The ice is melting!
Climate

47

time
65 minutes.

learning outcomes
To:
- know where ice can be found on Earth
- know that the amount of ice on Earth is shrinking
- know the difference between land ice and sea ice
- discover that melting sea ice does not affect rising sea levels
- discover that melting land ice does affect rising sea levels
- discover that it is colder on areas of ice (white) than on land and water (dark)

end product
- the results of an experiment using ice cubes
- a shoebox landscape which is partially made up from ice (white) and partially land (black)

materials needed
- 12 plastic cups
- 12 small plates or saucers
- 12 ice cubes
- 3 jugs of water
- 2 thermometers
- information sources, such as internet, encyclopaedias and an atlas
- colouring pencils
- clay
- shoebox
- piece of stiff card
- black paper
- white paper
- glue
- clingfilm
- sunlight

Tip.
Use small cups so you don't need so much clay.

Preparation
For the activity **Are water levels changing?** you will need the cups, plates, clay, and jugs of water. The day before the lesson, make at least 12 ice cubes. Take them out of the freezer just before you start this activity.
For the activity **Is the temperature changing?** divide a shoebox in two by placing a piece of stiff card in the middle.
Line the inside of one half with black paper and the other half with white paper.
Check that both thermometers show the same temperature.

Good to know.
The polar ice cap at the North Pole has shrunk by 9 percent in the last 10 years! But the situation used to be very different. During the most severe ice age the Earth was covered in ice sheets from the Poles to the Equator.

Ice 15 min.
The children complete Task 1 on the worksheet. They can use internet the encyclopaedia, and an atlas to find the answers.
Discuss the answers with the class. Explain that ice is formed when water freezes. Water freezes at zero degrees Celsius. Ice can appear as ice, hail, and snow. Most of the ice on Earth can be found at the North and South Poles, Greenland, and Siberia. The ice at the North Pole is sea ice, the ice at the South Pole is land ice. The photographs on the worksheet show that the ice at the North Pole has shrunk considerably in recent years. Ask the children if they know why this is. Do the children have any idea about what happens when the ice melts? There will be more water in the sea. Explain the concept of sea levels.

The children investigate what will happen to sea levels and the temperature on Earth if the ice melts.

What do you think? 5 min.

The children complete Task 2 on the worksheet and write down what they think the answer to the research question is.

Will sea levels change? 15 min.

Organise the children into groups of four. The children complete Task 3 on the worksheet. Explain that cup 1 represents the sea ice at the North Pole and cup 2 represents the land ice at the South Pole. The water in the cups represents the sea level.

Explain that they have to be careful when handling the ice cubes. They should wet their hands before they pick up their ice cube, this will stop the ice cube from sticking to their fingers.

It might take quite a long time for the ice cubes to melt. You can speed up the process by putting the cups on a sunny windowsill. You may find a few drops of water on the plate with cup 1, but these will be condensation from the warm air coming into contact with the cold cup.

Will the temperature change? 15 min.

What will happen to the temperature on Earth if the ice melts? Show the shoebox. Explain that the white half represents the ice on Earth and the black half represents land or water. Place a thermometer in each half of the shoebox. Cover the box with clingfilm. Place the box on a sunny windowsill. The children complete Task 4 on the worksheet.

Wait ten minutes and then encourage the children to read the thermometers in groups of four. What do they see? The children complete Task 4 on the worksheet.

Will the Earth flood? 15 min.

Finally, the children complete Task 5 on the worksheet. When they have finished, discuss the answers from both experiments. What did the children discover? Explain that cup 1 did not overflow because the weight of the water in the ice cube was already in the water. Cup 2 overflowed because the melted water from the ice cube was added to the water that was already there. From this we can see that the melting land ice at the South Pole will cause sea levels to rise, but the melting sea ice at the North Pole will not.

In the second experiment the temperature in the black half of the shoe box will be higher than in the white half. This is because light colours (white) reflect more heat and light than dark colours (black). White acts like a mirror, reflecting almost all the Sun's rays. If more ice melts, a larger area of the Earth's surface will be darker. This means that less sunlight and heat will be reflected and it will become increasingly warmer on Earth. This will cause the remaining ice to melt even more quickly. Is this what the children predicted in Task 4?

Good to know.

The melting ice in Greenland and Siberia will also contribute to rising sea levels.

The ice is melting!

1 Ice

a How is ice made?

b At what temperature does water freeze?

c What forms of frozen water can you name?

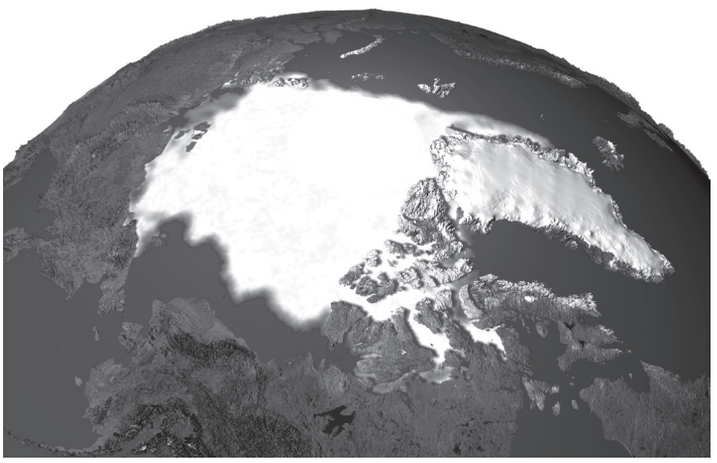
d Both the North Pole and the South Pole are covered in ice. But there is an important difference between the two sorts of ice. The ice at one pole is land ice and the ice at the other is sea ice. Do you know which is which?

Write your answers in the spaces provided.

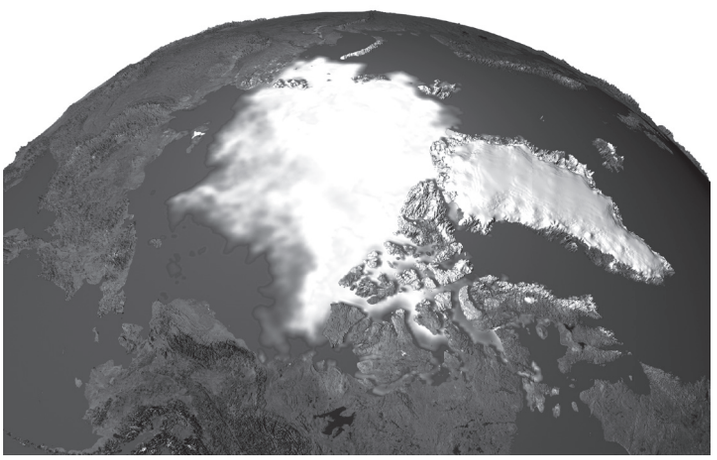
The North Pole is covered by _____ ice.

The South Pole is covered by _____ ice.

e Look at the two photographs on the next page. The photographs show the North Pole. The one on the left was taken in 1979. The one on the right was taken in 2003. What difference can you see?



polar ice cap at the North Pole in **1979**



polar ice cap at the North Pole in **2003**

2 What do you think?

Now you are going to investigate what will happen to sea levels and the temperature on Earth if the ice on Earth melts.

a What do you think will happen to sea levels if the ice melts?

b What do you think will happen to the temperature on Earth if the ice melts?

3 Will sea levels change?

You are going to investigate what will happen to the water if the ice at the North Pole and the South Pole melts.

What do you need?

- 2 plastic cups
- 2 plates
- 2 ice cubes
- clay
- jug of water

What do you need to do?

- **CUP 1**

1 Put the cup on the plate.

2 Put one ice cube in the cup. Wet your hands before you pick up the ice cube!

3 Fill the cup to the brim with water. This cup represents the sea ice at the North Pole.

- **CUP 2**

1 Put the cup on the plate.

2 Put some clay into the cup. Make sure the tip of the clay is just above the rim of the cup.

3 Fill the cup to the brim with water.

4 Put one ice cube on top of the clay. This cup represents the land ice at the South Pole.

CUP 1

CUP 2

a Do you think the water in cup 1 will overflow?

b Do you think the water in cup 2 will overflow?

Wait for five minutes and then examine your cups.

c Is cup 1 overflowing?

Yes / No

CIRCLE the correct answer

d Is cup 2 overflowing?

Yes / No

CIRCLE the correct answer

e Will sea levels rise if the ice at the North Pole melts?

f Will sea levels rise if the ice at the South Pole melts?

g Why is that?

4 Will the temperature change?

You are going to investigate whether the temperature will rise if the ice melts.

You are going to do this together with your teacher, using the black and white box.

a Look at the thermometers together. What temperature do they show?

_____ degrees and _____ degrees

b What do you see? Put a tick against your answer.

- O Both thermometers show the same temperature.
- O The thermometer in the white half shows a higher temperature.
- O The thermometer in the black half shows a higher temperature.

c What does this mean for the temperature on Earth if there is less ice (white) and more land and water (dark)?

5 Will the Earth flood?

a Return to your answers to Question 3.

What will happen to sea levels if the ice melts?

b Return to your answers to Question 4.

What will happen to the temperature on Earth if the ice melts?