Chemistry 10: Using Resources

Section 1: Using Earth's resources and sustainable development

1 Natural resources	Earth's materials (helped by agriculture) that provide warmth, shelter, food and transport eg food, timber, clothing and fuels
2 Finite resources	Used faster than they are created and therefore will **run out** eg fossil fuels
3 Renewable resources	**Replaced** at the same rate at which they are used up eg biofuels
4 Sustainable development	Development that **meets the needs** of current generations **without compromising** the ability of future generations to meet their own needs

Chemists try to create new products from **renewable** rather than **finite** natural resources to improve **sustainability** e.g. plastic is usually made from oil (finite fossil fuel), but can be made from farmed sugar cane (renewable crop)

Section 2: Obtaining potable water

5 Potable water	Water that is **safe** to drink i.e. low in dissolved salts and microbes. Still **not chemically pure** as still contains dissolved salts

6 Producing potable water depends on **availability of water** & **local conditions**

	Abundant fresh water: UK	Limited fresh water
Source	**Rainwater** collecting in ground, lakes, rivers or aquifers	**Salty** or sea water
Treatment	• Choose appropriate fresh water **source** • Pass through **filter beds** • Use **sterilising agents**: chlorine, ozone (O3) or ultraviolet light	**Desalination** by **distillation** or **reverse osmosis** (where salts are separated from water using a semipermeable membrane). Both require lots of **energy**

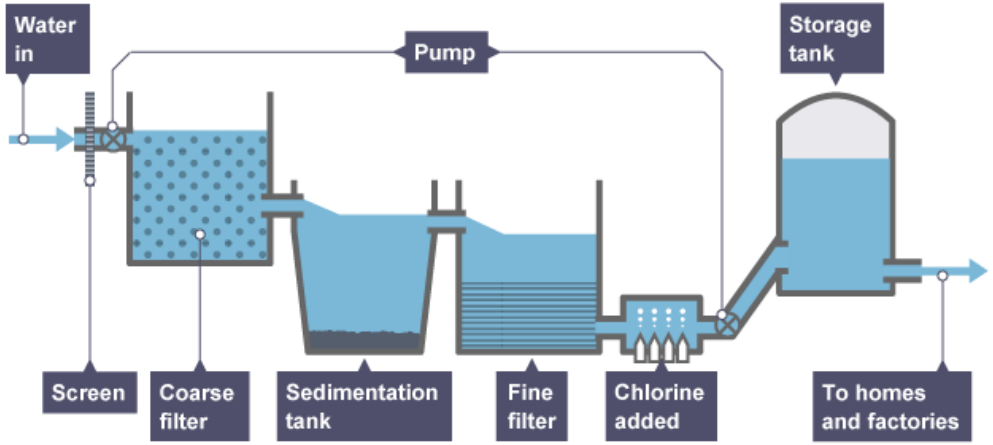
Section 3: Waste water treatment

7 Waste water	Water produced by urban lifestyles and industrial processes that **requires treatment** before being released into environment
8 Aerobic Digestion	Requires oxygen to sustain bacteria respiration. Bacteria break down organic compound

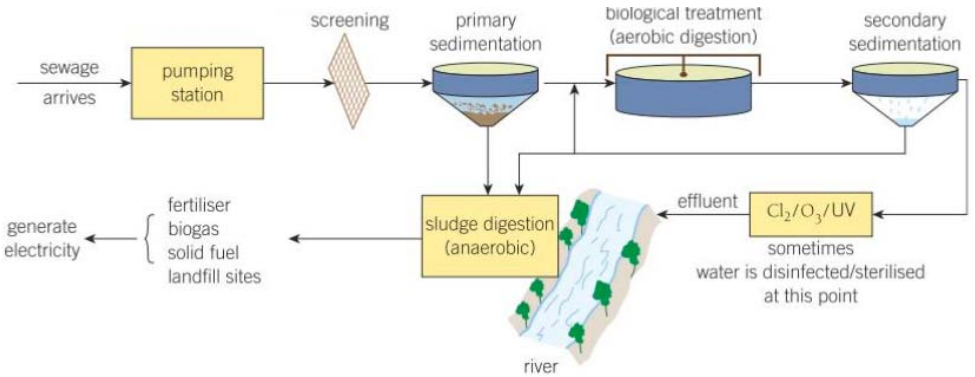
• **Screening & grit removal** • **Sedimentation** to remove fine sediments/ sludge • **Aerobic biological treatment** of effluent • **Anaerobic digestion** of sludge • **Disinfection** (chlorination or UV treatment)- kills microbes	**Removal** of **organic matter** and harmful **chemicals**

Section 3: Waste water treatment continued

9 Distillation	Involves heating salt water to produce steam (evaporation) and then condensing the steam to produce pure water (salt left behind)
10 Desalination	The purification of water and removal of salt using reverse osmosis.
11 Reverse Osmosis	Pure water is forced under pressure across a semi-permeable membrane against its concentration gradient (from a concentrated salt solution to pure water)



Treatment of potable water



Treatment of sewage

Section 4: Alternative methods of extracting metals (HIGHER TIER)

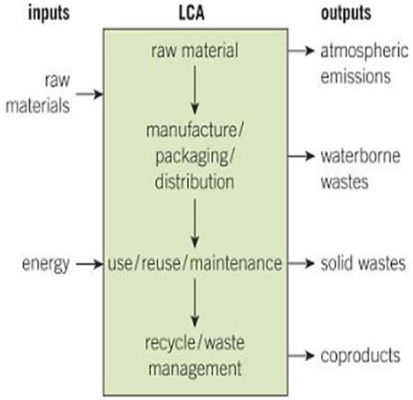
Metal ores are a finite natural resource e.g. copper ores are becoming scarce. New **biological** methods of extracting copper from low-grade ores that **avoid traditional mining methods of digging, moving and disposing of large amounts of rock** have been found

12 **Phytomining** uses plants to absorb metal compounds. They are harvested & burned to produce ash that contains metal compounds	13 **Bioleaching** uses bacteria to produce leachate solutions that contain metal compounds

Metal compounds in ash and leachate solution are then processed to obtain the metal eg copper can be obtained from solutions of copper compounds by displacement using scrap iron or by electrolysis

Section 5: Life Cycle Assessments

13 Life Cycle Assessment (LCAs)	Assesses the **environmental impact** of all the stages of a product's (eg car) life. Stages: • extracting and processing **raw materials** • **manufacturing & packaging** • **use and operation** during its lifetime • **disposal** at the end of its useful life, including transport & distribution at each stage LCAs can be **misused** to benefit a company eg as proving affects of pollutants requires **judgement**, company could present cars as more eco-friendly than reality for advertising purposes Use of resources such as water, energy sources and production of some wastes can be **easily quantified** (amount measured) so can't be misused



Section 6: Ways of reducing the use of resources

Reduction in use and encouraging the **reuse/recycling** of materials reduces;
- use of finite resources and energy sources
- production of **waste** and **environmental impacts**

Metals, glass, building materials, clay ceramics and most plastics are produced from limited raw materials

Reusing/recycling	Reduces need to obtain raw materials from the Earth by quarrying and mining that causes environmental impacts
Reuse	Glass bottles can be crushed and melted to make different glass products
Recycling	Metals can be recycled by melting & recasting or reforming into different products. Amount of separation required for recycling depends on material & properties required of the final product eg some scrap steel can be added to iron from a blast furnace to reduce the amount of iron that needs to be extracted from iron ore. Recycling: • Uses much less energy • Conserves finite resources • Reduces waste to landfill