



All you need to know about ...

Module

C3

OCR 21st Century Science

Revised Specification

MINERAL FORMATION

Geologists explain the earth's history in terms of...

- Tectonic plates**
- crust is broken into jigsaw like pieces
 - plates **MOVE AROUND**
 - plates moving together make mountains

Wegener

- suggested that all the continents used to be together and then **drifted apart**

Magnetic clues

- sea **floor spreading** by 10cm a year
- produces a magnetic pattern

Erosion

Sedimentation

Dissolving

Evaporation

- these procedures have led to the formation of valuable resources such as... coal limestone salt

Sedimentary rock formation

- the following provide evidence for the conditions under which sedimentary rocks were formed... fossils
- sand grains** **shell fragments**
- ripples on beds of seas and rivers**

LIFE CYCLE ASSESSMENT - LCA

Considers the impact of raw materials, energy and environmental aspects when making, using and disposing of something

ELEMENTS AND COMPOUNDS

- **elements** made up of atoms of only type
- **compounds** two or more elements chemically combined
- the chemical properties of compound usually differ greatly from those of their elements eg

hydrogen + chlorine → **hydrogen chloride**

ELEMENT **ELEMENT** **COMPOUND**

colourless **green, toxic** **colourless acidic gas with a**

flammable gas **reactive gas** **sharp odour; fumes in moist air**

THE CHEMICAL INDUSTRY

- many chemicals were made by traditional methods eg *burning wood and stale urine to make alkalis*
- chemicals industries grew up where there were... readily available resources + good communications

RUNCORN / WIDNES

- Lancashire coal fields** - for fuel
- Cheshire salt** - for raw materials
- River Mersey and Manchester Ship Canal** - transport / export by sea
- River Mersey narrowed** - bridges for rail and road

THE ALKALI INDUSTRY

- initially produced from salt, limestone and coal (for fuel) made **nasty by-products** hydrogen chloride (acid gas) great heaps of waste which gave off hydrogen sulphide (bad egg smell)
- problems solved by by turning waste into useful materials eg *oxidise hydrogen chloride into chlorine*

REACTIONS OF ALKALIS

- alkalis are **SOLUBLE BASES**
 - **soluble hydroxides and soluble carbonates are alkalis** sodium hydroxide NaOH potassium hydroxide KOH ammonium hydroxide NH₄OH sodium carbonate Na₂CO₃ potassium carbonate K₂CO₃
 - **alkalis react with acids to form salts**
 - hydroxides also produce water
 - carbonates also produce water and carbon dioxide
 - **sulphuric acid** produces salts called **sulphates**
 - **hydrochloric acid** produces salts called **chlorides**
 - **nitric acid** produces salts called **nitrates**
- Examples...*
- sodium hydroxide + sulphuric acid → sodium sulphate + water
- sodium carbonate + nitric acid → sodium nitrate + carbon dioxide + water
- sodium hydroxide + hydrochloric acid → sodium chloride + water

SALT - SODIUM CHLORIDE - NaCl

IMPORTANCE

- **flavour enhancer** and **preservative** for food
- **source of chemicals** - chlorine, sodium hydroxide, hydrogen
- **treating roads** in winter - *doesn't have to be pure*

SOURCES

- Sea**
- **evaporate sea water** by sun or heating
- Underground**
- **mine rock salt**
 - **dissolve in water** then pump to surface

EXTRACTION PROBLEMS

- Sea**
- evaporation by sun is **slow**
 - evaporation by heating is **expensive**
- Underground**
- mining produces **unsightly waste, subsidence**
 - dissolving in water produces **subsidence**

USE IN FOOD

- Advantage**
- evaporation by sun is **slow**
 - evaporation by heating is **expensive**
- Disadvantage**
- **Too much** mining produces **unsightly waste**
 - dissolving in water produces **subsidence**

CHLORINE - Cl₂

INDUSTRIAL MANUFACTURE

- **electrolysis of brine** (sodium chloride solution)
- **ELECTROLYSIS** *an electric current is used to bring about chemical change and make new chemicals*
- **by-products** are... sodium hydroxide *soap and paper manufacture, oven cleaner* hydrogen *fuel, margarine manufacture*

USES

- **purifying water** - kills **microorganisms**
- **bleach**
- **making PVC**, polyvinyl chloride, a polymer with C, H Cl atoms

PROBLEMS

- chlorine is **toxic**
- chlorine can **react with organic materials** in water
- **plasticizers** in **PVC** can leach out and have **harmful** effects