

C10 Using resources

Chemistry Paper 2 | AQA Combined Science Trilogy | Key ideas to remember

Water treatment

Required practical 13

Life cycles and recycling

Higher: metal extraction

1 Resources and sustainability

Finite: used faster than they form, e.g. ores and crude oil.

Renewable: replaced on a human timescale, e.g. timber if regrowth keeps up with harvesting.

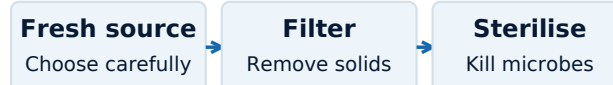
Sustainable development: meet present needs without compromising future generations' ability to meet theirs.

Agricultural and synthetic products can replace natural products. Compare properties and full environmental impacts.

Data: factor of 10 = one order of magnitude. Reserve ÷ annual use estimates lifetime if both stay constant.

2 Potable water and desalination

Potable = safe to drink, not chemically pure. Low enough levels of salts and microbes. Clear does not mean safe.



Sterilise with **chlorine, ozone or UV**. Filters leave dissolved salts.

Distillation: heat → water evaporates → cool vapour → water condenses. Salt stays behind.

Reverse osmosis: pressure pushes water through a partially permeable membrane; most ions stay behind.

Both need energy: heating or pumping.

3 Required practical 13: water

Compare **pH, dissolved-solid residue and distillation**. Use equal sample volumes; filter out suspended solids first.

1. Weigh a clean, dry basin.
2. Add a measured sample volume.
3. Heat gently; avoid splashing.
4. Cool the dry basin + residue; weigh.
5. Dry, cool and reweigh to constant mass.

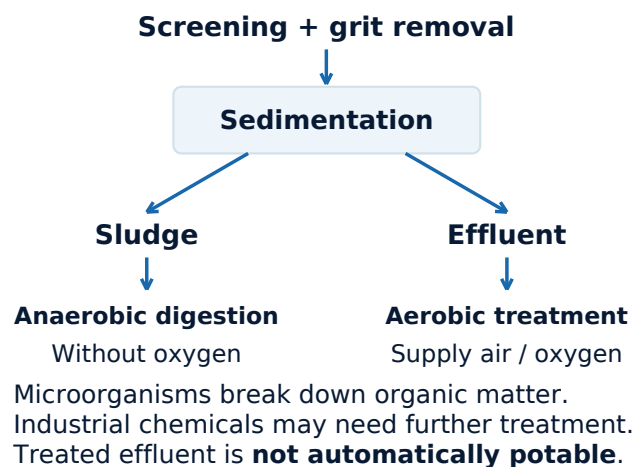
Residue = final mass – empty basin.

$42.7 - 42.3 = 0.4 \text{ g}$ (example).

Losing solid by splashing → result too low.

Do not boil dry or drink samples. Supervised heating; eye protection. These tests alone cannot prove drinking safety.

4 Wastewater: two branches



5 Life cycles and the three Rs

LCA: raw materials → manufacture and packaging → use → disposal / recycling. Include transport at every relevant stage.

Compare **equal service:** energy, water, resources, waste and pollution. Weighting impacts involves value judgements.

Reduce: use less material / energy.

Reuse: use the same item again.

Recycle: process waste into new items. Glass: crush and melt. Metals: melt and recast; sort for required properties.

Example: ore 200, recycled 10 MJ/kg.

Saving = $190 \text{ MJ/kg} = 95\%$.

Recycling conserves ores but uses energy.

6 Higher only: copper extraction

Low-grade ores: a small proportion of useful metal compounds.

Phytomining

Plants take up compounds
↓
Harvest and burn
↓
Ash contains compounds

Bioleaching

Bacteria act on ore
↓
Metal compounds dissolve
↓
Collect the leachate

Solution containing copper compounds

Recover by **iron displacement** (iron is more reactive) or **electrolysis**. Compare energy, yield, time and impacts.