# AQA Chemistry GCSE

## Topic 10: Using Resources

## Flashcards

# What is sustainable development?

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Development that meets the needs of current generations without compromising the ability of future generations to meet their own needs

In the UK, potable (safe to drink) water is produced by…?

# In the UK, potable water is produced by…?

- choosing an appropriate source of fresh water
- passing the water through filter beds to remove any solids
- sterilising to kill microbes

# What are the sterilising agents for potable water?

# What are the sterilising agents for potable water?

Sterilising agents used for potable water include chlorine, ozone or ultraviolet light.

- Chlorine is a toxic gas so the amount added to water has to be carefully monitored.
- Using ultraviolet light to kill microbes avoids adding chemicals to the water but is more expensive

# How is desalination carried out?

# How is desalination carried out?

Desalination can be done by distillation or by processes that use membranes such as reverse osmosis. These processes require large amounts of energy.

# What is reverse osmosis?

# What is reverse osmosis?

Sea water is passed through a membrane that only allows through the water molecules. It needs high pressure to push the water through the membrane. The high pressure requires a lot of energy to produce.

# How is wastewater produced and how is it treated?

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• Urban lifestyles and industrial processes produce large amounts of waste water that require treatment before being released into the environment.
• Sewage and agricultural waste water require removal of organic matter and harmful microbes.
• Industrial waste water may require removal of organic matter and harmful chemicals.

# What are the processes involved in sewage treatment?

# What are the processes involved in sewage treatment?

Sewage treatment includes:

- screening and grit removal
- sedimentation to produce sewage sludge and effluent
- anaerobic digestion of sewage sludge
- aerobic biological treatment of effluent

What do new methods of mining avoid in terms of disadvantages of traditional mining?

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Avoids the disadvantages of traditional mining methods of digging, moving and disposing of large amounts of rock

# What is phytomining?

Higher Tier Only

# What is phytomining?

Phytomining uses plants to absorb metal compounds from the soil. The plants are harvested and then burned to produce ash that contains the metal compounds

**Higher Tier Only**

# What is bioleaching?

Higher Tier Only

# What is bioleaching?

Bioleaching uses bacteria to produce leachate solutions that contain metal compounds.

**Higher Tier Only**

# What are the main advantages and disadvantages of phytomining and bioleaching?

Higher Tier Only

# What is the main advantage and disadvantage of these methods?

These methods need less energy than traditional methods, and can work on low concentration ores but are slow to carry out.

**Higher Tier Only**

# Describe the stages of LCAs

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Life Cycle Assessments (LCAs) are carried out to assess the environmental impact of products in each of these stages:

- extracting and processing raw materials
- manufacturing and packaging
- use and operation during its lifetime
- disposal at the end of its useful life, including transport and distribution at each stage.

# How do we reduce the use of resources?

# How do we reduce the use of resources?

The reduction in use, reuse and recycling of materials by end users reduces the use of limited resources, energy consumption, waste and environmental impacts.

# What are the advantages and disadvantages of recycling?

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Advantages of recycling: less acid rain (pollution) metal ore reserves last longer / conserved energy for extraction saved less mining / quarrying less waste less landfill creates local employment

Disadvantages of recycling ; collection problems transport problems/ cost of transport difficult to separate metal from appliances/sort

# What is corrosion and how is it prevented?

# What is corrosion and how is it prevented?

Corrosion is the destruction of materials by chemical reactions with substances in the environment, e.g. rusting.

Corrosion can be prevented by applying a coating that acts as a barrier, such as greasing, painting or electroplating. These methods stop the air or water coming into contact with the metal.

# Describe the sacrificial protection

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Some coatings are reactive and may contain corrosion inhibitors or a more reactive metal.

If two metals are in contact the more reactive metal will corrode instead of the less reactive one, e.g. zinc is used to galvanise iron and when scratched, provides sacrificial protection because zinc is more reactive than iron.

Describe the compounds and the uses of bronze, brass, gold and silver and copper and zinc, aluminium-magnesium and steels

# Alloys:

Bronze - an alloy of copper and tin, used for making statues and decorative objects.

Brass - an alloy of copper and zinc used for producing water taps and door fittings.

Gold used as jewellery is usually an alloy with silver, copper and zinc (The proportion of gold in the alloy is measured in carats, with pure gold being 24 carat, e.g. 18 carat gold is 75% gold.)

Aluminium-magnesium alloys are low density and used in aerospace manufacturing.

Steels - alloys of iron that contain specific amounts of carbon and other metals. High carbon steel is strong but brittle. Low carbon steel is softer and more easily shaped. Steels containing chromium and nickel (stainless steels) are hard and resistant to corrosion.

# How are the properties of polymers determined?

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The properties of polymers depend on what monomers they are made from and the conditions under which they are made. For example, low density (LD) and high density (HD) poly(ethene) are produced from ethene, using different catalysts and reaction conditions.

# Describe the structures of thermosoftening and thermosetting polymers

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Thermosetting polymers do not melt on heating. The polymer molecules are linked to each other by strong cross-links. Thermosoftening polymers soften easily on heating and can then be remoulded, keeping the new shape on cooling. The polymer molecules are attracted to each other by weak intermolecular forces.

# How is glass made?

# How is glass made?

Most of the glass we use is soda-lime glass, made by heating a mixture of sand, sodium carbonate and limestone. Borosilicate glass, made from sand and boron trioxide, melts at higher temperatures than soda-lime glass

# How are clay ceramics made?

# How are clay ceramics made?

Clay ceramics, including pottery and bricks, are made by shaping wet clay and then heating in a furnace.

# How are composites formed?

# How are composites formed?

Fibres or fragments of one material (reinforcement) are surrounded by a binder/matrix material that holds these fibres/fragments together.

E.g. fibreglass - glass fibres bound together in a polymer, used for making storage tanks.

Outline the key points of Haber process. Include the use of the product.

# Key stages of Haber process:

a) The purified $H_2$ and $N_2$ gases are passed over Fe catalyst at a high temperature (about 450 °C) and a high pressure (about 200 atm)

b) Fe speeds up the rate of reaction, so that a lower temperature could be used in the process.

c) Some of the hydrogen and nitrogen reacts to form ammonia. $N_2 + 3\ H_2 \rightleftharpoons 2\ NH_3$

d) The reaction is reversible so ammonia breaks down again into nitrogen and hydrogen.

e) On cooling, the ammonia liquefies and is removed. The remaining hydrogen and nitrogen are recycled. This means almost no material is wasted.

f) Ammonia is used for production of nitrogen-containing fertilisers.

The Haber process operates at high T, p conditions. Explain why this is so and why this is a compromise.

# The Haber process uses high T and p conditions. Explain why this is so and why this is a compromise.

The conditions are a compromise between rate and the yield:

• The reaction is exothermic. An optimum temperature of 450 °C is used. Using a lower temperature would give a higher yield, but the rate of $NH_3$ production would be too slow.

• A pressure of 200 atm is used. Using a higher pressure would give a higher yield, but would be too expensive, because of the cost of energy to produce the high pressure.

# How are compounds of nitrogen, phosphorus and potassium used?

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Compounds of nitrogen, phosphorus and potassium are used as fertilisers to improve agricultural productivity. NPK fertilisers contain compounds of all three elements

# How is industrial production of NPK fertilisers achieved?

# How is industrial production of NPK fertilisers achieved?

Ammonia can be used to manufacture ammonium salts. The ammonium sulfate, phosphate, and nitrate can be produced by reaction of ammonia with the requisite acid.

$2\ NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$
$2\ NH_3 + H_3PO_4 \rightarrow (NH_4)_3PO_4$
$NH_3 + HNO_3 \rightarrow NH_4NO_3$

*nitric acid is itself made from ammonia

# How is the phosphate rock utilised in the production of fertilisers?

# How is the phosphate rock utilised in the production of fertilisers?

- Phosphate rock is reacted with nitric acid to produce phosphoric acid and calcium nitrate.

- Phosphate rock can be reacted with sulfuric acid to produce a mixture of calcium phosphate and calcium sulfate

- Phosphate rock can be reacted with phosphoric acid to produce calcium phosphate.