INVESTIGATING ICE

Programmes of study

	KS1	Y 3/4	Y 5/6
Sc3	2b	2b	2b, 2c, 2d
Sc1	**Considering** 2h, 2i, 2j	**Obtaining & considering** 2h, 2i, 2j, 2k, 2l	**Obtaining & considering** 2f, 2h, 2i, 2j, 2l, 2m

Information for teachers

Ice is water in its solid form. When it melts it is still water but in its liquid form. Ice melts at about 0 ℃. The size of the lump of ice and the surrounding temperature are two of the main factors that affect the rate at which ice melts. Temperature is a measure of how hot something is. Things that are either hotter or colder than room temperature will adjust to room temperature if left to stand.

Hints for carrying out the investigation

Organisation KS1 and **Y 3/4** class activity; **Y 5/6** group activity

Children sometimes think that ice is a different substance to water because it has a different name. Keep referring to ice as solid water.

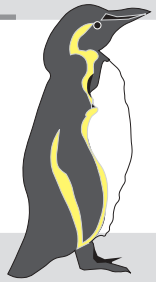
For the **KS1** investigation, use a very large piece of ice (e.g. a washing-up bowl size) and do the following every two hours:

- Wrap the paper strips round the ice, open them up and put them straight onto the wall as columns for a bar chart.
- Pour the melted water into a straight-sided container and build a column of centicubes (or similar blocks) up to the level of the water.

Y 3/4 pupils can take measurements at smaller time intervals. This will require greater accuracy.

For the **Y 5/6** investigation, use water starting at about 60 ℃ in one container and crushed ice in the other. For quicker changes use small amounts, e.g. 50 cm^3.

KS1	Y 3/4	Y 5/6
Key skills		
Sc1	Sc1	Sc1
2f make and record observations and measurements **2h** identify simple patterns **2j** compare what happened with what they expected and try to explain it	**2f** make systematic measurements **2h** use a bar chart **2i** identify patterns in measurements **2k** make further predictions **2l** explain conclusions	**2f** make systematic measurements **2h** use a line graph **2i** identify patterns in measurements **2k** make further predictions **2l** explain conclusions
Starter question		
■ How will this large lump of ice change during the day?	■ This large lump of ice will change during the day. ■ How quickly will it make those changes?	■ We're going to measure the temperature of this beaker of hot water and this beaker of crushed ice every 5 minutes and put each set of results on a line graph. ■ Draw a sketch of what you think the graphs will look like.
Equipment		
■ Large lump of ice, e.g. water frozen in washing-up bowl ■ Stiff paper cut in long strips ■ Tall straight-sided container, e.g. pop bottle ■ Centicubes or small bricks	■ Large lump of ice, e.g. water frozen in washing-up bowl ■ Tape measures ■ Measuring cylinders ■ Weighing scales	■ Beakers ■ Hand-hot water ■ Crushed ice ■ Thermometers or temperature sensors
Vocabulary		
Ice Water Melt	Melt Solid Liquid Mass Volume Circumference	Melt Solid Liquid Thermometer Room temperature Temperature
Key questions		
■ How could we find out how big our piece of ice is? How can we keep a record of the size of the lump? ■ How could we find out how much water has melted? ■ How can we keep a record of the amount of water that has melted?	■ What measurements could we take? ■ How often should we take measurements? ■ How could we keep a record of our results?	■ What lines did you sketch? ■ What made you think it would go like that? ■ Suppose I'd never used a thermometer/ temperature sensor before. What would you tell me to do?



KS1

Investigate

- What has happened to the size of the lump of ice?
- Make me a paper strip that you think will fit round the ice tomorrow morning. Why did you make it that size?
- What has happened to the amount of water?
- Build me a cube tower to show how much water you think will there be tomorrow morning. Why do you think there will be that much water?
- Where does the water come from?

Assessment

L1 describes how the ice changes to water.
L2 describes how the ice gets less as the water gets more.
L2 makes a reasonable prediction for the amount of ice/water the next day.
L3 can explain why they made their prediction.

Further activities

- Make lots of different ice lumps using a variety of containers (yoghurt pot, balloon, plastic gloves, etc.).
- Predict how long they will take to melt in comparison to the original lump.

Y 3/4

Investigate

- How much did the circumference of the ice/volume of water change in the first hour?
- Do you think it will change by the same amount in the next hour?
- If you add the mass of ice and mass of water together each time you take a measurement, what will happen to the total? Will it get less, more or stay the same? Why?
- Predict the circumference of the ice/ volume of water/mass of ice in 2 hours' time.
- How did you know what to predict?

Assessment

L2 describes how the ice gets less as the water gets more.
L3 identifies patterns and makes further reasonable numerical predictions.
L3 can explain why they made their predictions.
L4 can predict that the total mass of ice and water will remain the same and explain why.

Further activities

- Freeze cubes of other materials, e.g. lemonade, vinegar, squash.
- Carry out a fair test to compare rates of melting, e.g. by leaving all frozen lumps for one hour and measuring amount of liquid.

Y 5/6

Investigate

- What do you think the temperatures will be in another 5/10/15 minutes? Why?
- Does the temperature change in regular amounts?
- What does the steepness of the line tell you?
- The lines seem to be coming to the same temperature.
- Why do you think that happens?

Assessment

L4 measures temperature.
L4 draws line graph with support.
L4 describes patterns in graph and can explain why both lines finish at the same (room) temperature.
L5 draws line graph independently.
L5 describes how a steeper line means a greater increase/decrease in temperature over equivalent time periods.

Further activities

- Predict what the graphs would look like if the same experiments were carried out in different venues, e.g. on a hot summer's day, in the desert, in the arctic circle.