?

Discuss this question with your learning partner.

Be ready to share your feedback with the class.

Melting point

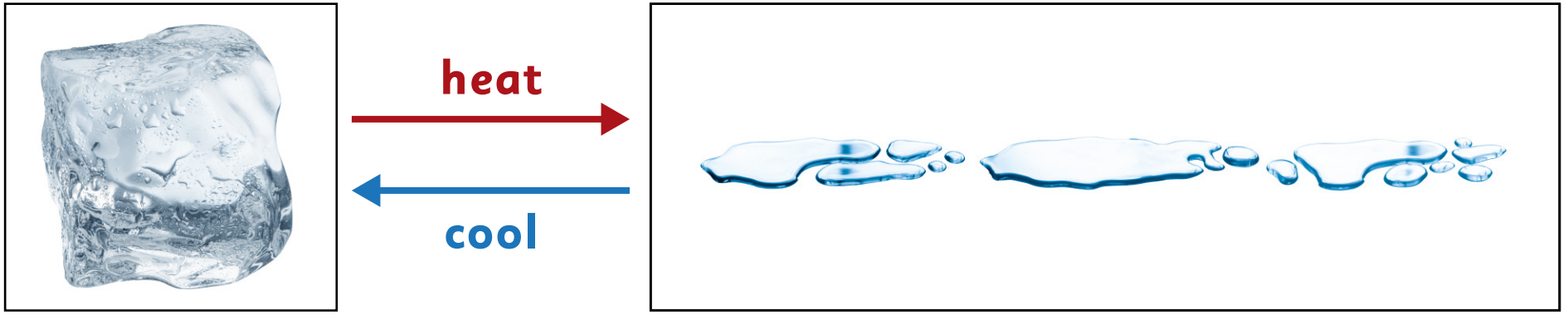
answers

New word alert!
reversible change – a change when the material can go back to what it was before

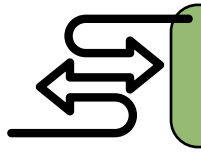
The freezing and melting temperatures are the same.

Materials can be **solid** at lower temperatures and **liquid** at higher temperatures.

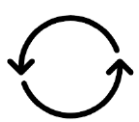
We call this a **reversible change**.



Word detective



reversible change – a change when the material can go back what it was before





re ⊕ **verse** ⊕ **ible** = **reversible**

"again or back" "turn" "can be done"

Together, these word parts mean **'turn and do again'**.

This makes sense because a reversible change means the material can be returned to its previous state.

Observing

We are going to compare the **freezing or melting point** of materials by observing them at different temperatures. You could use a material from the list below, or your teacher may have other materials for you to test.



water



orange juice



coconut oil



olive oil



butter

Setting up tests

You will **need** at least three different materials to test.

These might include:

- butter
- coconut oil
- candle wax
- chocolate
- water
- orange juice
- olive oil



You will also need:

- mini zip lock bags

You will need access to:

- fridge
- freezer
- radiator (or something warm)

Instructions

Setting up tests



You are going to follow these instructions to conduct your test.

- Put a **small** sample of each material into a bag.
- You will only need one sample of each material.

For each test location:

1. **Measure the temperature** at the location (inside the fridge/freezer).
2. Leave the material for 3 to 5 minutes.
3. **Observe** the state of the material – is it solid, semi-liquid or liquid? **(S SL L)**.
4. Record the observations on your activity worksheet.

Test location	Room 25°C	Fridge 5°C	Freezer -5°C	Radiator (warm location) 40°C
Water	L	L	S	L

Let's recap

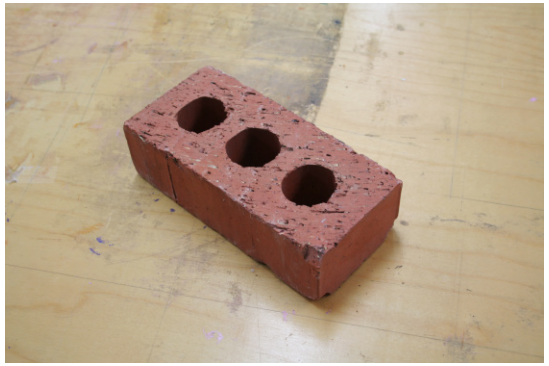


When you make your observations, think about the tests we did for solids and liquids.

Is it a solid? **Is it a liquid?** **Is it something in between?**

A solid:

- keeps its shape
- can be hard or soft



A liquid:

- changes to take the shape of the container
- can be poured



Activity

Observing

Recording data



It's time to start your test! Read the instructions on your activity worksheet to refresh your memory of what to do.

Record the temperature and your observation on your activity worksheet.

Activity

Investigation to observe the freezing/melting point of different materials.



You will need the following:
At least three materials to test from:
butter, coconut oil, candle wax, chocolate, water, juice, olive oil
- Mini zip lock bags
- Room temperature
- Fridge
- Freezer
- Radiator

What to do:
- Put a small sample of each material into a bag.
- You will only need one sample of each material.

For each test location:
- Measure the temperature at the location (inside the fridge/freezer).
- Leave the material for 3 to 5 minutes.
- Observe the state of the material - is it solid, semi-liquid or liquid? (S SL L).
- Record the observations.

Repeat at a new location.

Results:

Test location	Room	Fridge	Freezer	Radiator (warm location)
Water	L	L	S	L

What did we find out?
Which materials were solid at room temperature?
Did any of those materials melt when you put them in a warm location?
Which materials froze and were solid when you put them in the fridge?
Were there any materials that remained a liquid even when placed in the freezer?

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Activity

Interpreting & communicating results



Use your results to discuss the following questions with your learning partner.

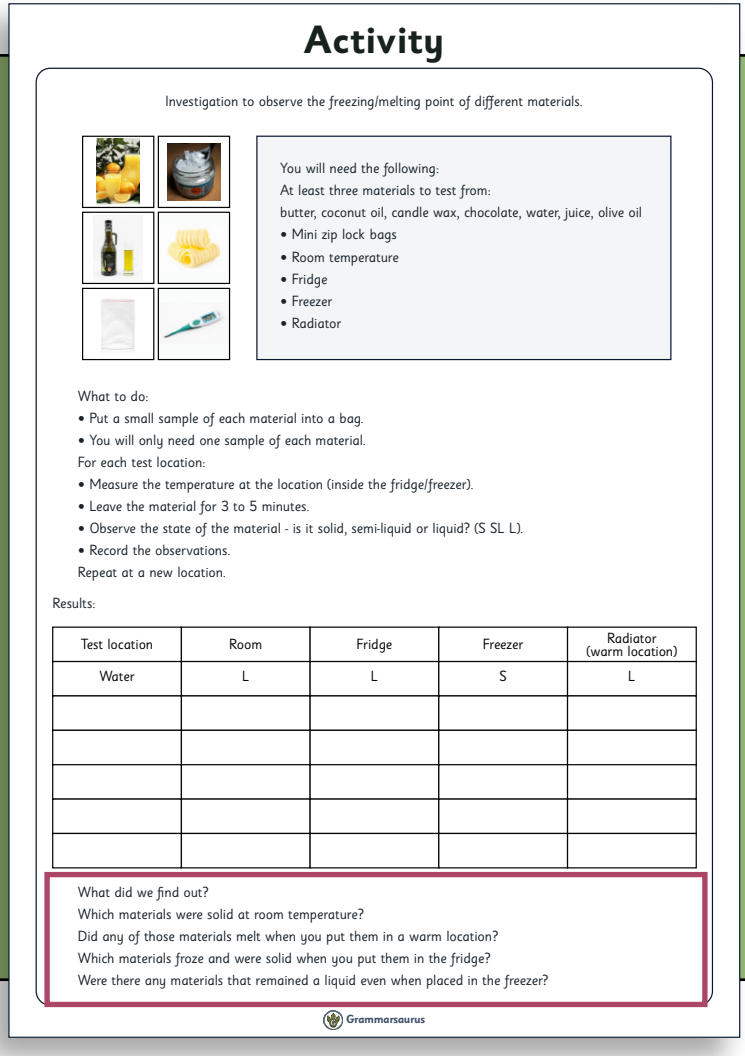
Which materials were solid at room temperature?

Did any of those materials **melt** when you put them in a warm location?

Which materials **froze** and were solid when you put them in the fridge?

Were there any materials that remained liquid even when placed in the freezer?

Then, write what you have found out on your activity worksheet.



Activity

Investigation to observe the freezing/melting point of different materials.

You will need the following:
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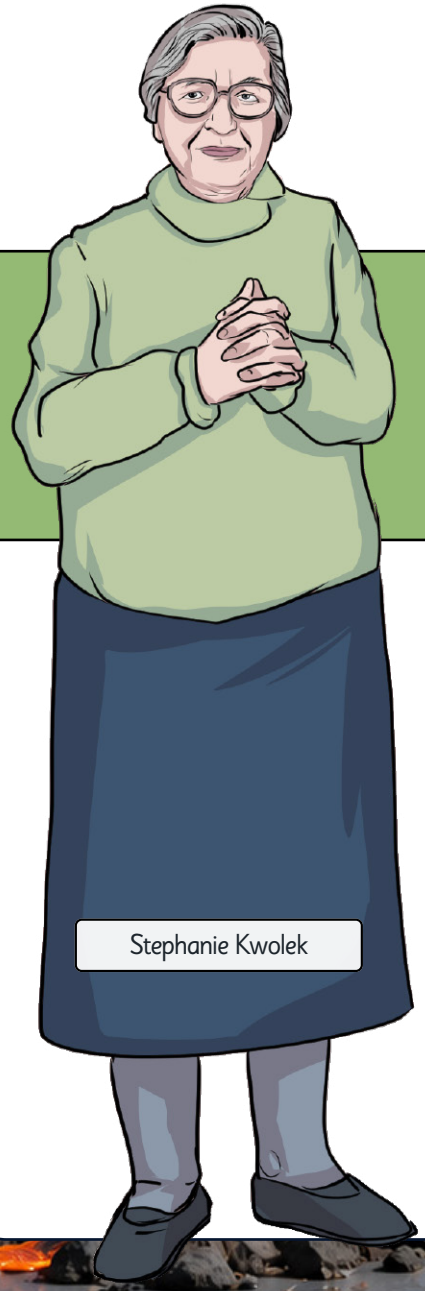
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Challenge



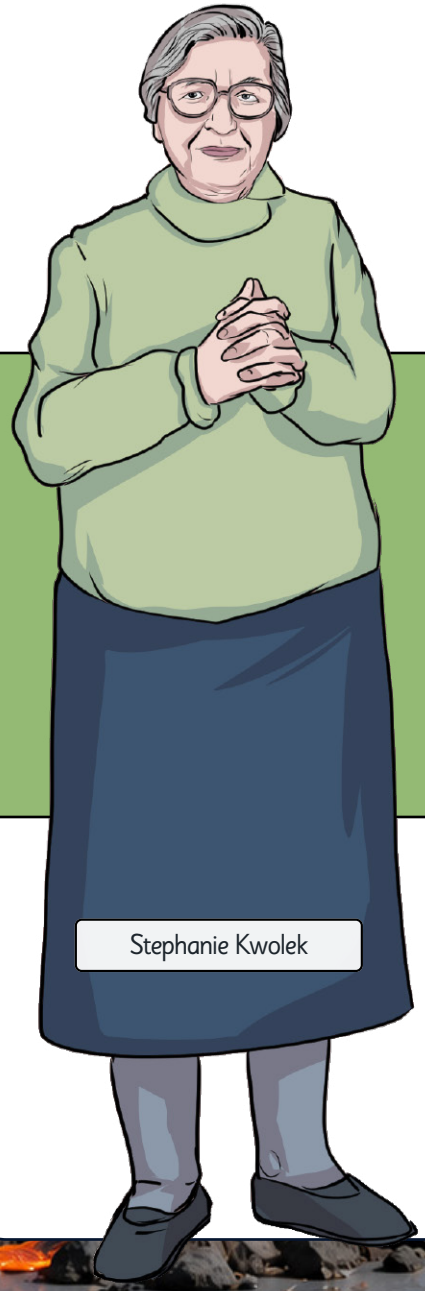
Liquids *freeze* at 0°C.

Is this **always**, **sometimes** or **never true**?

Discuss this question with your learning partner.
Be ready to share your *feedback* with the class.



Challenge answers



The correct answer is **‘sometimes true’**.

Water freezes at 0°C.

Coconut oil freezes at around 24°C.

Lava freezes into rock at over 700°C.

And other liquids have different freezing points .

