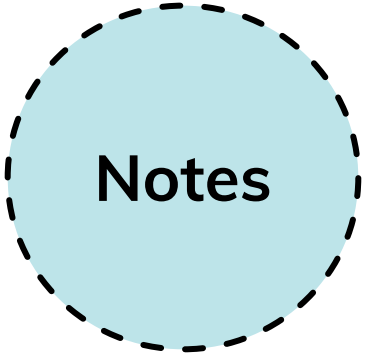
SCIENCE, GRADE 7

Hard And Soft Water

LESSON 2

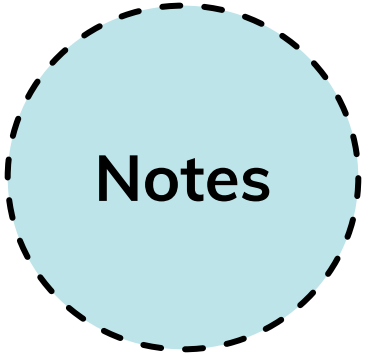
Time Distribution

Video review	10 mins
Picture Activity - Think Pair Share	15 mins
Types of Hardness	10 mins
Quick Check	07 mins
Taking down homework	03 mins



Lesson 2

- Understanding the disadvantages of hard water
- Different types of hard water – Temporary and Permanent hard water
- Understanding how hard water can be treated – Methods to remove hardness



Instruct students that they must sit in their places with their writing material and notebooks.

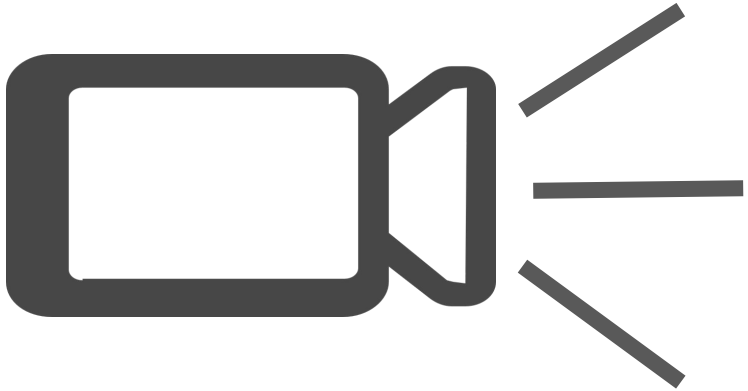
We'll review the previous lesson by showing them an introductory video on hard and soft water.

Tell them to **write down the differences between hard and soft water that are mentioned in the video. You could play the video one more time so they can note down the differences. (10 mins)**

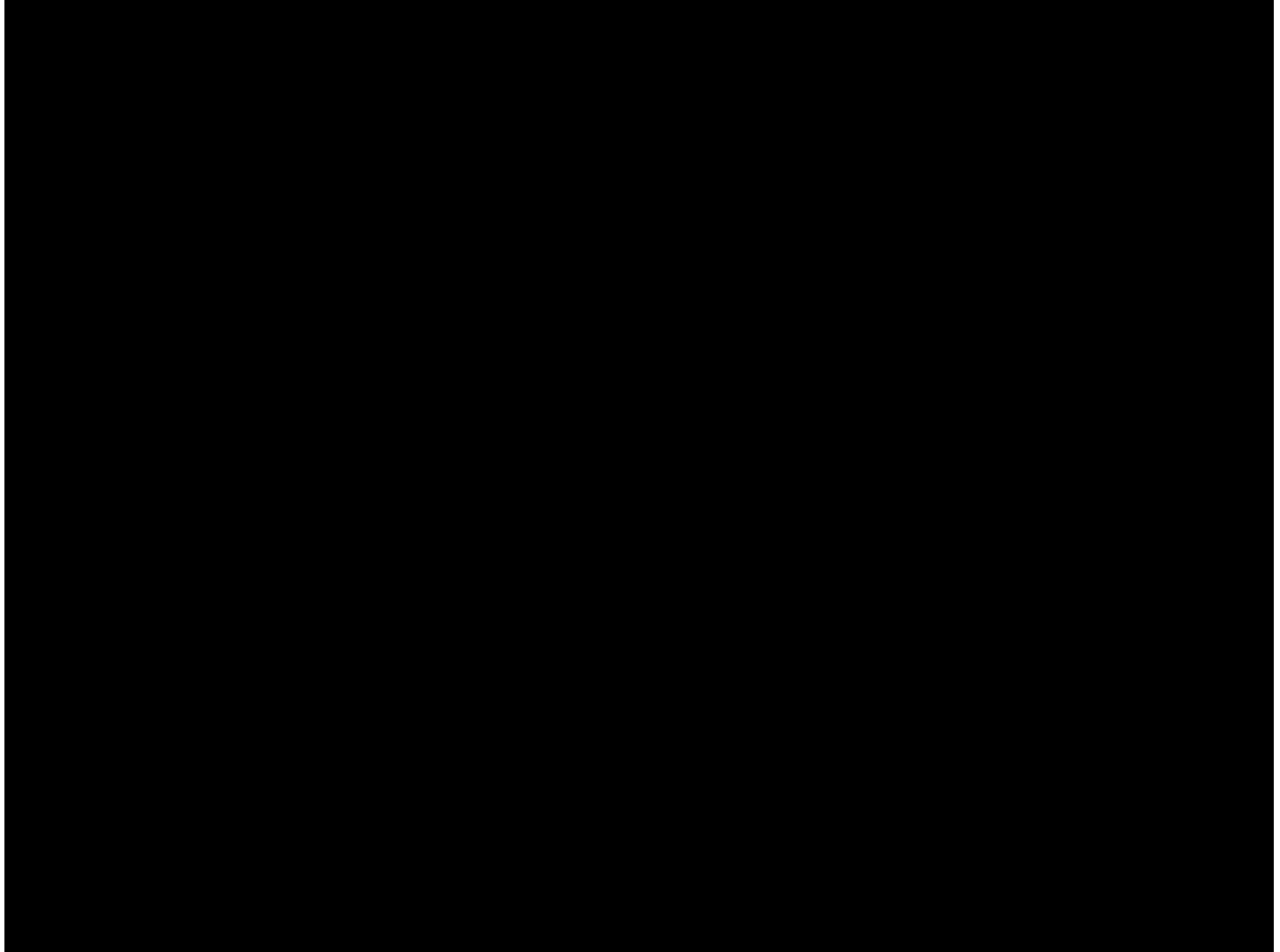
Hard and Soft water

We’ll revise what we learned in the last class by watching a video on hard and soft water...

In your notebooks write down the differences between hard water and soft water, based on the video, the activity and experiments done so far.



Hard and Soft Water



Why is rainwater always soft?

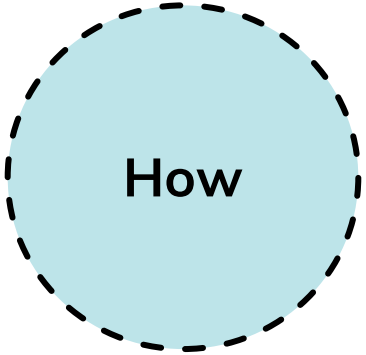
Write your responses in the book.

What

Show them a few pictures of household items and other things getting affected by hard water.

Why

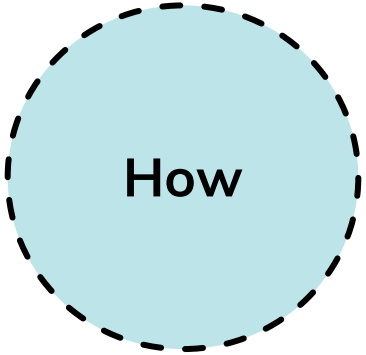
This picture activity is for students to begin to **understand what could be some of the disadvantages of using hard water.**



Picture Activity:
Have the students (in pairs – with the person sitting next to them) **discuss the disadvantages of using hard water, and write these down**.
Go over the disadvantages of hard water.

Discuss the two types of hard water – temporary hardness and permanent.

Ask students to think about what these terms might mean, and to write it down (their guesses) in their notebooks.



Further discussion:

How do you think hardness may be removed? How do you think it is treated?

What do you think are the simplest ways of removing the salts from hard water?

Picture Activity!

Look at these pictures!

What is the white deposit?

Why do these deposits form?

Discuss each picture with the person sitting next to you. Write down your thoughts in your notebook.


Hard water increases soap consumption

Hard water increases soap consumption

Is this true?

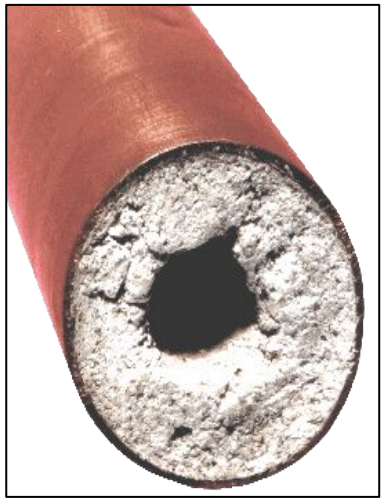
Why do you think that using hard water to wash your hands would increase the amount of soap used?

Hint:

What happens when hard water reacts with soap/detergent?

Disadvantages of Hard Water

Looking at each of these images and what we have discussed previously, discuss what are the disadvantages of hard water.



The calcium and magnesium ions from hard water produce SCUM with soap.

Sodium stearate reacts with the Calcium and Magnesium ions to form Calcium stearate **(insoluble)** which is called SCUM.

Hard water increases soap consumption

Since the SCUM is **insoluble**, you will need more of the soap in order to wash properly and clean the substance.

Hard water increases soap consumption

Industries need superheated steam that is free from the salts, to carry out different processes. Water is boiled in huge boilers and passed through the pipes.

When calcium bicarbonate is boiled, it forms **insoluble** calcium carbonate, carbon dioxide and water.

Calcium bicarbonate →(boiling)→
Calcium carbonate + Carbon dioxide + Water

The calcium carbonate thus forms deposits at the bottom of the boiler and the walls of pipes.

This calcium carbonate deposit in the pipes could eventually develop cracks in the boiler, causing it to burst.

Temporary and Permanent Hardness

When we think of the word ‘temporary’ and the word ‘permanent’ what are some of the words that come to mind?

Spend about 2 minutes thinking about some of the synonyms (words with the same meaning) for temporary and permanent.

What do you think these words mean?

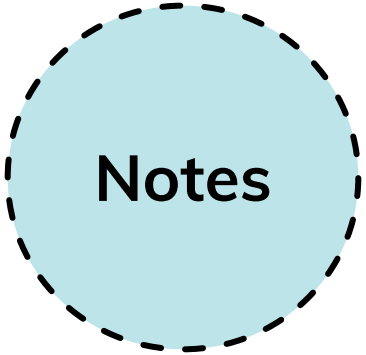
The two kinds of hardness are –

temporary and **permanent**.

Temporary hardness can be easily removed.

Permanent hardness is harder to remove.

Temporary hardness	Permanent hardness
It is caused by **calcium and magnesium bicarbonates** dissolved in water.	It is caused b**y calcium and magnesium chlorides and sulphates** dissolved in water.
It **can be removed by boiling**, where the bicarbonates decompose into carbonates. These carbonates can be filtered out.	It **can’t be removed by boiling**. It can be removed using the ion exchange process.



Give students 8 minutes to write down the answers to these questions in their notebooks.

Walk around and discuss their answers with them.

Ask a few students to stand up and share their answers with the rest of the class.

Quick Check!

- Temporary hardness in water is due to dissolved bicarbonates of _____ and _____.
- Permanent hardness in water is due to dissolved calcium and magnesium _____ and _____.

Give reasons for -

- Why it is dangerous to use hard water in industrial boilers.
- Why rain water is a good example of soft water.

Homework

‘Can the hardness of water be determined by soap bubbles?’

Design an experiment for the above question, using a format that includes:

Aim	
Materials needed	
Steps	
What happened?	
Why did it happen?	

Homework! – To be submitted in 2 days

- Note: Collect a 1 litre sample of hard water and 1 litre of soft water.
- Before you carry out a fresh analysis, write your hypothesis or prediction on what you think is the answer to this question: Can hardness be determined by soap bubbles? And **WHY** do you think it can/can't be determined by soap bubbles?
- Then conduct the experiment and document it in the format given above in green.