



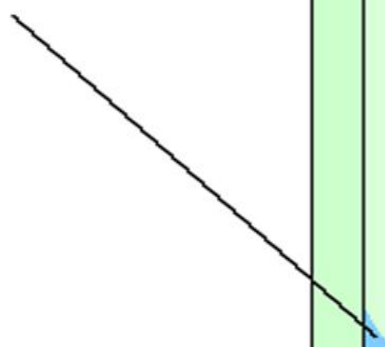
Water

The Meniscus

- When water stays still the surface of water is curved
- This is called the meniscus



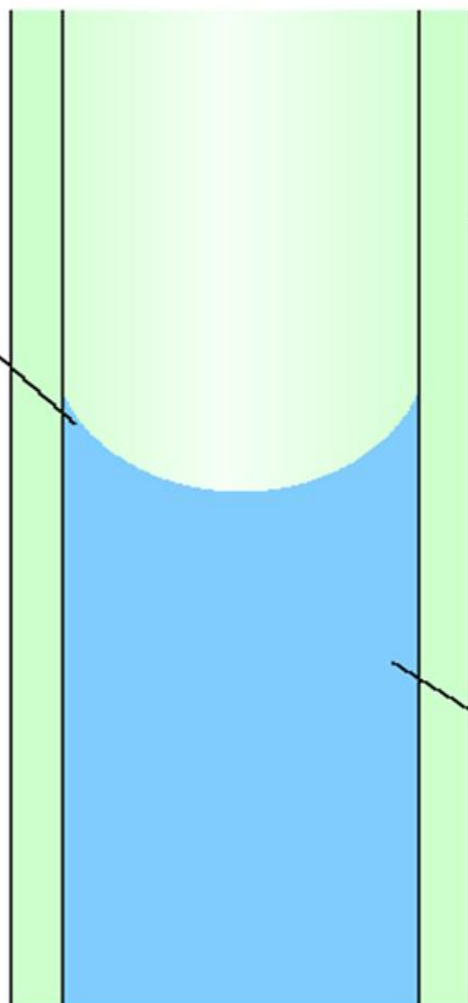
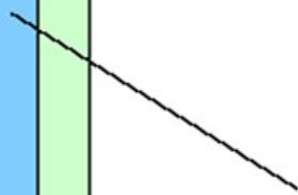
Meniscus



Glass

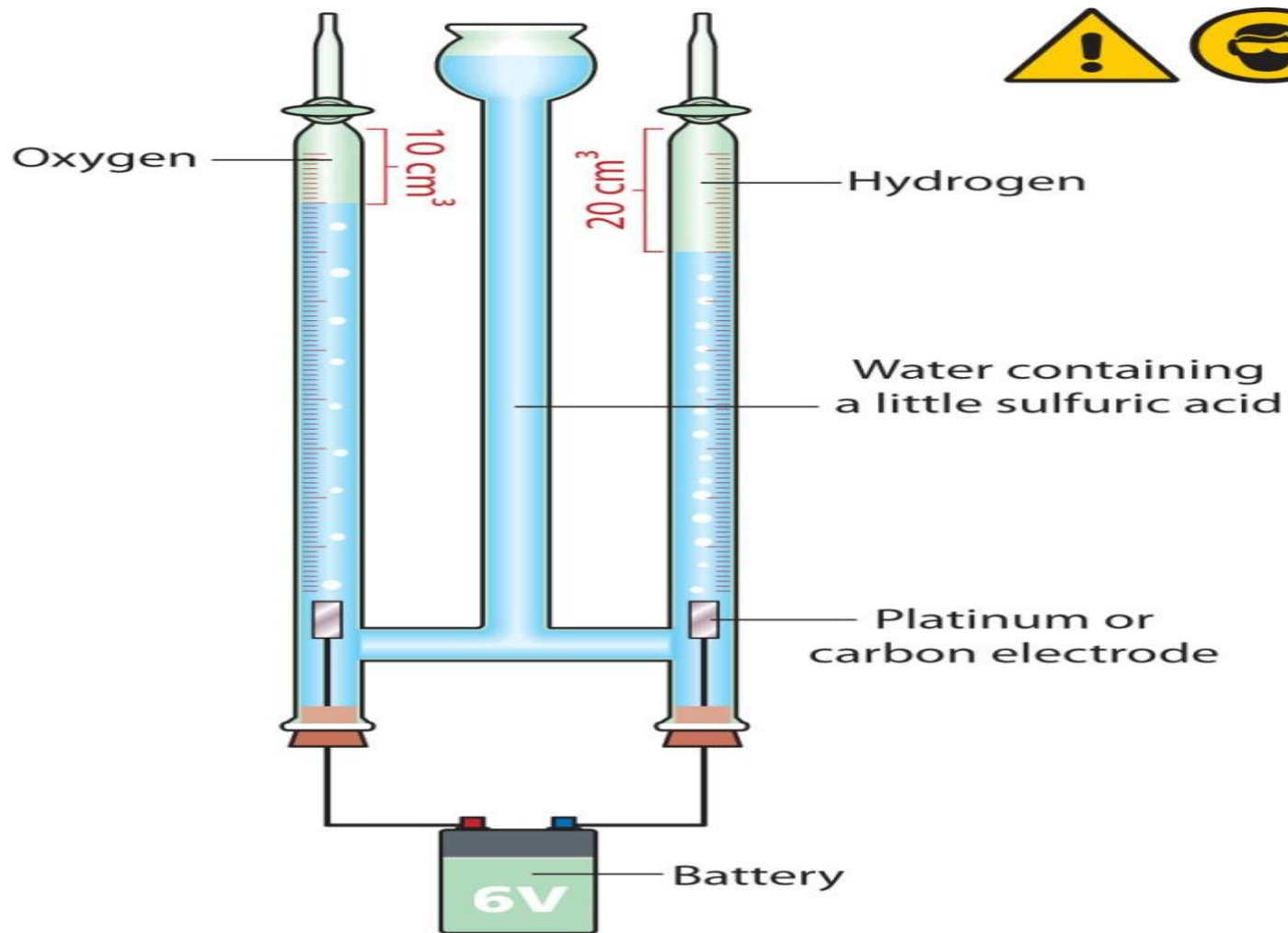


Water



Electrolysis of water

- Electrolysis means using electricity to break up the compound of water (H_2O) into its elements of Hydrogen and Oxygen
- You use a Hoffmann voltammeter



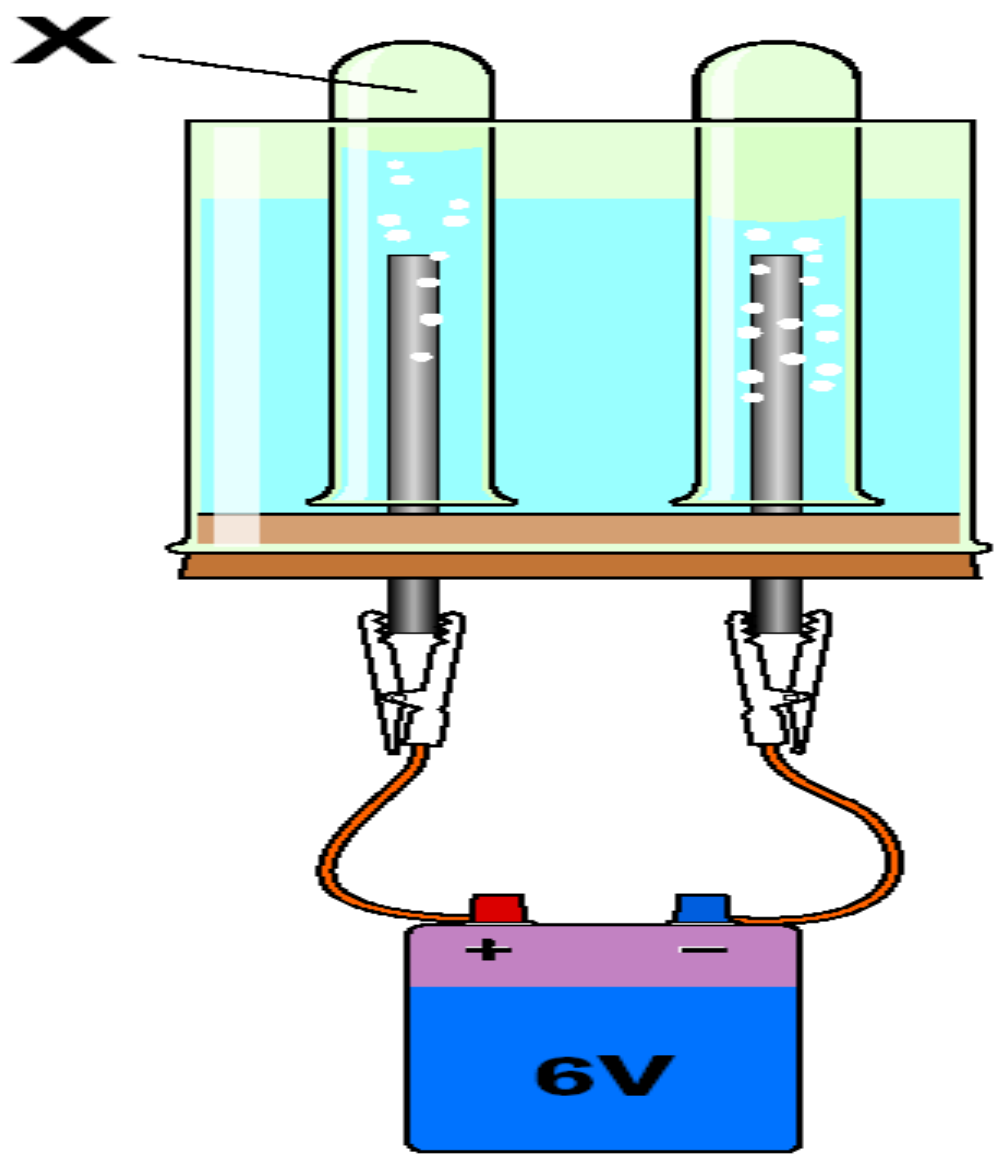
▲ Fig 28.11 Hoffmann voltameter

- Water is a poor conductor of electricity so you have to add a small amount of dilute sulphuric acid
- Hydrogen gas forms at the negative side of the battery
- Oxygen gas forms at the positive side of the battery

- Twice as much Hydrogen gas forms because water H_2O splits up into

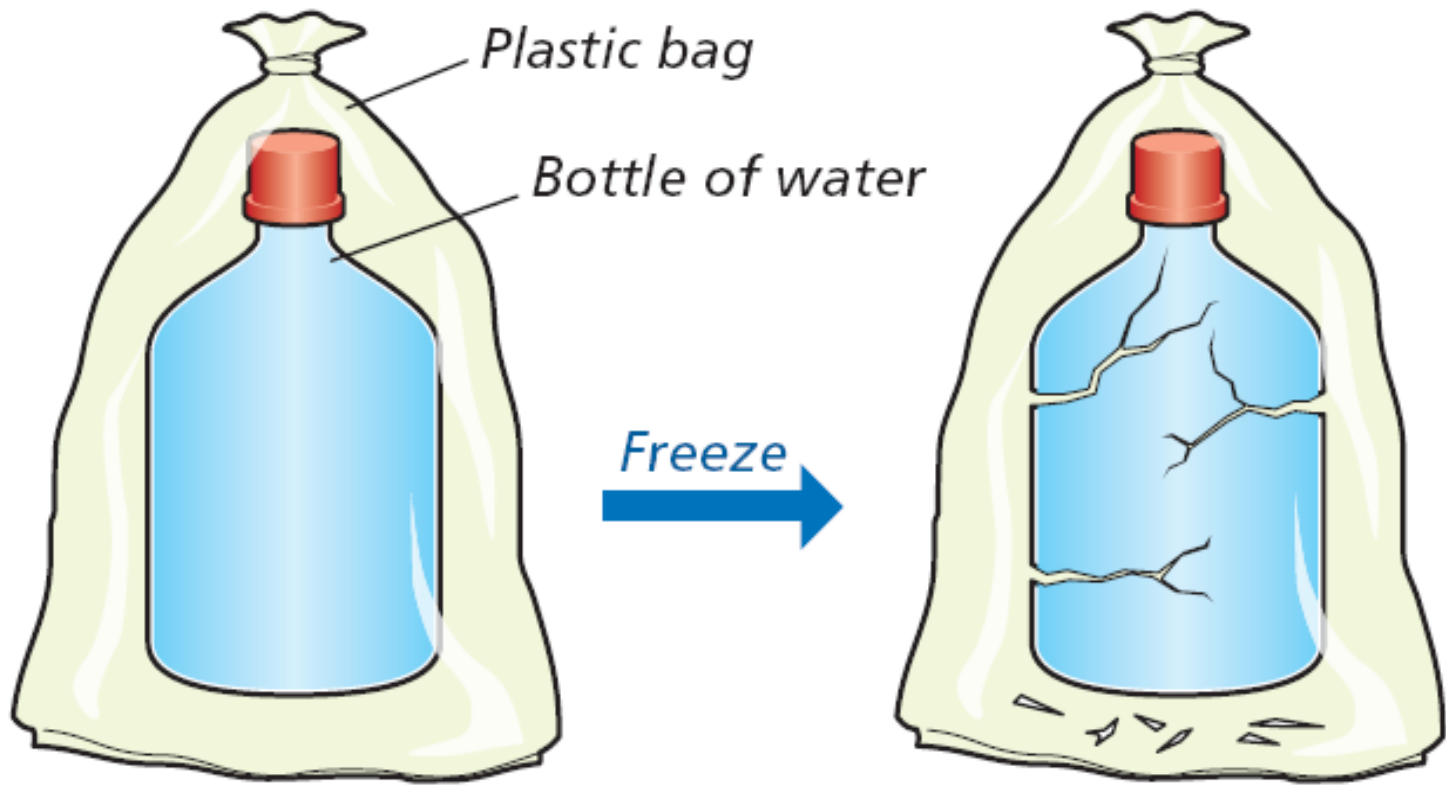
H_2 and O

2 Hydrogen and 1 Oxygen



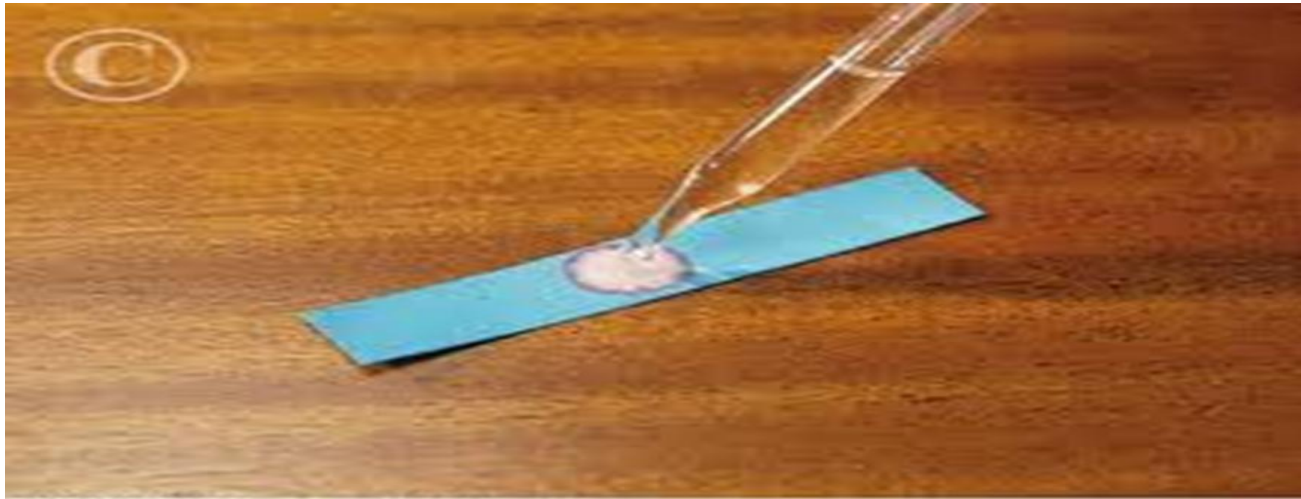
Expansion of water

- Water is unusual because when it freezes it actually expands!
- Every other liquid contracts when it freezes
- Water freezes at 0°C and boils at 100°C
- Water is colourless
- Water is an excellent solvent



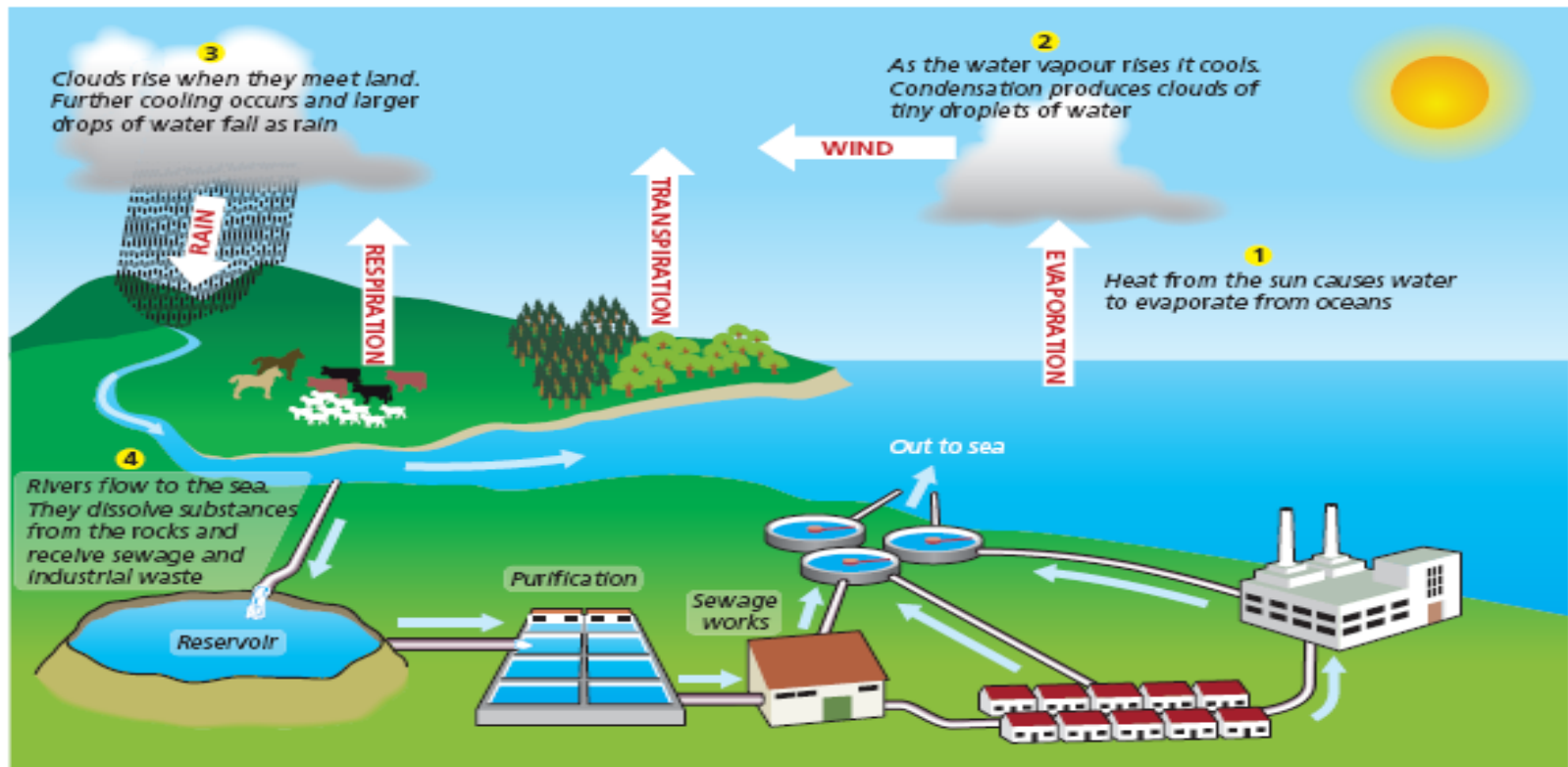
To test for water

- Cobalt Chloride paper goes from blue to pink when it comes into contact with water



a598575 [RM] © www.visualphotos.com

The water cycle – how water is recycled



Water treatment

- Water is treated to clean it for drinking
- Unclean water can cause diseases like typhoid and cholera

Screening

- Water is passed through wire meshes to trap large floating material e.g. twigs

Settling

- Water is stored in large tanks and left to allow all the dissolved solids to fall to the bottom to form a sludge
- The water is decanted (poured) from the sludge

Filtration

- Water is passed through beds of gravel and sand which filters all remaining particles in the water

Chlorination

- Water is treated with Chlorine to kill all the bacteria in it

Fluoridation

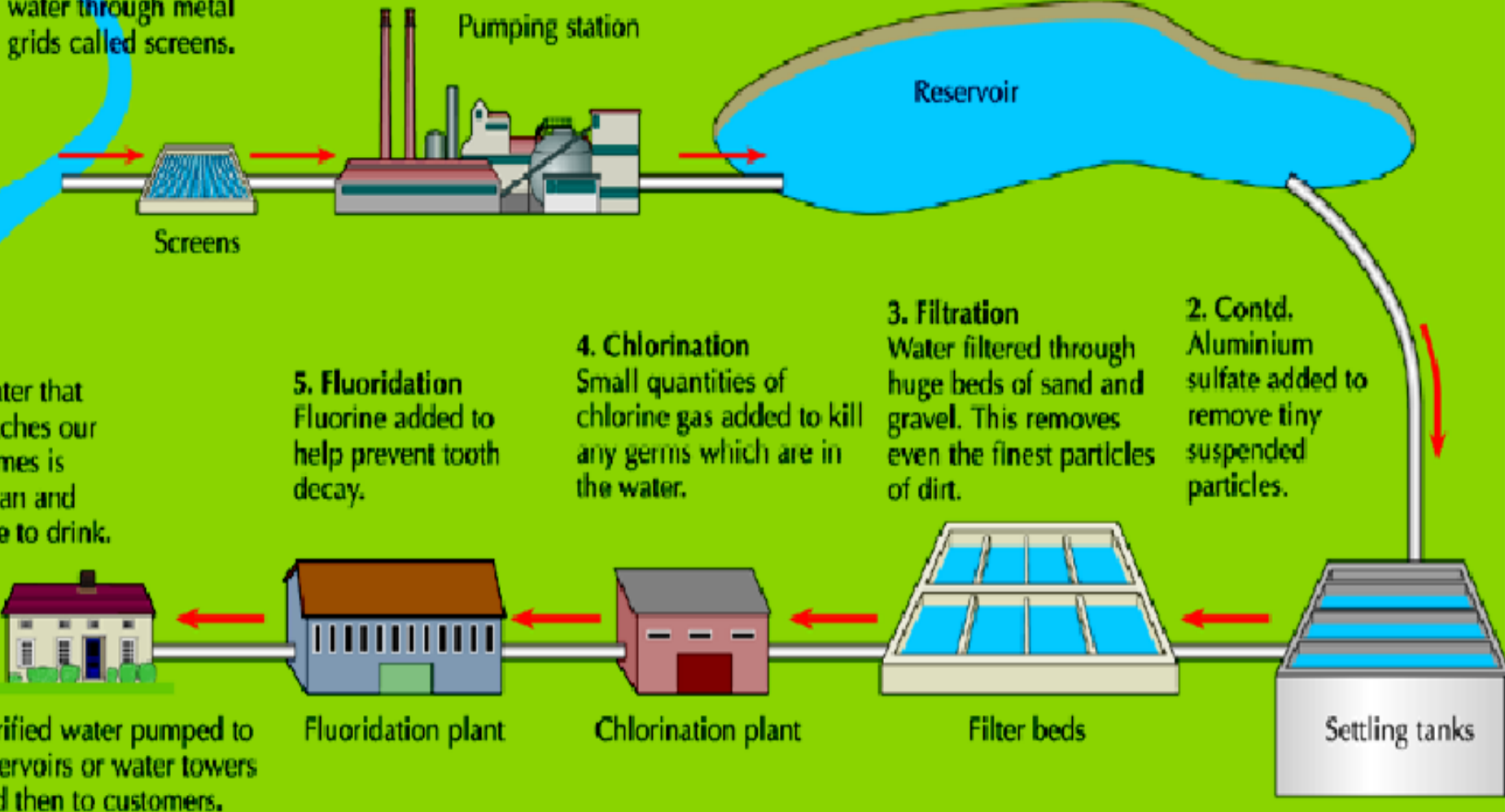
- Fluorine is added to the water to prevent tooth decay

1. Screening

Water collected from river and pumped to reservoir. Large pieces of dirt removed by passing water through metal grids called screens.

2. Settling

Water stored in reservoir until needed. While stored, particles of dirt settle out at bottom.



Screens

Pumping station

Reservoir

2. Contd.
Aluminium sulfate added to remove tiny suspended particles.

3. Filtration
Water filtered through huge beds of sand and gravel. This removes even the finest particles of dirt.

4. Chlorination
Small quantities of chlorine gas added to kill any germs which are in the water.

5. Fluoridation
Fluorine added to help prevent tooth decay.

Settling tanks

Filter beds

Chlorination plant

Fluoridation plant

Purified water pumped to reservoirs or water towers and then to customers.

Water that reaches our homes is clean and safe to drink.

Silly

Sean

Follows

Chelsea

Football

Screening

Settling

Filtration

Chlorination

Fluoridation

Desalination

- Desalination is when salt water is treated to turn it into drinking water
- Water is first evaporated and then condensed to collect the pure water
- A very expensive way of treating water



Water hardness

Hard water:

Water that does not easily lather with soap

Soft water:

Water that easily forms a lather with soap

- Hard water is caused by Calcium (Ca^{+2}) or Magnesium (Mg^{+2}) ions
- Hard water will form in certain parts of the country



Soft

Less than 100mg/l as calcium carbonate



Slightly hard to moderate

100 - 200mg/l as calcium carbonate

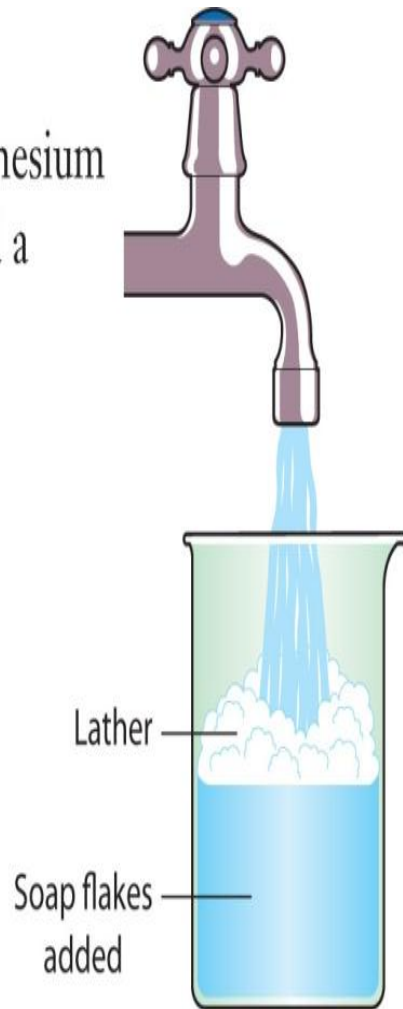


Hard to very hard

above 200mg/l as calcium carbonate

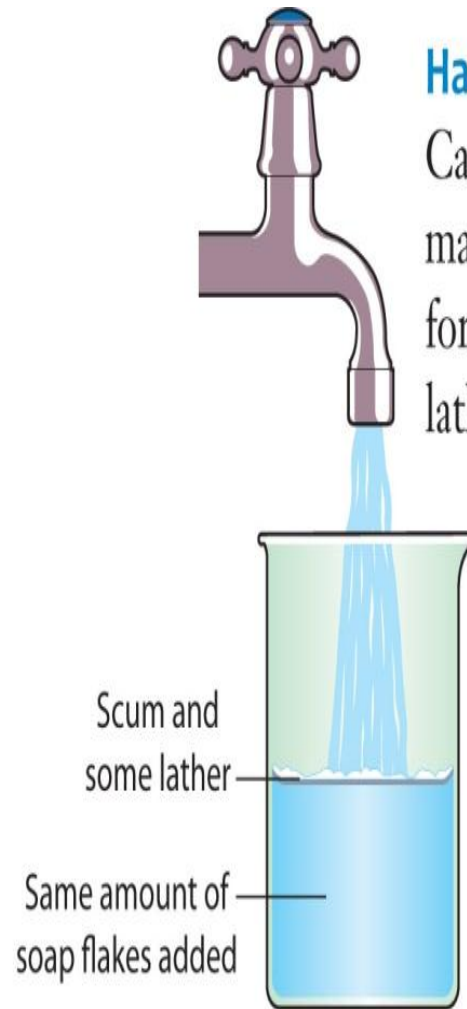
Soft water

No calcium or magnesium ions so no scum and a good lather.



Hard water

Caused by calcium or magnesium ions. Scum forms with little or no lather.



▲ Fig 29.2 Soft water lathers well with soap, whereas hard water does not

Advantages of Hard Water

- Good source of Calcium, which is needed for strong teeth and bones
- Tastes nicer

Disadvantages of Hard Water

- Wastes soap
- Lime scale blocks up kettles and pipes





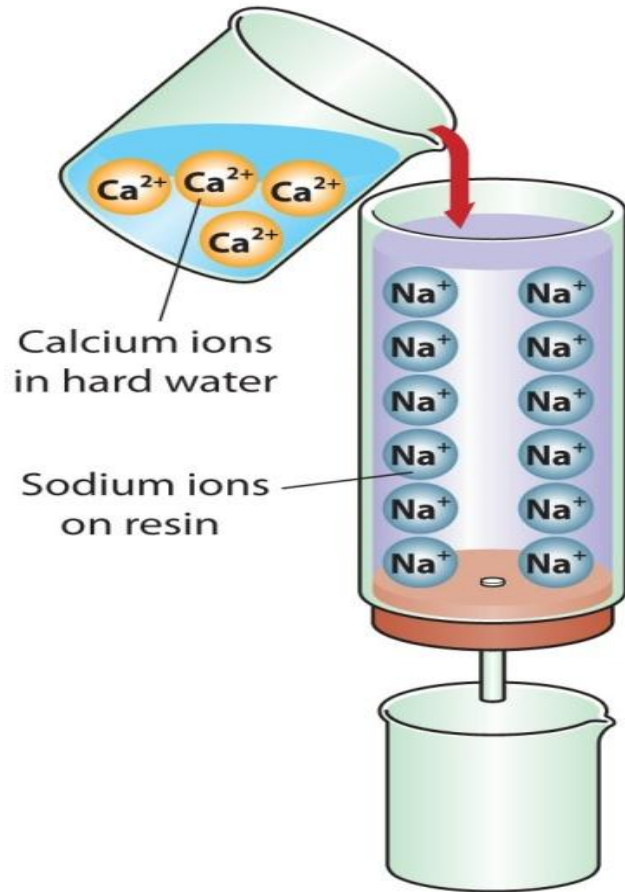
Softening water

- Hardness in water can be removed in a number of ways
- The easiest way to remove hardness is to boil the water
- The calcium and or magnesium ions need to be removed

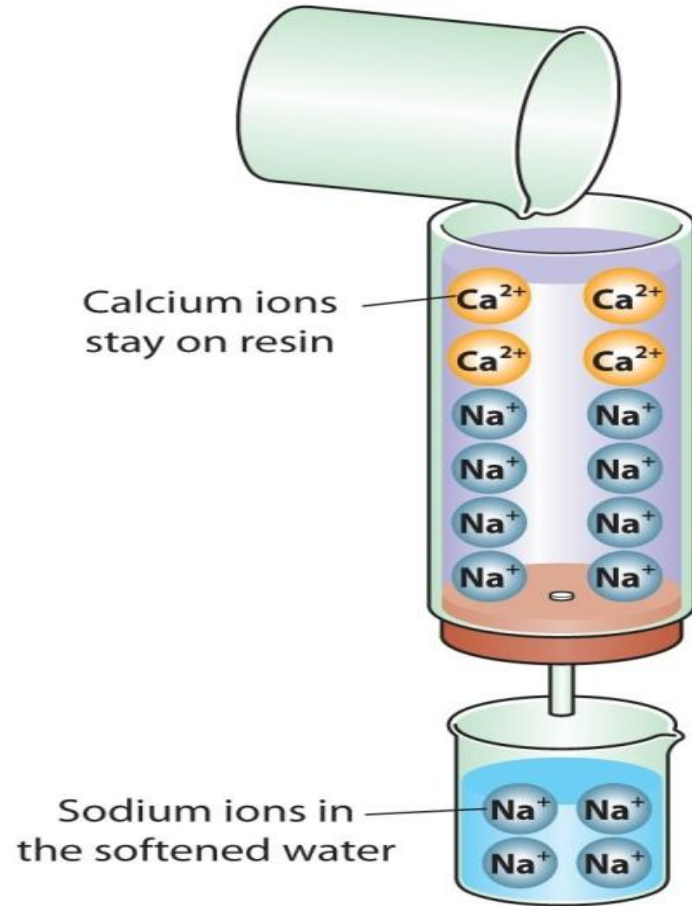
Ion Exchanger

- An Ion Exchanger works by replacing the ions that cause hardness (Ca^{+2} and Mg^{+2}) with ions that don't.
- Sodium ions are often used in the resin
- Hard water runs through the resin and swaps its calcium and magnesium ions for sodium ions

Column before use



Column in use



▲ Fig 29.4 Ion exchange



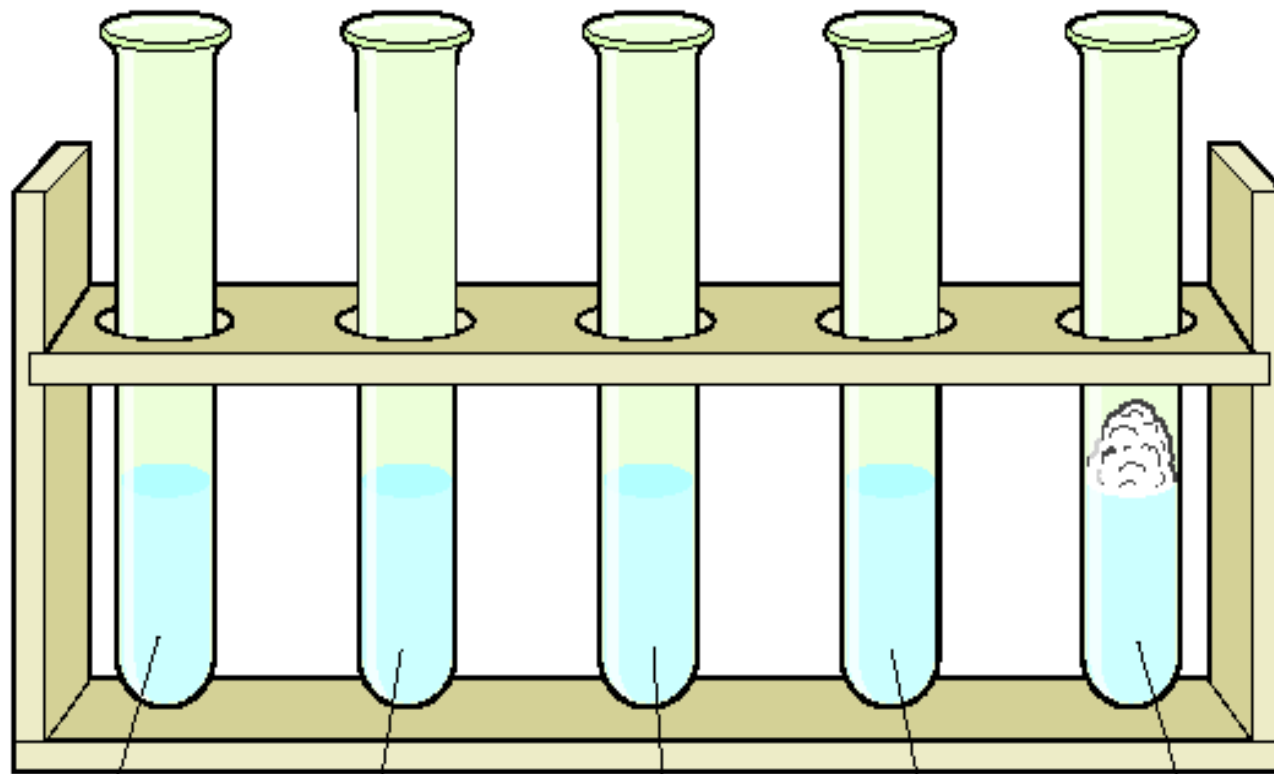
Deioniser

- A deioniser removes all ions from water

To investigate hardness in water

- Fill each test tube with 20 cm³ of each water sample
- Mark each test tube 5 cm³ above the water level
- Add a drop of soap solution to each test tube, stopper and shake
- Continue adding soap until a lather forms





Hard water

Distilled water

Sea water

Tap water

Rainwater

- Different water samples needed different amounts of soap solution to make a lather.
- The water sample that required the most amount of soap to form a lather was the hardest.
- The water that needed the least amount of soap solution was soft water.