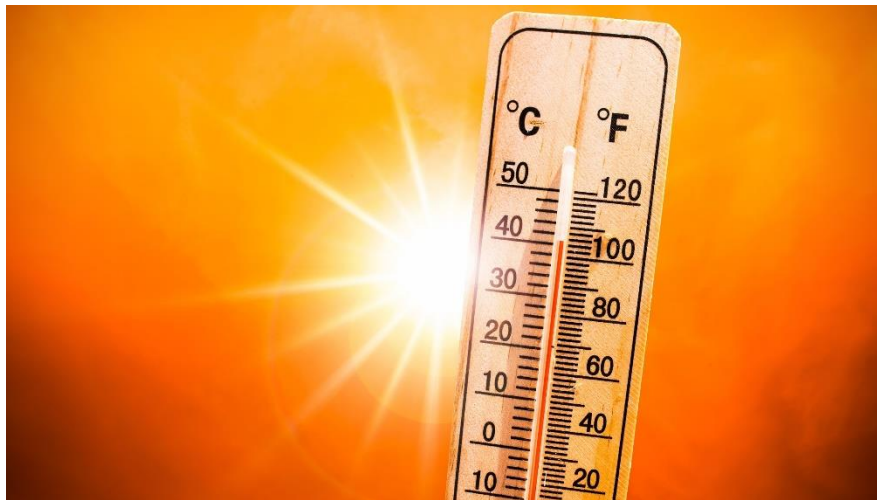


# Kirkcaldy High School



## BGE Science

### Science of the House

### Heat

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Teacher: \_\_\_\_\_

## Heat and Temperature

### Starter

1. Name 3 sources of heat.

\_\_\_\_\_

2. State the piece of equipment used to measure temperature

\_\_\_\_\_

### Learning Intentions

- To learn about heat and temperature and how they are measured
- To undertake an experiment measuring the temperature cooling curve of water

### Success Criteria

I can state the definitions of heat and temperature

I can identify the units that heat and temperature are measured in

Tick me at the end if ***you can***

...

---

## Heat and Temperature

Heat is a type of \_\_\_\_\_, measured in \_\_\_\_\_.

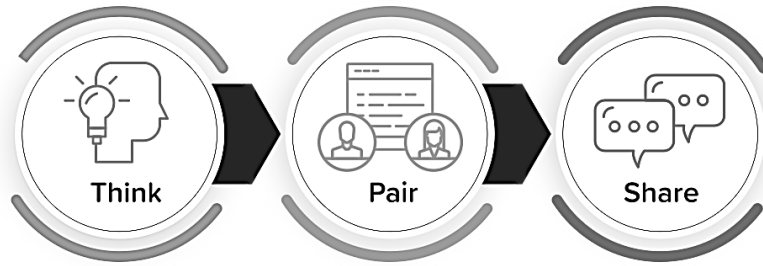
Temperature is measured using a \_\_\_\_\_ and tells us how hot or cold something is.



HEAT



TEMPERATURE



**Scenario 1:** You have just poured a cup of hot coffee!

What happens to the temperature over time?

*Explain why.*

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**Scenario 2:** You have just taken a cold can of cola from the fridge.

What happens to the temperature over time?

*Explain why.*

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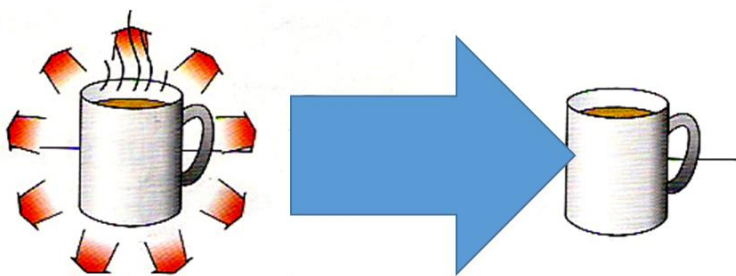


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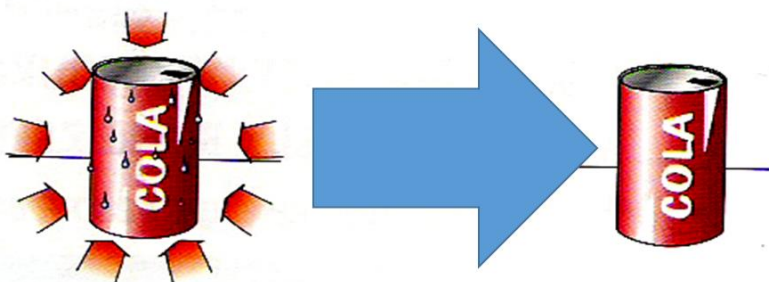


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Heat energy is transferred from the \_\_\_\_\_ object to the \_\_\_\_\_ object.



The heat energy moves \_\_\_\_\_ the hot coffee mug.



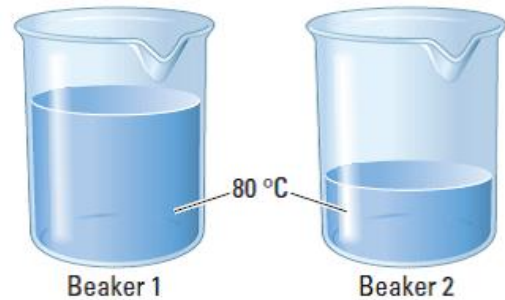
The heat energy moves \_\_\_\_\_ the cold coke can.

## Cooling Curve Experiment

**Aim:** To investigate which beaker of water loses heat most quickly.

**Method:**

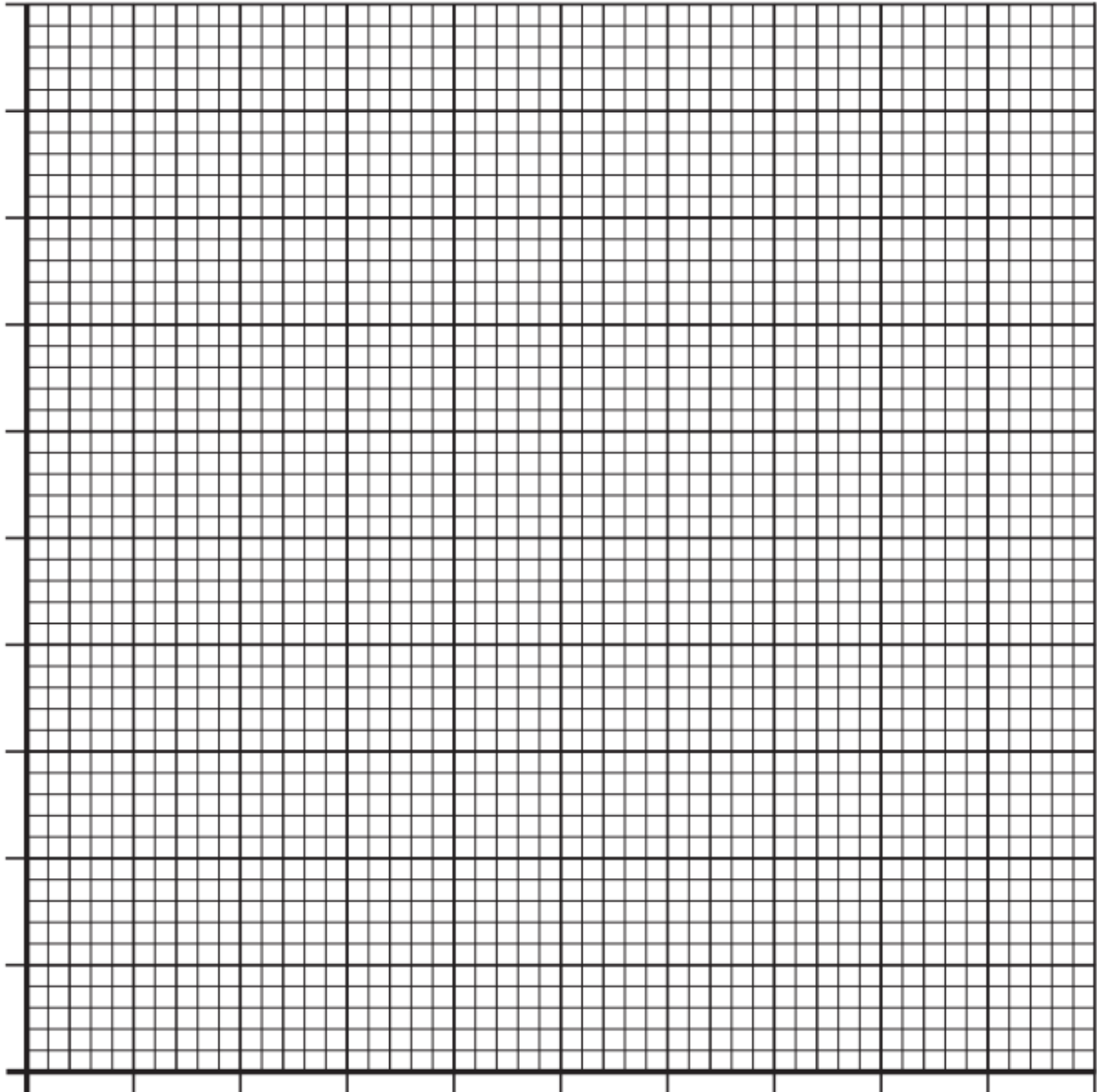
- Collect two 400 ml beakers.
- Add 300 ml of hot water to beaker 1.
- Add 100 ml of hot water to beaker 2.



**Results:**

Time (mins)	Beaker 1 (°C)	Beaker 2 (°C)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

*Draw a graph of your results.*



**Conclusion:** *What is the answer to your aim?*

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**Evaluation:** *How could you improve your experiment?*

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# Conduction

## Starter

1. You may hear someone say

*'shut the door, you're letting the cold in!!!'*

**Explain why are they wrong?**

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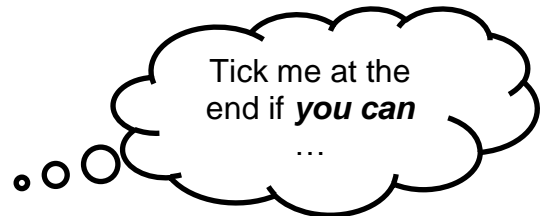
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## Learning Intentions

- To learn about good conductors and insulators

## Success Criteria

- I can complete a scientific report.
- I can identify good conductors and insulators.



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## Heat Travelling in Solids

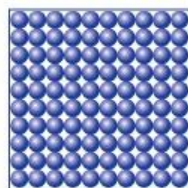
A conductor is a material that allows the \_\_\_\_\_ of heat.

Poor conductors of heat are called \_\_\_\_\_.

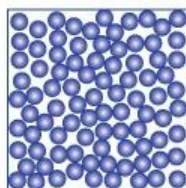
### Why do only solids conduct heat?

Conductivity is caused by the \_\_\_\_\_ of \_\_\_\_\_.

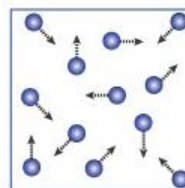
The vibrating particles vibrate into the particles \_\_\_\_\_ to them which \_\_\_\_\_ the heat energy.



Solid



Liquid



Gas

Particles are

Particles are



## Activity

Fill in the table with appropriate headings and decide if each of the following are **conductors** or **insulators**:

*Wooden spoon, aluminium pot, glass, plastic cup, keys, metal fork, oven gloves, tiles, leather, coins*


## Good Conductors of Heat

**Aim:** To investigate which metal is the best conductor of heat.

**Method:** *draw a labelled diagram*

**Results:**


**Conclusion:** *What is the answer to your aim?*

---

---

**Evaluation:** *How could you improve your experiment?*

---

---



## Convection in Liquids

### Starter

1. Draw the particles in a liquid.



2. Why do you think heat cannot travel through liquids by conduction? (hint: think of the particles)

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3. List 3 different liquids in your home that heat can travel through.

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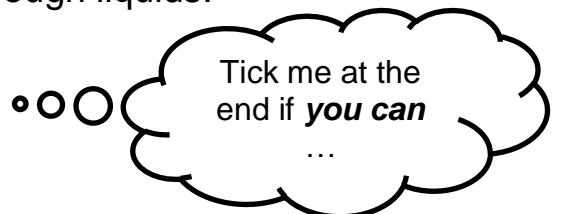
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### Learning Intentions

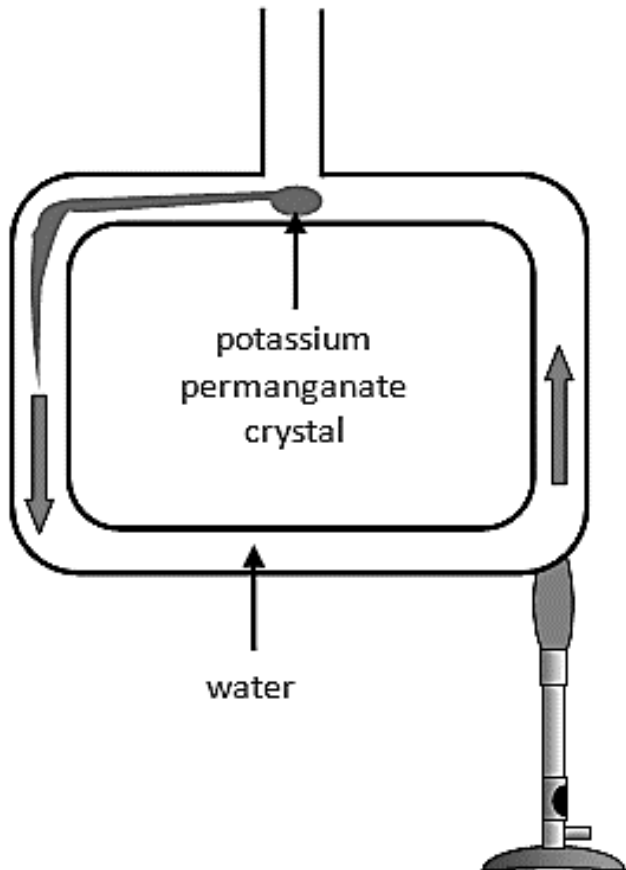
- To learn how heat travels through liquids

### Success Criteria

- I can state the term used for heat travelling through liquids.
- I can explain how heat travels through liquids.



## Convection of Liquids



**While watching the demonstration, think about the following questions:**

1. What direction does the water move above the Bunsen burner?
2. What direction does the potassium permanganate move?
3. How did the glass feel just above the Bunsen burner when we stop heating it?
4. **Explain** why it feels this way.

### Summary

Heat is not transferred in liquids by \_\_\_\_\_. As the particles are too close together in a solid to move.

In a liquid heat is transferred by \_\_\_\_\_. A \_\_\_\_\_ current is formed.

## Convection Current Video

Summarise what you learned in this video

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Why do you think this is relevant in the ocean, what effect do you think convection currents have in the ocean? (extension)

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# Convection in Gases

## Starter

1. Draw the particles in a gas.



2. When you boil a kettle a convection current is formed. Draw a diagram of how this would look.

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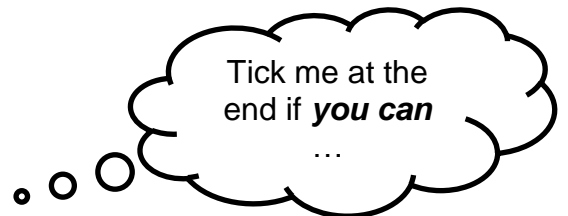
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## Learning Intentions

- To learn how heat travels through gases

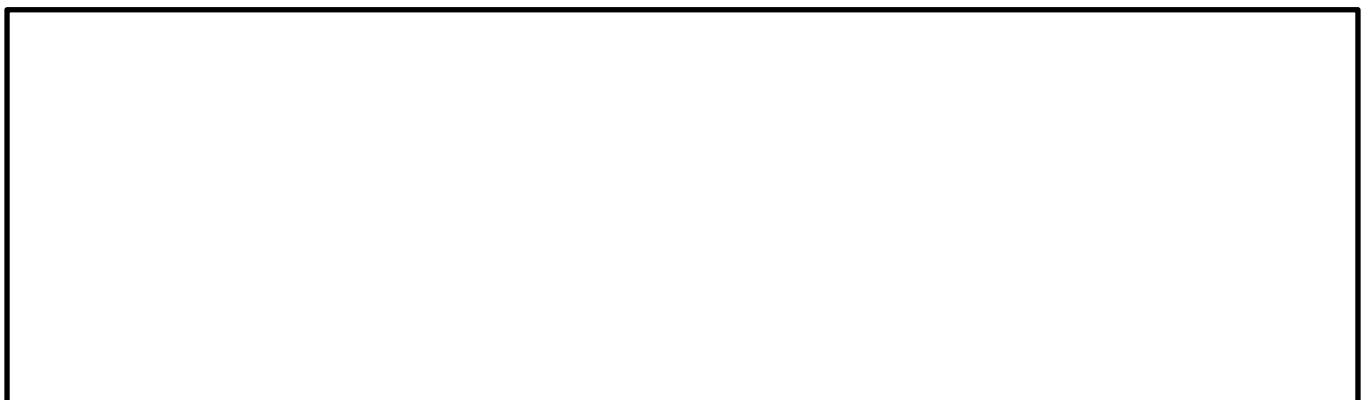
## Success Criteria

- I can complete a scientific report.
- I can explain how heat travels through gases.



## Convection Air Demonstration

Draw and label a diagram, draw arrows to show your observations.



## Convection

Convection happens in a \_\_\_\_\_ and a \_\_\_\_\_.

When the particles get hot they gain \_\_\_\_\_.

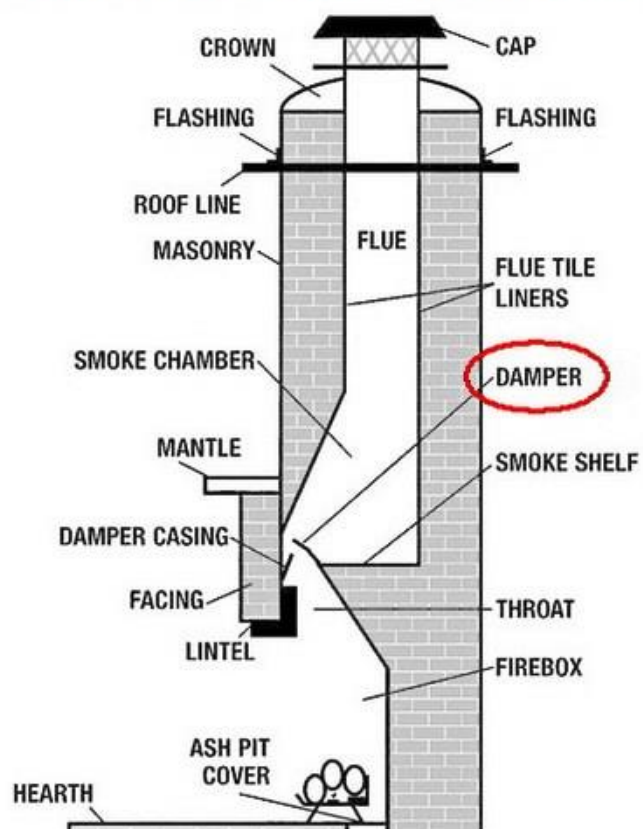
The particles with the most \_\_\_\_\_ move upwards.

When the particles cool down they move \_\_\_\_\_ to be heated again until all particles are the same temperature.

Challenge yourself: **Explain** how a coal fire chimney works.

*If you prefer, try the extension activities at the back of the workbook.*

### FIREPLACE - CHIMNEY DIAGRAM




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After watching the video, how accurate was your description?

- 1**
**2**
**3**
**4**
**5**
- Not even close
accurate

# Radiation

## Starter

1. Why is toasting your bread on the grill not an example of conduction?

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2. Why is toasting your bread on the grill not an example of convection?

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---

3. What do you understand by the word 'radiation'?

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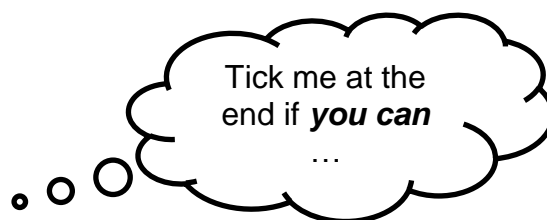
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## Learning Intentions

- To learn how heat travels through radiation

## Success Criteria

- I can complete a scientific report
- I can state which heat transfer method the sun uses
- I can explain how heat travels by radiation



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## What is radiation?

Heat can be transferred through radiation.

\_\_\_\_\_.

Some surfaces are better than others at \_\_\_\_\_ (taking in) radiation. Some surfaces \_\_\_\_\_ heat.

***Do you feel warmer in the sun wearing black or white?***

***Can you explain why this is?***



## Radiation Experiment

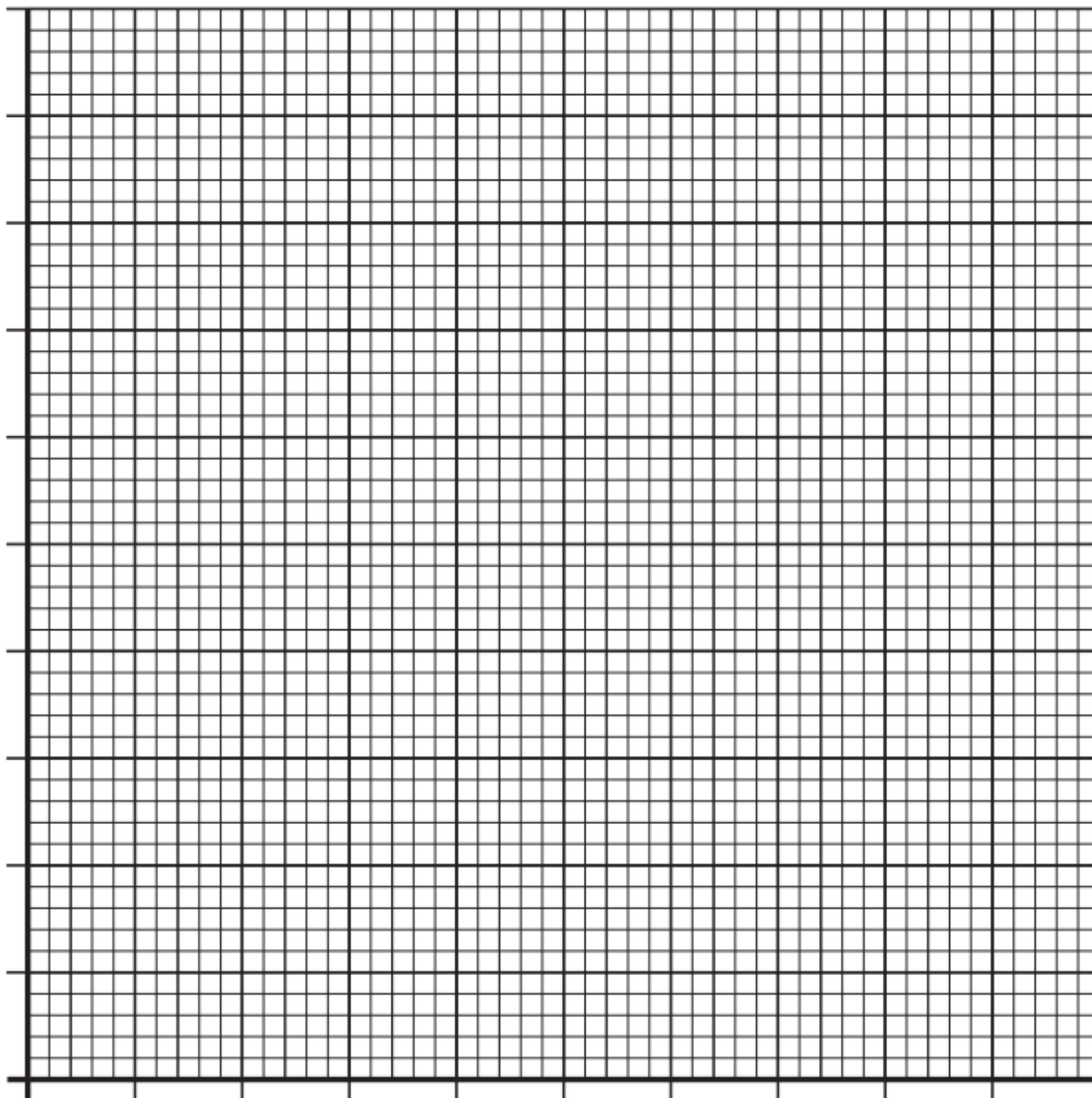
**Aim:** To investigate the effect of shiny and black surfaces on the amount of radiation radiated.

**Method:**

**Results:**

Time (mins)	Temperature of water of shiny can (°C)	Temperature of water of matt black can (°C)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

*Draw a graph of your results.*



**Conclusion:** *What is the answer to your aim?*

---

---

**Evaluation:** *How could you improve your experiment?*

---

---



Radiation is also known as \_\_\_\_\_ (this is invisible) which is a type of \_\_\_\_\_.

The \_\_\_\_\_ an object is, the \_\_\_\_\_ infrared radiation it emits.

You can see infrared radiation using \_\_\_\_\_.

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Summarise by writing or drawing what you seen with the Infrared camera (what was cold, what was hot ... )

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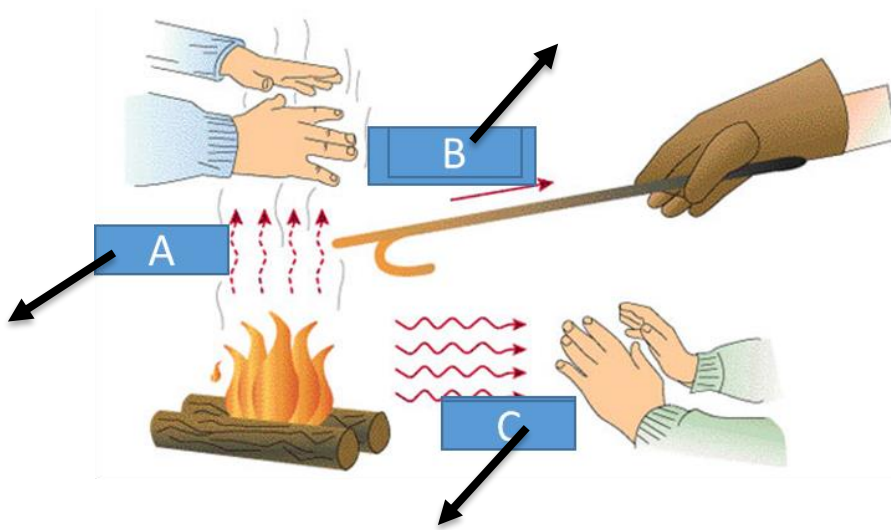
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# Preventing Heat Loss

## Starter

1. Label the heat transfer method in A,B and C.



2. Explain how the infra-red photo shows where most of the heat energy is escaping from.

---

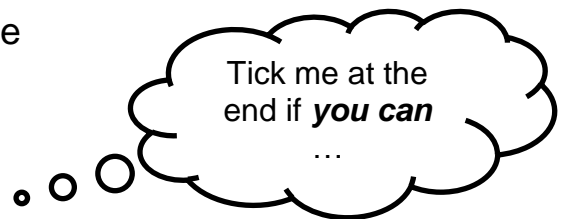
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## Learning Intentions

- To learn about reducing heat loss in our home

## Success Criteria

- I can identify ways of reducing heat loss in a home
- I can interpret thermal imaging diagrams



## Insulators

\_\_\_\_\_ are substances that \_\_\_\_\_ transfer heat.

\_\_\_\_\_ is an excellent heat \_\_\_\_\_ and helps to stop heat loss.

Your body is \_\_\_\_\_ than the air around you and so it is always \_\_\_\_\_ heat.



### Insulators at Home

<u>What</u>	<u>How</u>	<u>Heat Transfer</u>
<i>Paint radiators black</i>	<i>Black surfaces emit more heat than shiny surfaces</i>	<i>Radiation</i>

## Match

Temperature
Thermometer
Particles in a Gas
Particles in a Liquid
Particles in a Solid
Conductor
Insulator
Heat
3 ways heat energy can be transferred

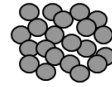
Heat energy can easily pass through this material

Convection

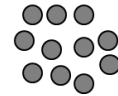
A device used to measure temperature

How hot or cold something is

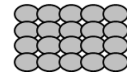
Conduction



Radiation



Heat energy cannot easily pass through this material



A measure of energy

## Preventing Heat Loss Challenge

### Starter

1. How would you prevent a flask from losing heat?

---

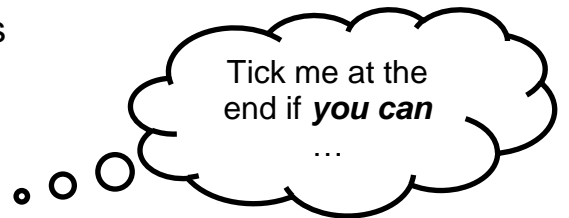
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### Learning Intentions

- To design an experiment to prevent heat loss

### Success Criteria

- I can identify ways of reducing heat loss in a home
- I can interpret thermal imaging diagrams



---

You will design, write-up and carry out an experiment to devise a way of keeping 100 ml of hot water as hot as possible.

i.e. keep the heat lost to a minimum

The resources available are:

Containers – metal, glass, plastic

Materials – cloth, bubble wrap, polystyrene, black card, aluminium foil, cotton wool

To be able to compare how well your set-up has worked, you should set up a control experiment (with no heat loss reduction).

***Use the following blank page to design your own experiment and write it up as a lab report.***

## Design your experiment

## Preventing Heat Loss Challenge Write-up

**Aim:** To devise a way of keeping 100 ml of hot water as hot as possible.

**Method:**

**Results:** What was your initial temperature and temperature after 5 mins for your control and heat-loss reduction set up?


**Conclusion:** *How well did your set up reduce heat-loss?*

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---

**Evaluation:** *How could you improve your experiment?*

---

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## Extension Tasks

You will be presented with a series of real-world scenarios.

For each scenario, identify which type(s) of heat transfer (conduction, convection, radiation) are primarily involved and explain why.

### Scenarios:

**Cooking on a Stove:** Describe how heat is transferred from the stove to the pot and then to the food.

**Feeling Warm in Sunlight:** Explain how heat reaches you from the sun and why you feel warmer in sunlight.

**Using a Thermos Flask:** Discuss how a thermos flask minimizes heat loss or gain and which types of heat transfer it's countering.

**Global Wind Patterns:** Explain how convection plays a role in forming wind patterns around the Earth.

### Research:

Research one technological advancement or invention that utilises principles of heat transfer in an innovative way. Describe its function and the science behind it.



## Word Search

# Heat

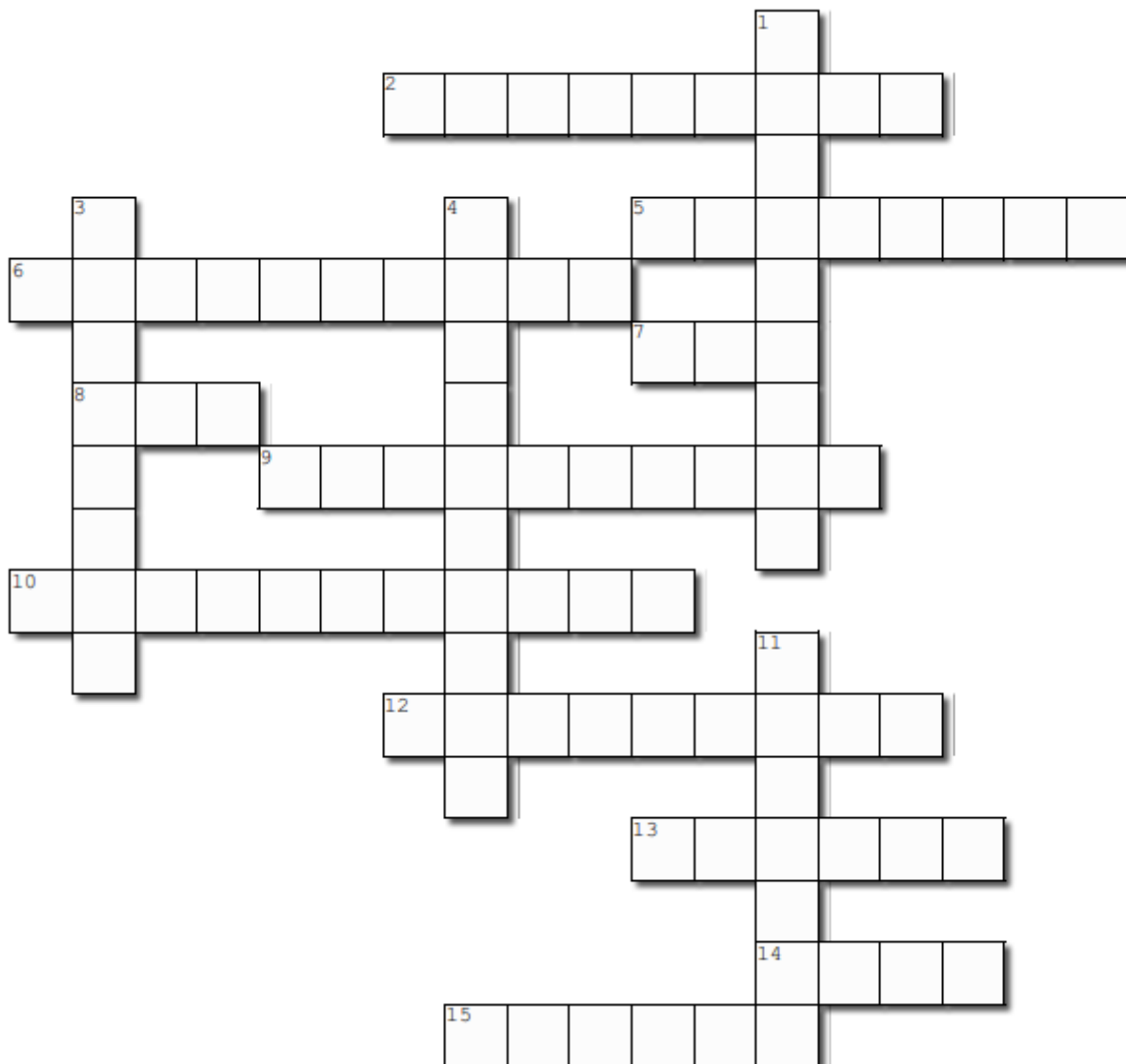
D	A	I	N	S	U	L	A	T	I	O	N	D	T
M	C	A	R	A	I	N	O	L	R	I	A	C	E
R	U	L	U	R	A	H	N	T	C	I	H	A	M
I	R	M	E	S	N	T	I	T	R	T	U	R	P
N	T	A	A	R	T	O	N	U	I	O	C	P	E
S	A	I	H	H	A	T	I	O	A	O	O	E	R
U	I	N	N	R	E	D	N	T	N	I	T	T	A
L	N	F	I	N	L	J	I	D	A	R	L	U	T
A	S	R	D	I	O	L	U	A	T	R	A	S	U
T	R	A	T	U	N	C	N	A	T	W	B	A	R
O	P	R	L	R	T	D	E	I	M	I	T	I	E
R	L	E	E	I	S	H	N	S	N	O	O	R	V
S	S	D	O	N	P	F	A	R	O	L	N	N	N
E	T	N	D	O	W	N	W	A	R	D	S	N	S

RADIATION  
HOT  
JOULES  
DOWNWARDS  
CONDUCTION  
INSULATORS  
VIBRATION  
CARPET  
TEMPERATURE  
INFRARED  
CURTAINS  
INSULATION  
HEAT

## Crossword

# Heat

Complete the crossword puzzle below



### Across

- The sun transfers heat through \_\_\_\_\_.
- Can be put in front of windows to prevent heat loss.
- Poor conductors of heat are known as \_\_\_\_\_.
- \_\_\_\_\_ air travels upwards
- Hot areas in an infrared camera are coloured \_\_\_\_\_.
- This can be added to the walls and roof of a house to keep it warm.
- Measured in degrees Celsius(°C)
- Cold air travels \_\_\_\_\_.
- All energy is measured in \_\_\_\_\_.
- A form of energy.
- Can be used to prevent heat loss through floors.

### Down

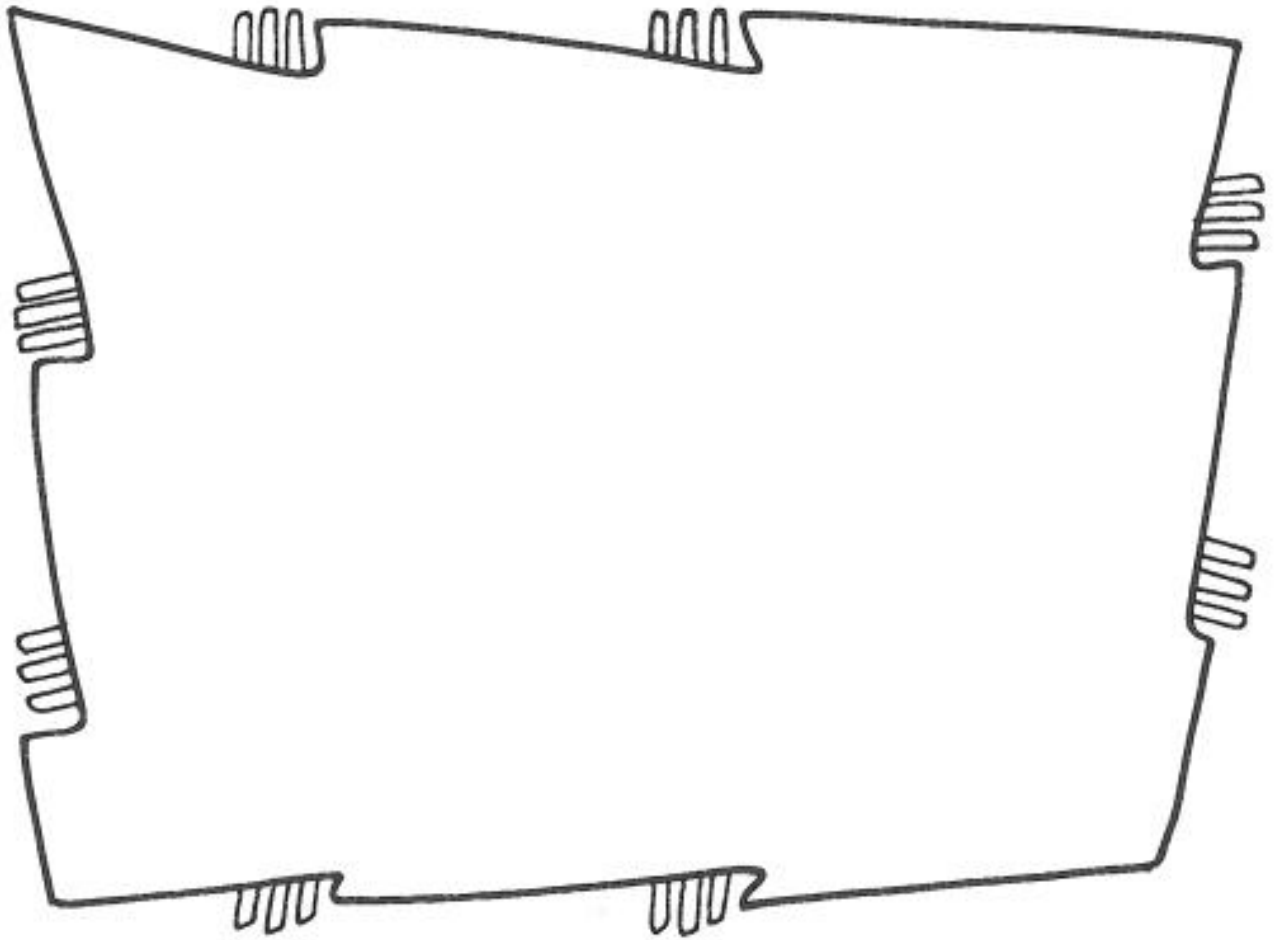
- Particles \_\_\_\_\_ in a solid during conduction.
- This type of light is used to 'see' heat energy.
- The method of heat transfer in a solid.
- \_\_\_\_\_ excluders are put below doors to prevent heat loss.

**Plenary (end of lesson summaries)**

<b>Lesson</b>	<b>Key Concepts Learned</b>	<b>Real-World Applications</b>
<b>Heat and Temperature</b>		
<b>Heat Transfer Scenarios</b>		
<b>Cooling Curve Experiment</b>		
<b>Conduction</b>		
<b>Convection in Liquids and Gases</b>		
<b>Radiation</b>		
<b>Preventing Heat Loss</b>		

Colouring Sheet

THERMAL



ENERGY

Doodle Art Alley ©