

Chemistry knowledge organiser  
Unit 10: sustainability

**The definition of sustainability is...**

Meeting the needs of the present without jeopardising the ability of future generations to meet their own needs

**What is potable water?**

Water that is safe to drink

**Explain why potable water is not pure.**

It contains safe levels of dis-solved substances

**Define the following**

**Finite**—a resource that will run out/cannot be replaced

**Abundant**—a resource there is a lot of

**Reserves**—amount of a resource available

**Biofuel**— fuels produced from plant material rather than fossil fuels (eg bioethanol and biodiesel)

**Biofuel advantages(+) & disadvantages(-):**

-human resources: more people are needed to produce biofuels than are needed to produce petrol and diesel

+increased income: for farmers

+lower fuel prices: biofuels limit the demand for fossil fuels, helping to reduce increases in fuel prices.

+Biodiesel naturally contains little sulphur

-while biofuels produce less carbon dioxide overall, they are not carbon neutral. This is because fossil fuels are used in their production

-crops that could be used to feed people are used to provide the raw materials for biofuels instead

**Quiz 1 (everyone)**

1. What is sustainable development?
2. Give an example of a finite resource
3. Give an example of a renewable resource
4. Wood is a natural material that was used for window frames. Which synthetic products have replaced/supplemented it's use?
5. What is fifty thousand in standard form?

**Quiz 2 (everyone)**

1. What is potable water?
2. Why isn't potable water pure?
3. Give an example of a sterilizing agent used on potable water
4. Why is water filtered?
5. Name 1 way water can be desalinated

**Quiz 3 (everyone)**

1. Urban/agricultural/industrial waste water is called?
2. Screening removes ?????? From waste water
3. Sedimentation removes ?????? From waste water
4. Why are the products of anaerobic sludge digestion useful?
5. How can desalination produce greenhouse gases?

**Quiz 4 (Higher only)**

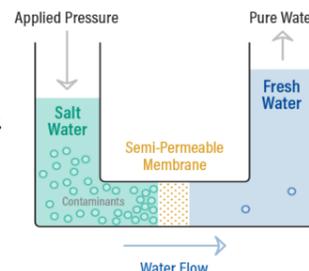
1. What is a low grade ore?
2. Which extraction method uses plants to absorb minerals?
3. What happens to the plants after they have absorbed the metal compounds?
4. Which extraction method uses bacteria?
5. Which process is used to extract copper from copper solutions?

**Quiz 5 (everyone)**

1. What does an LCA assess?
2. What is qualitative data?
3. What is quantitative data?
4. What does objective mean?
5. What does subjective mean?

**Explain how saline (seawater) can be made into potable water**

1. **Distillation** is used to evaporate large volumes of seawater to remove the salt, and then cooling it so that it condenses into potable water. Requires lots of energy to supply the heat.
2. **Reverse osmosis**—forces seawater through a semi permeable membrane that doesn't allow salt through. Requires lots of energy to supply the pressure.



**List where we can get potable water from and where it can be stored**

Lakes, rivers, aquifers, bore holes and reservoirs

**Explain why we would use desalination & why it is expensive**

Arid areas have very little groundwater available so desalination is sometimes the only option (or demand for groundwater in an area might be too high).

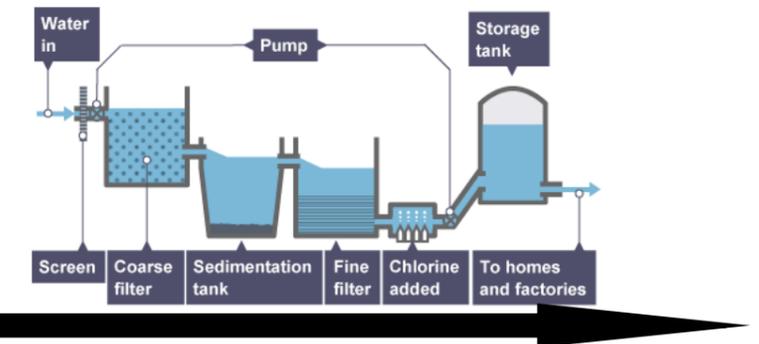
**Expenses/impact on environment:**

- it is expensive because large amounts of energy are needed to heat the seawater/force it through the membrane at high pressure.

- it increases the use of fossil fuels - which are non-renewable resources

- carbon dioxide emissions from burning fossil fuels contribute to global warming

**Explain how groundwater can be made into potable water**

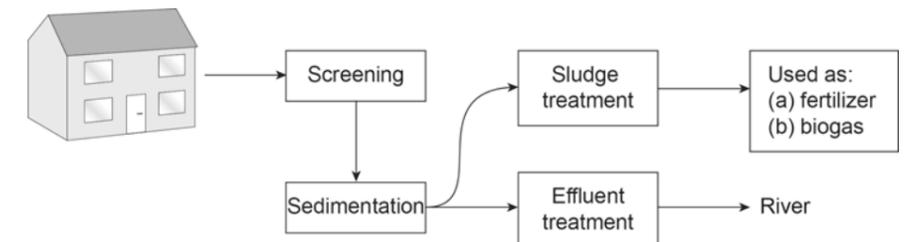


**Sedimentation** - removes tiny particles by getting them to clump together into larger ones and sink to the bottom.

**Filtration**— removes very small particles by passing the water through sand

**Sterilisation** - chlorine is added to kill microbes.

**Explain how waste water/sewage is treated**



**Screening:** removes large particles (twigs, dead fish etc) by passing the water through a mesh/grid

**Sedimentation:** removes tiny particles by getting them to clump together into larger ones and sink to the bottom.

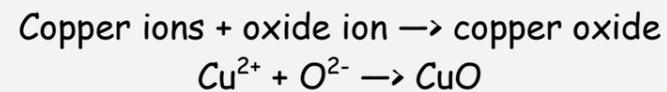
**Sludge treatment:** includes heating sludge to encourage anaerobic bacteria to digest it, any leftover can be sold as fertiliser.

**Effluent treatment:** involves bubbling oxygen through it to encourage aerobic bacteria to digest it.

### HIGHER ONLY!

Explain how and why phytomining is used.

Grow plants in a low grade copper ore. When growing they will absorb some copper ions. Burn the plants to create ash that contains copper oxide:



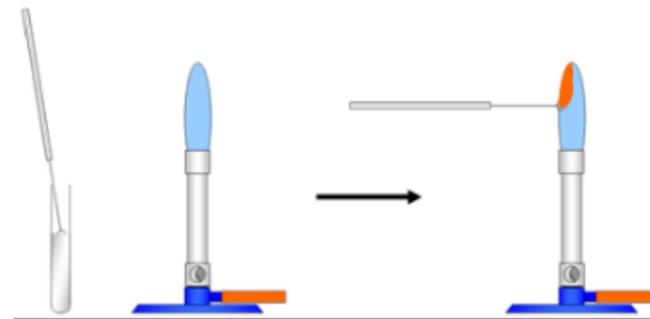
The ash can be dissolved and electrolysis is used to extract the copper from solution.

The process is needed because copper is a finite resource. As it becomes more scarce the availability of high grade ores decreases.

How and why do we use a flame test to check for pollutants?

- Evaporate some of the water sample—if any solids are left behind it is impure.
- Heat a wire loop to clean it.
- Dip it in some acid and then into the solid from the water sample.
- Heat the sample in a blue flame and observe the colour.
- Different metals have different flame colours: E.g. copper = green, calcium = red, sodium = yellow/orange

Flame tests tell us which metal ions are dissolved in the water



How and why can we use silver nitrate solution to test for pollutants

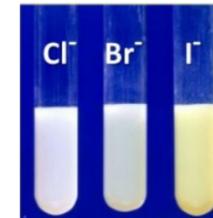
Pour a small amount of a water sample into a test tube.

Add a few drops of silver nitrate solution

Observe to see if a solid precipitate forms.

The colour of precipitate identifies the pollutant present:

- Chloride ions (Cl<sup>-</sup>) = White
- Bromide ions (Br<sup>-</sup>) = Cream
- Iodide ions (I<sup>-</sup>) = Yellow



Pollutant tested for: Halide ions (group 7 ions)

### HIGHER ONLY!

Explain how and why bioleaching is used

Some bacteria absorb copper compounds. They then produce solutions called leachates, which contain copper compounds. This method of extraction is called bioleaching. The copper can be extracted from the solution by electrolysis.

The process is needed because copper is a finite resource. As it becomes more scarce the availability of high grade ores decreases.

How do urban environments affect the water cycle?

Urban lifestyles and industrial processes produce large amounts of waste water (sewage) that needs treating before it is released into the environment.

This sort of water often has levels of chemicals, organic matter and microbes that are considered harmful to the environment.

To make this water potable you must treat it to be safe enough to release it into the environment and then treat it again as groundwater to make it safe to drink.

Explain what the following mean...

**Qualitative:** data that is descriptive (eg the flame colour of copper is green) and can't be measured on a scale.

**Quantitative:** data that is numbers based (eg the mass of an average storm-cloud is 400 tons) and measured on a scale.

**Objective:** making a statement or decision based on facts and data that you can measure and observe.

**Subjective:** making a statement or decision based on (or influenced by) personal feelings, emotions or opinions.

**reduce, re-use, recycle...**

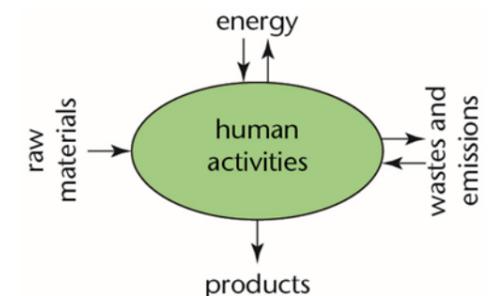
Explain how these terms are used to stop us using too many finite resources

**Reduce:** create less waste by choosing to buy items with less packaging, reducing the demand for finite resources and the energy needed to make them.

**Re-use:** Items can be used many times (eg water bottles), doing so prevents the need for more to be made from finite resources (and the energy needed to make them).

**Recycle:** items can be broken down and re made into different items with a new use, reducing the demand for finite resources and the energy needed to make them.

Explain how a life cycle assessment is carried out and what is important to consider when making one



The stages in a simplified LCA are to consider:

- **extracting** and *processing* the raw materials
- **manufacturing** the product and *packaging*
- the *use* and *operation* of the product during its lifetime
- *disposal* at the end of its useful life.

How can advertisers use information about sustainability to their advantage?

They can be selective about the information that they give out. They can be biased towards a product by only explaining the positives about the sustainability of it and not the negatives.