



OCR B GCSE Chemistry

Topic 4: Material choices

What happens to products at the end of their useful life?

Notes





1. Describe the conditions, which cause corrosion and the process of corrosion, and explain how mitigation is achieved by creating a physical barrier to oxygen and water and by sacrificial protection (separate science only)

- Corrosion = destruction of materials by chemical reactions with substances in the environment (e.g. rusting)
 - Both air and water need to be present
- Rusting can be prevented by excluding oxygen and water e.g. by:
 - painting
 - coating with plastic
 - using oil or grease
- Aluminium has an oxide coating that protects the metal from further corrosion – exclusion of oxygen and water
- water can be kept away using a desiccant in the container (absorbs water vapour)
- oxygen can be kept away by storing the metal in a vacuum container
- Sacrificial protection: where the metal you want to be protected from rusting is galvanised with a more reactive metal, which will rust first and prevent water and oxygen reaching the layer underneath
 - E.g. zinc is used to galvanise iron

2. Explain reduction and oxidation in terms of loss or gain of oxygen, identifying which species are oxidised and which are reduced

- Oxidation is gain of oxygen, reduction is loss of oxygen
 - E.g. ethanol (OH) can be oxidised to form ethanoic acid (COOH), gaining oxygen

3. (HT only) explain reduction and oxidation in terms of gain or loss of electrons, identifying which species are oxidised and which are reduced

- Try and remember this phrase: OIL RIG: Oxidation Is Loss and Reduction Is Gain (of electrons)



4. Describe the basic principles in carrying out a life-cycle assessment of a material or product including: the use of water, energy and the environmental impact of each stage in a life cycle, including its manufacture, transport and disposal; incineration, landfill and electricity generation schemes; biodegradable and non-biodegradable materials

- These 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
- Use of water, resources, energy sources and production of some wastes can be fairly easily quantified
- Allocating numerical values to pollutant effects is less straightforward and requires value judgements, so LCA (life cycle assessment) is not a purely objective process
- Selective or abbreviated LCAs can be devised to evaluate a product but these can be misused to reach pre-determined conclusions, eg in support of claims for advertising purposes

5. Interpret data from a life-cycle assessment of a material or product

- use 4 / above info to do so

6. Describe the process where PET drinks bottles are reused and recycled for different uses, and explain why this is viable

- Reduction in use, reuse and recycling of materials by end users reduces the use of limited resources, use of energy sources, waste and environmental impacts
- PET drinks bottles are produced from limited raw materials.
 - Much of the energy for the processes comes from limited resources
 - Obtaining raw materials from the Earth by quarrying and mining causes environmental impacts (e.g. crude oil)
 - You can melt the PET drinks bottles, mold them and reuse them
- Viable because this process isn't too expensive and it means that you can save crude oil (a finite resource) instead of using it to create another object using this limited resource



7. Evaluate factors that affect decisions on recycling with reference to products made from crude oil and metal ores

- Recycling is important to achieve sustainable development
 - Requires less energy to melt and remould metals than it does to extract new metals from their ores or to extract
 - Mining ores is bad for the environment as large quarries are created, which produce noise pollution and dust
 - Also, recycling allows for waste metals to be reused, saving money, helping the environment and the supply of valuable raw materials (meaning metal ores and crude oil will last longer)
- however, there are disadvantage to recycling:
 - costs (including energy) of collecting and transporting items to recycling centres
 - need to be sorted into types before they can be recycled
 - saves different amount of energy for different materials

