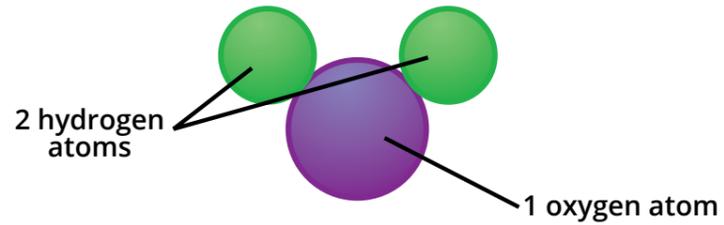


1.3 Water: Supply and Public Treatment

Introduction:

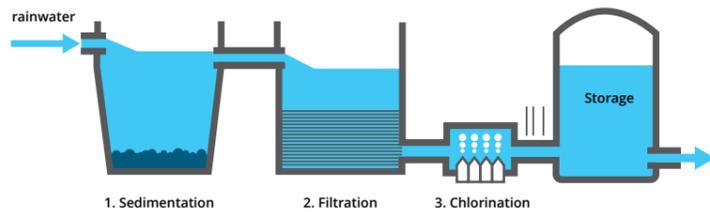
- Water is a **compound** with the formula H_2O .



- 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:



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

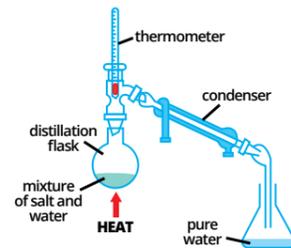
* Note – the amount of chlorine added to water supplies is carefully controlled so there is enough to kill bacteria without being harmful to us!

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.

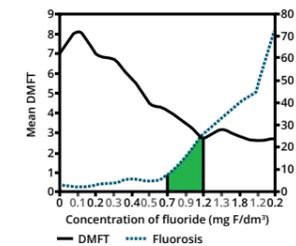
Fluoridation of Water Supplies:

- 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

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