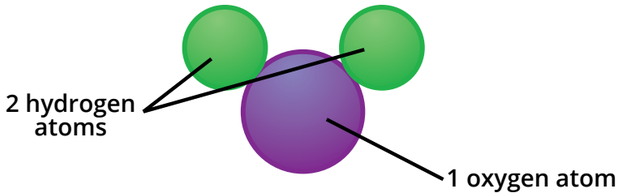
1.3 Water: Supply and Public Treatment

Introduction:

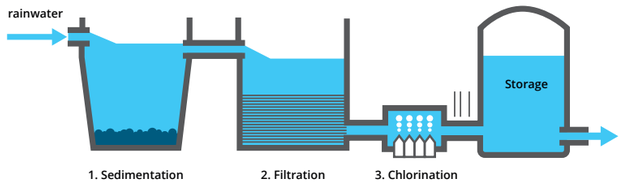
- Water is a **compound** with the formula **H_2O**.



- The uses of water include: a coolant in factories, for hygiene purposes (washing and keeping clean), growing plants and food, as a solvent (to dissolve minerals and gases) and as drinking water.
- Pure water **boils at exactly 100°C** however, the water we use daily is not pure, so does not boil at this temperature!

Treatment of Public Water:

- Water is made safe for drinking in the UK by treating rainwater. There are 3 main stages



1. **Sedimentation** – large insoluble particles settle to the bottom of the tank by gravity.
2. **Filtration** – small insoluble particles are removed by passing the water through sand filter beds.
3. **Chlorination** – the water is sterilised by adding chlorine* to kill bacteria.

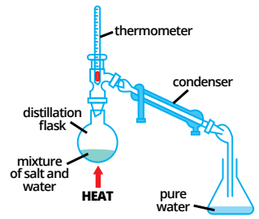
** Note – the amount of chlorine added to water supplies is carefully controlled so there is enough to kill bacteria without being harmful to us!*

Water Sustainability:

- Only a very small percentage of the water on Earth is safe for drinking.
- **Shortage** of water arises when there is **more demand than supply** of water. Factors that contribute to this include increasing populations, expanding industry and climate change.
- Ways of decreasing our use of water include having a shower instead of a bath, using wastewater for washing cars and watering the garden and only using washing machines and dishwashers when they are full.

Desalination of sea water

- **Desalination** is the **removal of salt** from sea water. It is a method of obtaining additional drinking water to meet demand.
- **Distillation** is the simplest method of desalination. Other methods include the use of **membrane systems**.



The saltwater is heated and boiled.
The water vapour cools and condenses.

Pure water collects in the flask.
The salt is left behind.

- The potential of using desalination as a source of drinking water depends upon several factors including closeness to the sea, availability of 'clean' energy supplies and a country's wealth.

Adding Fluoride to Water Supplies:

- Fluoride ions are found in most natural freshwater supplies.
- The concentration of fluoride ions varies between countries and in different areas of the UK.
- The decision to add fluoride ions to water supplies is made by individual countries and local authorities.

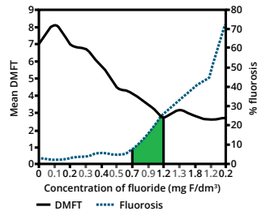
Fluoridation of Water Supplies:

- Fluoridation of water supplies is a controversial matter - there are arguments both for and against the process.
- **Fluoride** is added to water supplies because there is evidence it **prevents tooth decay in children**, by strengthening tooth enamel.
- Many people oppose adding fluoride to water supplies since there is also evidence it:
  - causes fluorosis (discolouring of teeth in adults)
  - increases the chance of developing stomach and bone cancers
  - may cause infertility.
- Other people argue that the fluoridation of water is mass medication and that it takes away a person's freedom of choice.

Notes

1. Fluoridation of water supplies is optional, whereas chlorination is compulsory – we must have sterile water!
2. Science provides facts and evidence to inform opinion. It does not tell us whether it is correct to add fluoride to water supplies.
3. Articles relating to the fluoridation of water come from a wide range of sources. Many can be biased and try to influence opinion!
4. Other sources of obtaining fluoride ions include toothpastes and mouthwashes.

How much fluoride?



The graph shows data collated from a public survey. It shows that as the fluoride concentration increases;

- DMFT in children decreases
- the amount of fluorosis increases.

However – it is not until concentrations of fluoride are above 0.7mg/dm3 that the amount of fluorosis increases significantly.

Similarly, concentrations of fluoride higher than 1.2 mg/dm3 do not further reduce DMFT.

Therefore, the evidence suggests that a concentration of 0.7-1.2mg/dm3 of fluoride will have the biggest impact on DMFT in children with the least negative impact.