

Box 1: Keywords

Alloy	A mixture of two or more elements, one of which must be a metal
Delocalised electron	Electrons that are no longer tied to one particular atom and are free to move through the structure
Positive ion	An atom that has lost one or more of its outer electrons
Malleable	A material that can be bent and hammered into shape
Ductile	A material that can be pulled into a wire
Metal Lattice	The giant metal structure consisting of positive metal ions surrounded by delocalised electrons
Electrostatic attraction	The attraction between a positively charged and negatively charged particles

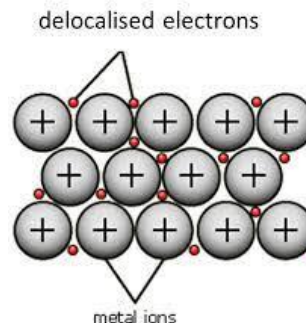
Box 2: Key skills

- Visualise and represent two dimensional forms of 3dimensional objects.
- Explain the properties of a material in terms of its structure and bonding

Box 3: Structure and bonding in metals

Metals consist of a **giant** structure of atoms arranged in a **regular** pattern

The outer shell electrons of the metal atoms are **delocalised**, and are free to move through the whole structure.



The strong **electrostatic** attraction between the positive metal ions and negative electrons forms the strong **metallic bonds**.

Explaining the properties of metals

Property	Explanation
Good conductor of electricity	Delocalised electrons can move through the metal and carry charge.
Good conductor of heat	Delocalised electrons can move through the metal and transfer thermal energy.
High melting and boiling points	Lots of energy needed to overcome the strong forces of attraction between the positive metal ions and delocalised electrons.

Box 4: Alloys

Pure metals are too soft for many uses and are often mixed with other metals to make alloys which are much harder.

Alloys are a mixture of two or more elements, one of which must be a metal.

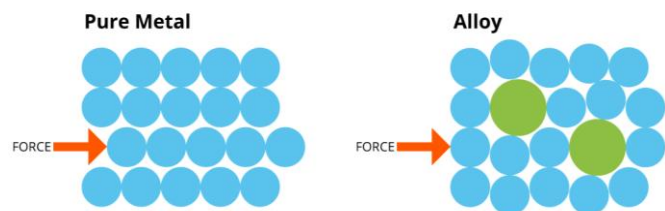
Some common alloys are shown below

Alloy	Bronze	Brass	Steel
Elements it contains	Copper and tin	Copper and zinc	Iron and carbon

Why are alloys harder than metals?

The mixture of different sized atoms in an alloy, **distort** the layers in the giant metallic structure.

This makes it more difficult for the **layers** to **slide** over each other so alloys are harder than pure metals



Box 7: Pathway

Previous knowledge: Metals and other materials, atomic structure, using the earth's resources

Future links: Metal reactions, corrosion (TRIPLE)

Careers: Material scientists researchers, Science editors, Science authors, Science teachers, technicians, Science presenters, engineers, electricians.

Box 5: Metals and their uses

All metals share a general set of properties but will have specific uses depending on their individual properties

Metal	Property	Use
Copper	Good conductor of electricity, ductile	Electrical wiring
Steel	Construction	Construction
Gold	Malleable and Resistant to corrosion	Jewellery

Duralumin is an alloy of aluminium and copper.

Aluminium is very light and resistant to corrosion. When it is alloyed with copper, it is much harder so can be used for airplane bodies.

Box 6: Composition of alloys

18 carat gold contains 75% gold and 25% other metals.
In a 5.00 g wedding ring the mass of gold would be:

$$5.00 \times \frac{75}{100} = 3.75\text{g}$$

Box 7: Cross curricular links

Design and technology