



# Can you live on Mars?

## Journey to Mars

### time

65 minutes

### learning outcomes

To:

- know that you would have to take lots of water with you to survive on Mars
- know that when you purify water some of it is lost
- know there are many ways to purify water
- know that the different methods of water purification remove different substances from the water

### end product

- purified water

### materials needed

- 36 clear plastic cups
- 24 activated carbon tablets
- 12 teaspoons
- 12 half-litre bottles
- 12 1.5-litre thin plastic bottles
- 12 containers to catch water
- 12 cone coffee filter holders
- 12 cone coffee filters
- electric hotplate
- small saucepan
- sand
- small stones
- fountain pen ink
- cotton wool
- scissors
- felt-tip pens

## Preparation

The day before you start this lesson, ask the children to complete the activity

**Water on Earth and on Mars** as homework.

For the activity **Water purification**, fill 12 bottles with dirty water.

Add sand, stones, and ink to the water for this.



## Water on Earth and on Mars 20 min.

The children find out how much water they use at home in a single day and write this down in [Task 1](#) of the worksheet.

Discuss the table. Do they use more or less than they thought?

Ask what people need to survive. Encourage the children to name as many conditions as they can think of. To survive, people need food and oxygen, but water is also very important. Explain that people cannot survive without water. Also explain that this is one of the reasons why people cannot live on Mars at the moment. The differences in temperature are also very large; Mars has a very thin atmosphere and the air pressure is very low. There is frozen water underground on Mars. This water is not clean. So you would have to take water with you if you wanted to live on Mars. And you would need to be able to purify this water if you wanted to keep using it.



The children investigate how you can purify water and if this would enable you to survive on Mars.



## **Purify the water** 30 min.

Organise the children into pairs and hand out the materials for the experiment. Explain that the surface of Mars is covered in stones and sand. The ink in the water represents the invisible impurities. The children are going to purify the water in three stages, by completing Task 2 on the worksheet. The water will become cleaner at each step. Emphasise that each of the three steps removes different substances from the water. Ask the children if they think the water is completely clean at the end. Do not allow them to drink the purified water! Because it has not been professionally cleaned, it may still contain pollutants.



## **Can you live on Mars?** 10 min.

Discuss the three stages of water purification. Explain that the first stage is to remove the solid particles. Explain that activated carbon has a sponge-like structure that enables it to absorb all kinds of substances. Because the activated carbon does not pass through the filter, the pollutants it has absorbed remain in the filter with it. This happens in stage 2.

In stage 3, the water is boiled to kill all the remaining germs and bacteria that can cause illness.



Ask whether the children think it would be possible to survive on Mars using this kind of water treatment. What would they have to take with them? And what would they do when it was all used up? On Earth we use water treatment works to purify the water that we use.

The children complete Task 3 on the worksheet.



## **Conditions for life** 5 min.

Review the conditions for life with the children. We have already investigated one of these conditions: water. But what about the other conditions for life? Are these present on Mars? Could you take them with you? How could you make sure you don't run out?



# Can you live on Mars?



You are going to investigate how you can purify water and if this would enable you to survive on Mars.

1 *Water on Earth and on Mars*

a Keep a record for one day of all the water that you use that day. Record the information in the table.



Activity	Litres water each time	Number of times	Total
Taking a shower	60 litres	_____	_____
Brushing teeth	2 litres	_____	_____
Washing face	2.5 litres	_____	_____
Flushing the toilet	6 litres	_____	_____
Washing hands	1 litre	_____	_____
Washing the dishes <small>by hand</small>	8 litres	_____	_____
Using the dishwasher	10 litres	_____	_____
Cooking	1.5 litres	_____	_____
Drinking <small>water, tea, soft drinks</small>	0.2 litres	_____	_____

write your amounts HERE

ADD UP the figures in this column

b How much water did you use in total in a day?

c Do you think this is a little or a lot?

write your answer HERE



## 2 Purify the water

What do you need?

- 1.5 litre plastic water bottle
- cup of sand
- 0.5 litre bottle
- scissors
- cotton wool with dirty water
- small cup of stones
- felt-tip pen

What do you need to do?

You are going to purify the water using three different methods.

Use the water you treated in one method for the next.

Examine the bottle of dirty water.

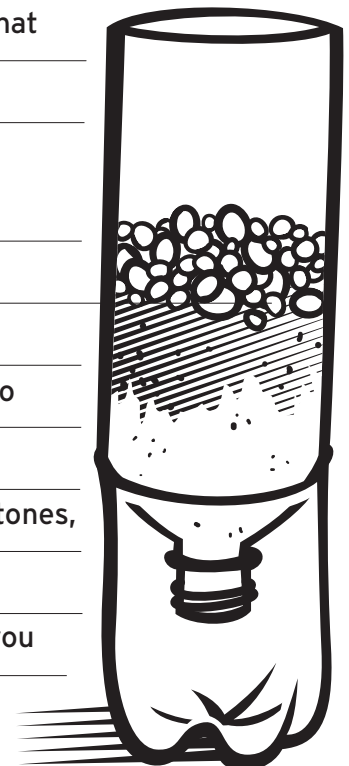
a What colour is the water?

b What kinds of dirt can you see?

*Solid dirt.*

First of all you are going to remove the solid, undissolved dirt that you can see in the water. You are going to make a filter for this.

- 1 Use a felt pen to draw lines dividing the bottle into three equal parts.
- 2 Cut off the bottom third of the bottle.
- 3 Turn the top part of the bottle upside down and push it into the bottom part.
- 4 Fill the top part of the bottle with cotton wool, sand and stones, as shown in the drawing. Now you have made your filter.
- 5 Pour the dirty water into the filter. Pour carefully so that you do not disturb the layers.



c	Does your filter work? <b>yes / no</b>	CIRCLE the correct answer
d	What colour is the water now?	write your answer HERE
e	What has the filter removed from the water?	
f	Is the water clean enough to drink? <b>yes / no</b> , because	
<i>Invisible substances</i>		
Now you are going to remove the invisible substances from the water.		
Use the filtered water from the first stage. You do not need the filter.		
What do you need?		
<ul style="list-style-type: none"> <li>• 2 clear plastic cups      • teaspoon</li> <li>• 2 tablets of                      • coffee filter</li> <li>activated carbon              • coffee filter holder</li> </ul>		
What do you need to do?		
1 Take the filtered water.		
2 Pour this water into a plastic cup.		
3 Add two tablets of activated carbon to the water and stir well.		
4 Put the filter holder on the other plastic cup, as shown in the drawing.		
5 Pour the mixture into the filter.		



g How does the activated carbon work?

h What colour is the water now?

*Limescale and invisible germs.*

To finish, you are going to remove the limescale and invisible germs in the water.

What do you need?

- electric hotplate
- small saucepan
- 2 plastic cups

What do you need to do?

1 Fill a new clear plastic cup with the treated water

from the previous stage.

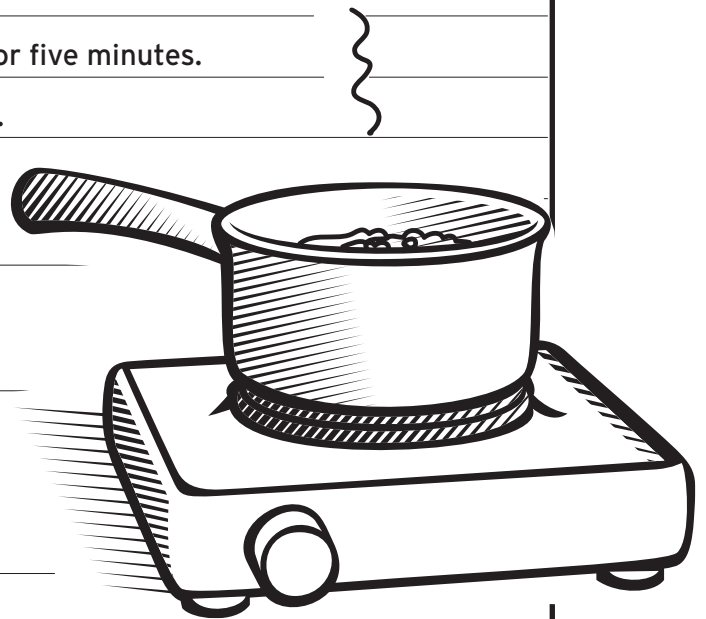
2 Ask your teacher to boil this water for five minutes.

Wait until the water has cooled down.

3 Pour the cooled boiled water  
into a clean plastic cup.

i What colour is the water now?

j What kind of deposit can you see  
in the saucepan?



3 *Conditions for life*

a Look at the table in Task 1.



How much clean water do you use in a day?

write your answer  
HERE



b If you were going to Mars for a week, how much water would you need to take?



Use the quantities in Task 1. Take into account that 20% of the water will be lost during purification and through leaking. You don't need to take into account the water you will need on the long voyage.

c What would you need to take to use these water purification methods on Mars?

d What would you do when all your water purification materials have been used up?

