

C10 Using Resources – Part 2 – TRIPLE only

3.1 Corrosion and its prevention

Corrosion is when a metal is destroyed by chemical reactions with other substances in the environment. (rusting is just one example of this)

Both Oxygen and air are needed for Iron to rust

How to stop corrosion:

Physical Barriers:

Paint

Coat with plastic

Oil or grease

Electroplating

Use electrolysis to coat a VERY THIN layer of an unreactive metal over the surface.

Sacrificial protection

Put the metal in contact with a MORE REACTIVE metal (e.g. zinc) – the zinc is “sacrificed”

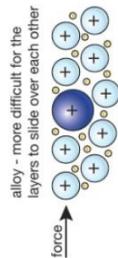
Galvanising

Coat the metal in zinc which is then BOTH a physical barrier and a “sacrifice”

3.2 Alloys

Name of Alloy	Component Metals	Uses
bronze	copper and tin	bells coins statues
brass	copper and zinc	locks taps instruments door hinges door knobs
gold	Alloyed with other metals such as silver, zinc and copper.	Jewellery
High carbon steel	Iron and a high amount of carbon	Construction industry (hard and brittle)
Low Carbon Steel	Iron and a small amount of carbon	Car body panels (soft and easily shaped)
Stainless steel	Iron, chromium and nickel	Cutlery (hard and does not corrode)

Alloys are mixtures of 2 or more metals (sometimes including carbon)



Alloys are usually harder and stronger than pure metals

3.3 Ceramics Polymers and Composites

Glass

Glass is made by melting a mixture of sand (silicon dioxide), limestone and sodium carbonate. This is called soda-lime glass. Soda-lime glass is used for window panes, glass jars and bottles.

Borosilicate glass contains boron trioxide. It has a higher melting point than soda-lime glass.

Ceramics

Ceramics made from clay include china, porcelain and brick. Wet clay is shaped and then placed into a furnace where it is heated to a high temperature. Crystals form in the clay and join it together.

Polymers

Properties depend on 2 things:

The monomer they are made from

The conditions when they are made

E.g. High density Poly(ethene) and Low density Poly(ethene)

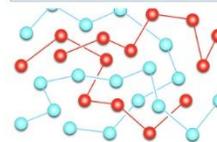
Composites

Made of 2 materials:

Reinforcement (Fibres or particles) that are bound together by the matrix

E.g. Fibre glass, Concrete and carbon Fibre

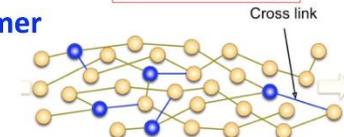
Thermosoftening (thermoplastic)



- Tangled polymer chains
- No cross-links between chains
- Weak forces of attraction between chains
- Softens when heated

Two types of polymer

Thermosetting (thermoset)



- Polymer chains held together by **strong covalent cross-link bonding** that does not break on heating.
- Remains hard when heated

1	Give three types of physical barrier that can be used to protect a metal from corrosion.
2	Give 2 other methods that can be used to protect metals and explain how they work
3	What is an alloy?
4	How are the properties of alloys different to pure metals
5	Name 2 types of glass and give a use for each
6	Explain what ceramic is and give a use
7	Explain what a composite is and give 3 examples
8	State the meaning of Thermosetting
9	State the meaning of thermosoftening
10	Explain the differences in properties between thermosetting and thermosoftening polymers

Corrosion	When a metal is destroyed by chemical reactions with other substances in the environment
Alloy	A mixture of two or more metal elements – usually harder or stronger than the elements on their own
Composite	consists of two or more materials with different properties. They are combined to produce a material with improved properties.
Ceramic	Made from wet clay which is shaped and then heated in a furnace
Polymer	Made from many monomers joined together to form a long chain
Thermosoftening	Polymer that melts when heated
Thermosetting	Polymer that does not melt when heated. These will char or burn instead due to the strong crosslinks
Haber process	Process used for the manufacture of ammonia
Ammonia	Compound formed from nitrogen and hydrogen with the formula NH_3
Electroplating	Using electrolysis to coat a very thin layer of metal over another less expensive metal
Sacrificial protection	Process where a more reactive metal is used to protect another metal. The more reactive metal will be used up
Galvanising	Coating a metal with zinc in order to protect it.