Exercise walk-through

10.1
Resources and potable water (4.10.1.1–4.10.1.3)

AQA · GCSE · Chemistry

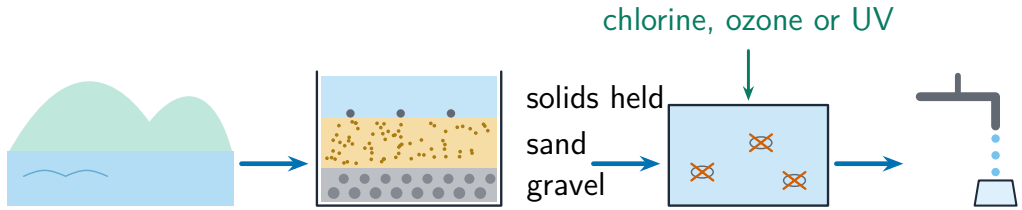
Resources and sustainable development

- We use Earth's resources for warmth, shelter, food and transport.
- Natural resources, supplemented by farming, give us food, timber, clothing and fuels.
- Chemistry also makes synthetic products, such as polyester fibres, that can replace natural ones.
- A **finite resource** will run out, because it is not replaced as fast as we use it: metal ores and fossil fuels are examples.

Potable water

- screening removes large objects, and grit settles out;
- **sedimentation** in large tanks separates it into **sludge**, which sinks, and **effluent**, the liquid on top;
- the **sludge** goes through **anaerobic digestion**: bacteria break it down without oxygen, producing methane gas that can be burned for energy;
- the **effluent** goes through **aerobic biological treatment**: air is bubbled through it so that other bacteria break down the remaining organic matter.

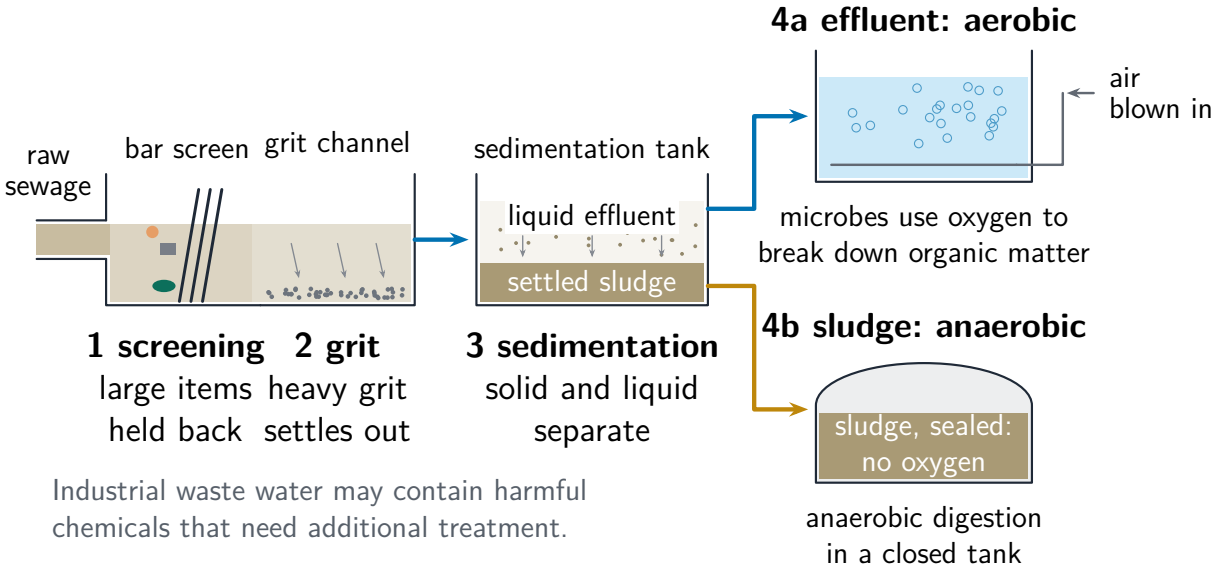
Figure: Potable water



salt water (sea water) is a different route: **distillation** or **reverse osmosis** removes the dissolved salts, but both need a lot of energy, so they are used only where fresh water is scarce.

- Fresh-water filtration and sterilisation, distinct from **desalination**.
- Match each part of the diagram to the text.

Figure: Potable water ·



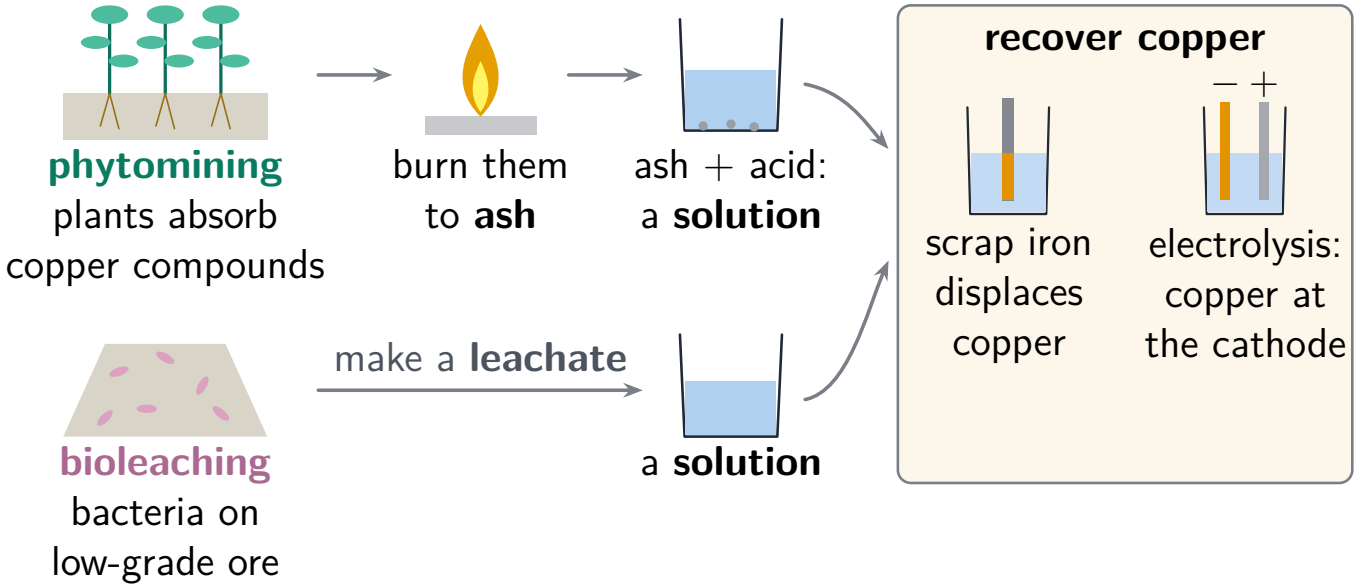
- **Sludge**: **anaerobic digestion**.
- **Effluent**: aerobic treatment.

Extracting copper with living things (higher tier)

- **Phytomining** uses plants to absorb metal compounds from the soil. The plants are harvested and burned, and the ash contains the metal compounds.
- **Bioleaching** uses bacteria to produce a solution, called a **leachate** , that contains metal compounds.

$$\mathrm{Fe} + \mathrm{CuSO_4} \rightarrow \mathrm{FeSO_4} + \mathrm{Cu}$$

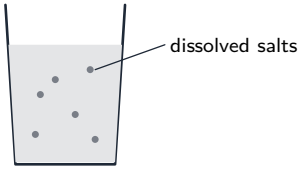
Figure: Extracting copper with living things (higher tier)



- Plants or bacteria collect copper compounds.
- Scrap iron or electrolysis recovers the copper.

Exercises 2.1·2.2

2.1 Tap water is potable but it is not pure. Explain why. [2]

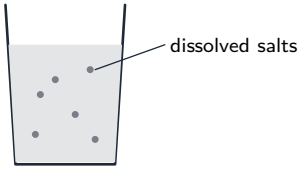


2.2 The diagram shows the steps to make fresh water safe to drink. Give **two** ways the water can be sterilised in the last step. [2]



Exercises 2.1·2.2

2.1 Tap water is potable but it is not pure. Explain why. [2]



2.1

- it contains dissolved substances, such as salts; pure means only one substance

2.2 The diagram shows the steps to make fresh water safe to drink. Give **two** ways the water can be sterilised in the last step. [2]

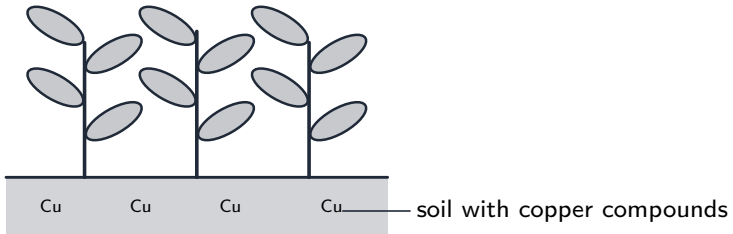


2.2

- any two: chlorine; ozone; ultraviolet light

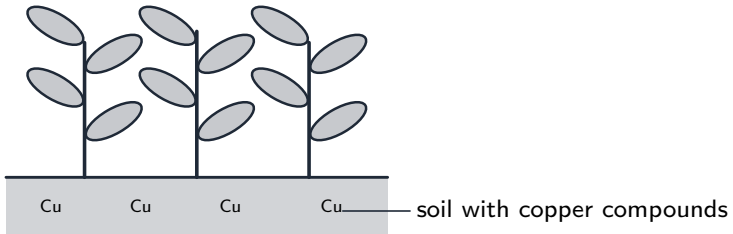
Exercise 2.3

2.3 (HT) Describe how phytomining is used to get copper compounds from land that contains only a little copper. [2]



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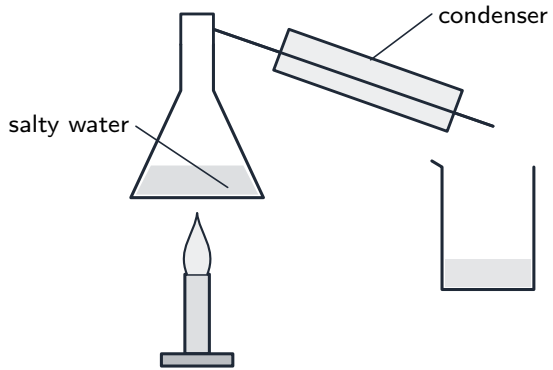


2.3

- plants are grown on the land and take up copper compounds; the plants are burned and the ash contains copper compounds

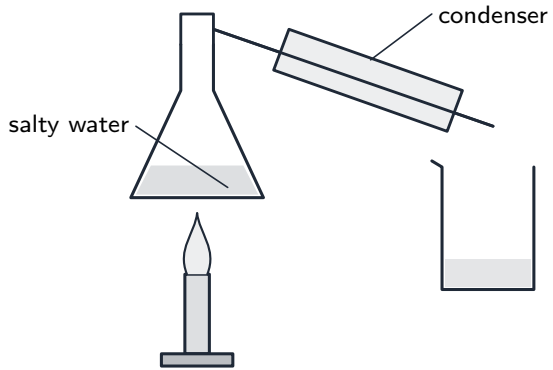
Exercise 3.1

3.1 Describe how pure water can be made from salty water using this apparatus. [3]



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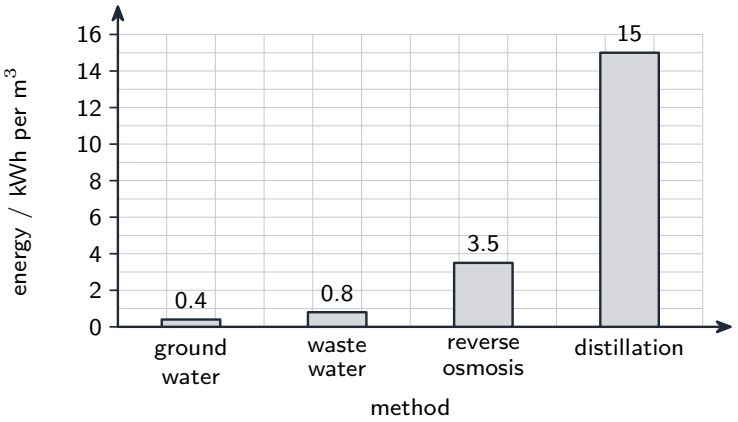
3.1

- heat the salty water until it boils
- the water vapour passes into the condenser, where it is cooled and condenses
- the pure water is collected; the salt stays in the flask

Exercise 3.2 (a)

3.2 The chart shows the energy needed to make 1 m^3 of drinking water by different methods.

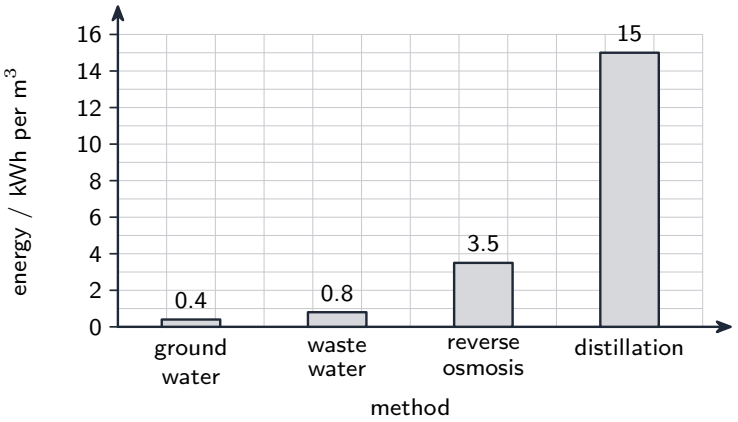
(a) Which method needs the most energy? How many times more energy does it need than treating ground water? [2]



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(a) **distillation**; $15 \div 0.4 =$ about **38** times

Exercise 3.2 (b)

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(b) Explain why most drinking water in the UK is made from fresh water, not by desalination. [3]

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(b) Explain why most drinking water in the UK is made from fresh water, not by desalination. [3]

(b) the UK has plenty of rain, so there is enough fresh water; desalination needs a lot of energy; so it costs much more

Exercise 3.2 (c)

3.2 The chart shows the energy needed to make 1 m^3 of drinking water by different methods.

(c) Explain why treating waste water needs more energy than treating ground water. [2]

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(c) Explain why treating waste water needs more energy than treating ground water. [2]

(c) waste water contains organic matter and harmful microbes; so it needs more treatment steps

Exercise 3.2 (d)

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(d) Describe how sewage is treated so that it is safe to put back into rivers. [6]

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(d) points to include:

- screening removes large objects and grit
- in sedimentation tanks the solids settle to form sludge; the liquid on top is effluent
- the sludge is digested by bacteria without air (anaerobic digestion)
- this makes methane gas, which can be used as a fuel, and the rest can be used as fertiliser
- the effluent is treated by bacteria with air (aerobic) to break down organic matter
- the clean water is then put back into rivers

Levels: **5–6** a full, logical answer with correct chemistry and correct terms; **3–4** several correct points, partly linked; **1–2** one or two relevant points.