

# AQA GCSE Chemistry

## Topic 10: Using resources

### Using materials (chemistry only)

#### Notes

(Content in bold is for Higher Tier only)





## Corrosion and its prevention

- Corrosion = destruction of materials by chemical reactions with substances in the environment
  - E.g. rusting
    - Both air and water are necessary for iron to rust
- Corrosion can be prevented by applying a coating that acts as a barrier, such as greasing, painting or electroplating
  - Aluminium has an oxide coating that protects the metal from further corrosion
  - Some coatings are reactive and contain a more reactive metal to provide sacrificial protection
    - E.g. zinc is used to galvanise iron
    - sacrificial protection works by the more reactive metal donating electrons to any ions of the other metal that may have formed so they don't corrode

## Alloys as useful materials

- Most metals in everyday uses are alloys. Pure copper, gold, iron and aluminium are all too soft for everyday uses and so are mixed with small amounts of similar metals to make them harder for everyday use.
  - Gold in jewellery is usually an alloy with silver, copper and zinc and the gold purity is measured in carats
  - Bronze is an alloy of copper and tin - used in electrical connectors
  - Brass is an alloy of copper and zinc - used for tools
- Steels are alloys since they used mixtures of carbon and iron
  - Some steels contain other metals. Alloys can be designed to specific uses.
  - Low-carbon steels are easily shaped - used for sheeting (malleable)
  - High carbon steels are hard - used for cutting tools
  - Stainless steels (containing chromium and nickel) are resistant to corrosion - used for cutlery
- Aluminium alloys are low density - used for aircraft

## Ceramics, polymers and composites

- Soda-lime glass: made by heating a mixture of sand, sodium carbonate and limestone (most commonly used glass)
- Borosilicate glass: made from sand and boron trioxide, melts at higher temperatures than soda-lime glass
- Clay ceramics, including pottery and bricks, are made by shaping wet clay and then heating in a furnace





- Properties of polymers depend on what monomers they are made from and the conditions under which they are made.
  - Low density polyethene and high density polyethene, are both made under different reaction conditions using different catalysts.
    - Low density polyethene has weaker forces of attraction as the chains are further apart, meaning it has a low melting point and is soft
    - HD polyethene has higher forces of attraction, as the chains are closer together, giving it a higher melting point
- Thermosoftening polymers are made of individual, tangled polymer chains which are easily separated and are melted by heat
  - 1) There are weak intermolecular forces between the chains
  - 2) The chains are easy to separate
  - 3) At lower temperatures
  - 4) Less heat energy is needed to break the chains
- Thermosetting polymers consist of polymer chains, which cross links, so that they do not melt when heated.
- Most composites are made of two materials, a matrix or binder surrounding and binding together fibres or fragments of the other material, which is called the reinforcement
  - examples of composites: carbon fibre and fibreglass (both are very hard but very brittle)

