

C6.1.10 Alloys

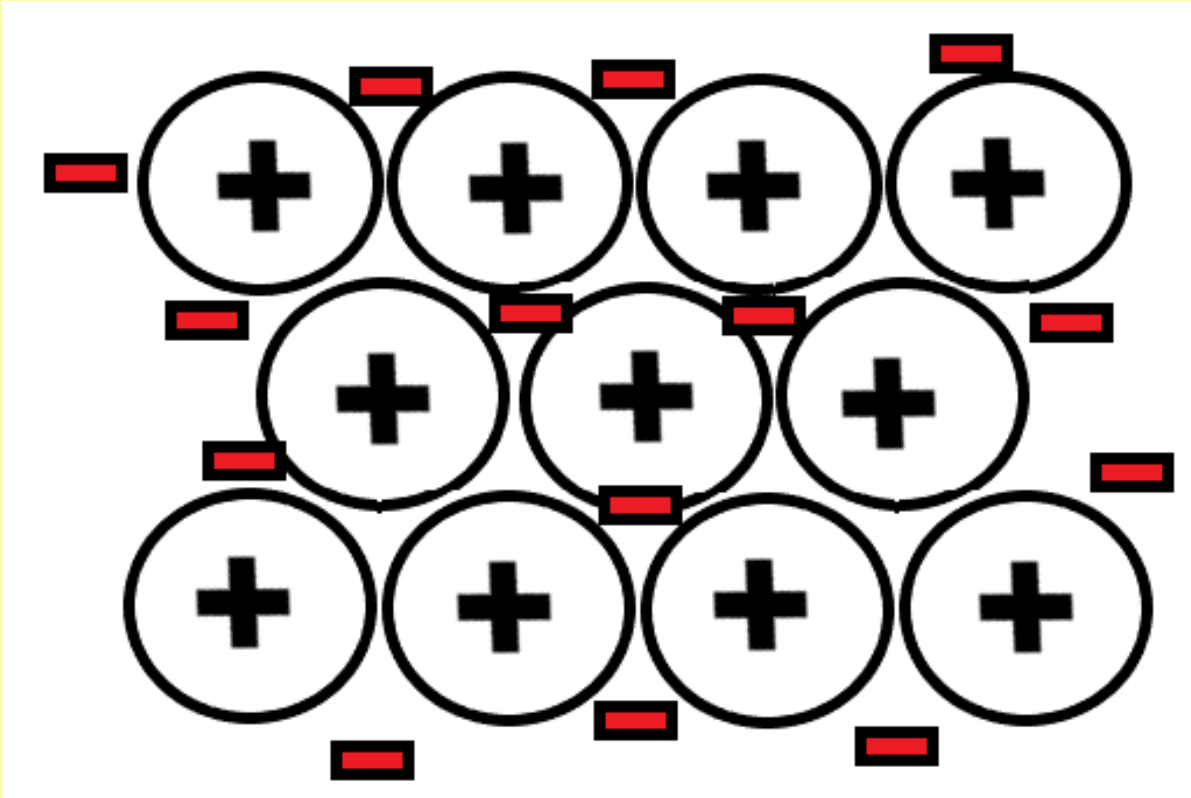
Previous knowledge:

C2.2.8 Structure of Metals

Description of metallic bonding, including a labelled diagram

Link between the structure of metals and their properties

Positive metal cations surrounded by a sea of **delocalised** electrons



Delocalised electrons

- Good conductors of heat and electricity

Strong forces of attraction between the positive metal cations and the delocalised electrons

- High melting and boiling points

Layers of ions can slide over each other without breaking the metallic bond

- Ductile
- Malleable

What have we remembered about metallic bonding and last lesson?

- Complete the quiz questions

Learning Objectives

- List the elements used to make steel, duralumin, solder, brass and bronze
- Describe how the properties of alloys link to their uses
- Explain how the structure of alloys is different from that of a metal element and how this influences their properties

What is an alloy?

**Copy this definition into
your notes**

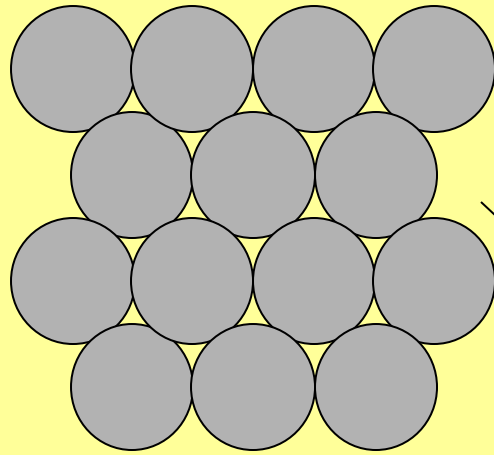
- An **alloy** is a mixture of two or more elements, at least one of which is a metal

Alloys and their uses

Copy this table into your notes

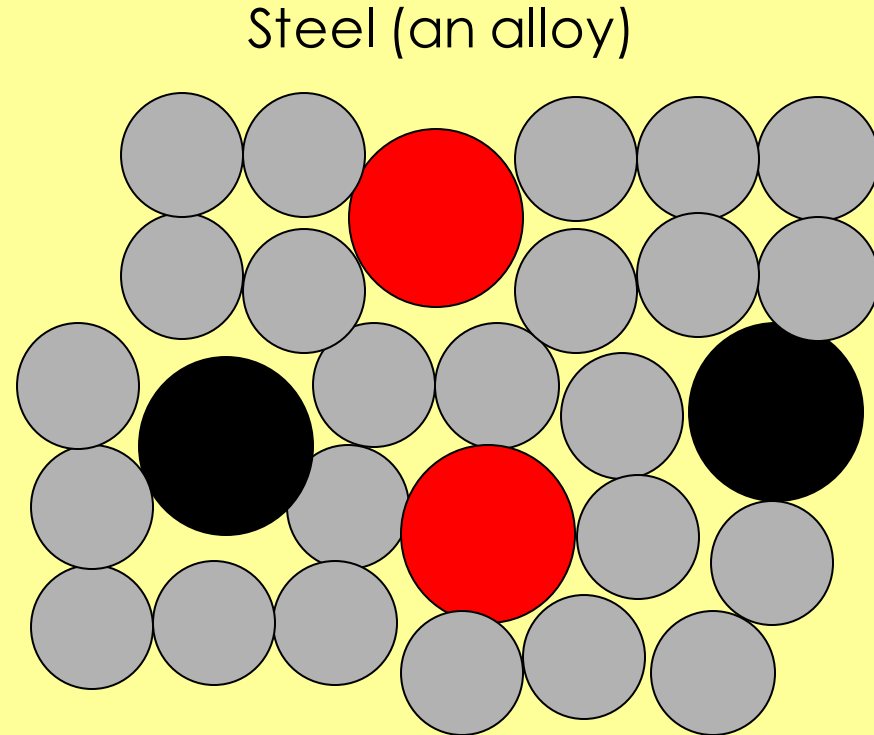
Alloy	Main metals	Typical Uses	Reasons for use
Steel	Iron	Buildings, bridges, cars	Strong, malleable
Duralumin	Aluminium and copper	Aircraft parts	Low density, strong
Solder	Variable – traditionally lead and tin, but can be tin and copper	Joining electrical components and copper pipes	Low melting point, conducts electricity well
Brass	Copper and zinc	Musical instruments and coins	Doesn't easily corrode
Bronze	Copper and tin	Bells, propellers for ships	Strong, hard, doesn't easily corrode

Copy this diagram into
your notes



Pure iron (wrought
iron)

Carbon
and other
metals
added



Pure iron is very soft and malleable (flexible).
When carbon and other metals are added to it an
alloy called steel is made. The more carbon you
add, the **stronger** and **harder** the steel gets. But it
also becomes less **malleable** and more **brittle**.

Quiz questions

Typical exam questions

Watch the video which models how to answer the first question

Answer the second question

Teacher modelled question – watch the video and copy down the model answer

1. Look at the table. It gives information about the properties of some metals.

Metal	Melting point in °C	Density in g/cm ³	Relative strength (1 = weak, 10 = strong)	Relative heat conductivity (1 = low, 10 = high)	Cost per tonne in £
A	1660	4.5	6.4	8.6	5000
B	420	7.1	4.3	9.0	870
C	1535	7.9	8.2	7.3	400

Look at the picture of a military aircraft. Only small numbers of these aircraft are made.



Evaluate the advantages and disadvantages of each metal for making the **body** and **wings** of this military aircraft. Which metal, **A**, **B** or **C**, would you choose and why?

Student question – use the same approach as the modelled question to help answer this question

2. This question is about metals.

Look at the table. It shows some properties of three metals.

	Density in g/cm^3	Relative electrical conductivity (0 = low, 100 = high)	Relative strength (0 = weak, 1000 = very strong)	Corrosion in moist air	Cost per tonne in £
Aluminium	2.7	40	300	does not corrode	770
Copper	8.9	64	400	corrodes slowly	5900
Iron	7.9	11	600	corrodes	200

Look at the picture. It shows overhead power cables used by electric trains.



overhead power cables

Suggest what **properties** are needed by a metal used to make the overhead power cables.

Which metal in the table would you use and why?