METALS, ALLOYS AND METALLIC BONDING

- Recall the common properties of metals
- Explain how metallic bonds form
- Describe the effects of forming an alloy

ANAGRAM DEFINITIONS

Unscramble these terms and explain their meaning

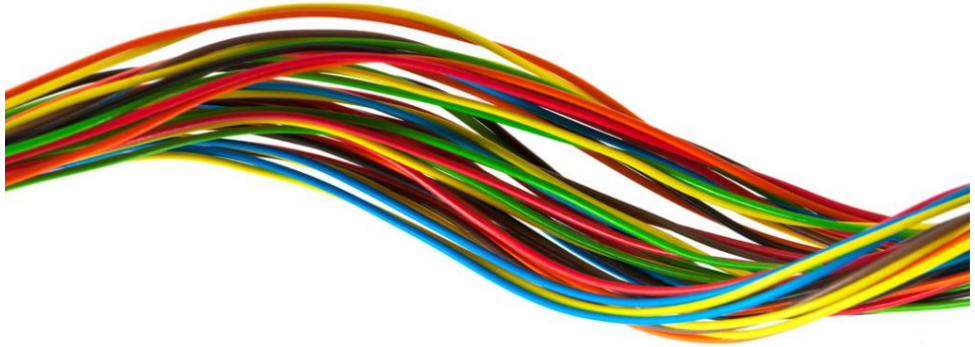
(HINT: Think about what we learnt last lesson)

1. BIONIC GIN NOD

2. BELL DOTING MANIAC

3. BACON DENT LOVING

THE PROPERTIES OF METALS



Hard	Can take a large force without damage
Strong	Can transfer electrical energy easily
Malleable	Makes a ringing sound when struck
High Melting Point	Can be shaped without breaking
Thermal Conductor	Can be drawn into wires
Electrical Conductor	Solid and rigid
Ductile	Can transfer heat energy easily
Sonorous	Changes state from solid to liquid at a high temperature

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METALLIC BONDING

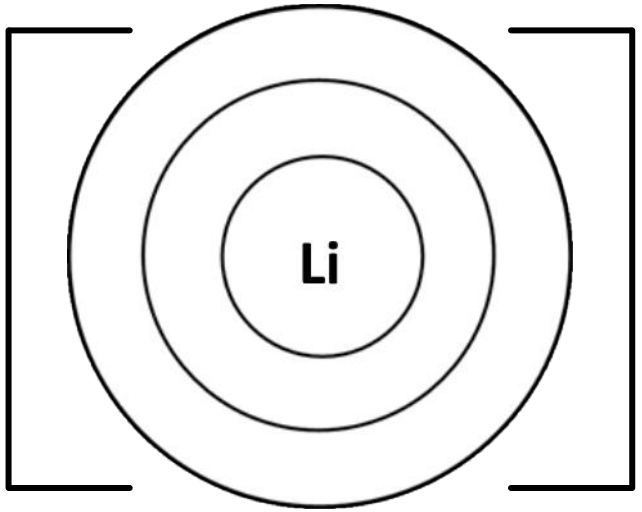
All of the properties of metals can be explained by understanding how the atoms that make up metals are chemically bonded.

Metal atoms can form stable ions (with full outer shells) by losing electrons.

How many electrons do these metal atoms need to lose to become stable ions?

Lithium	Magnesium	Aluminium

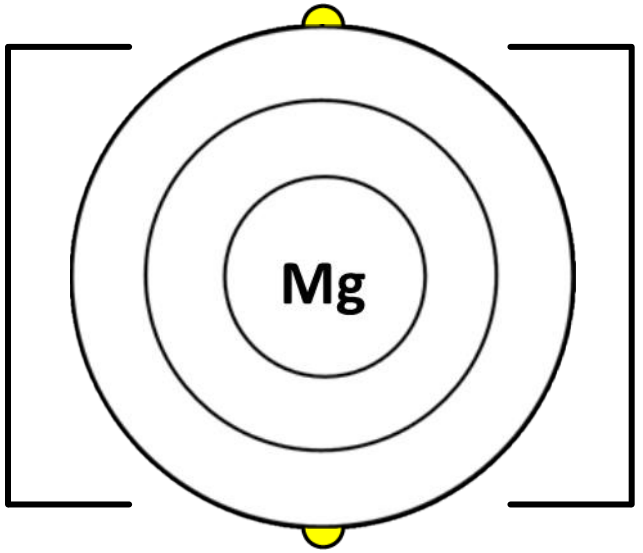
METALLIC BONDING



3 protons = 3+

3 electrons = 3-

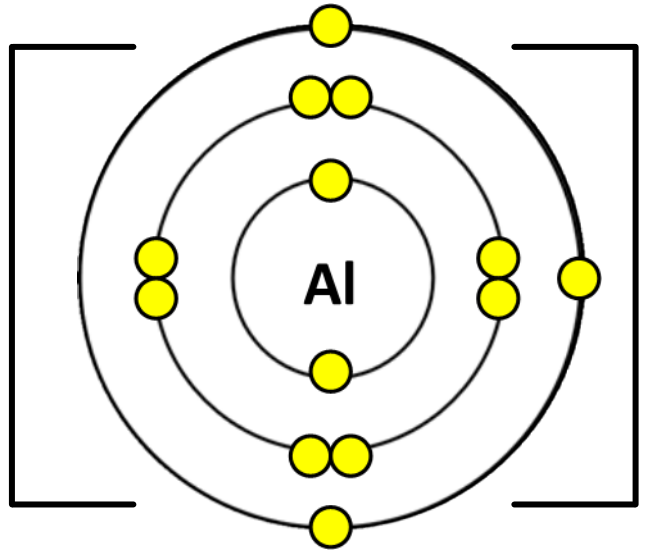
Charge = 0



12 protons = 12+

12 electrons = 12-

Charge = 0



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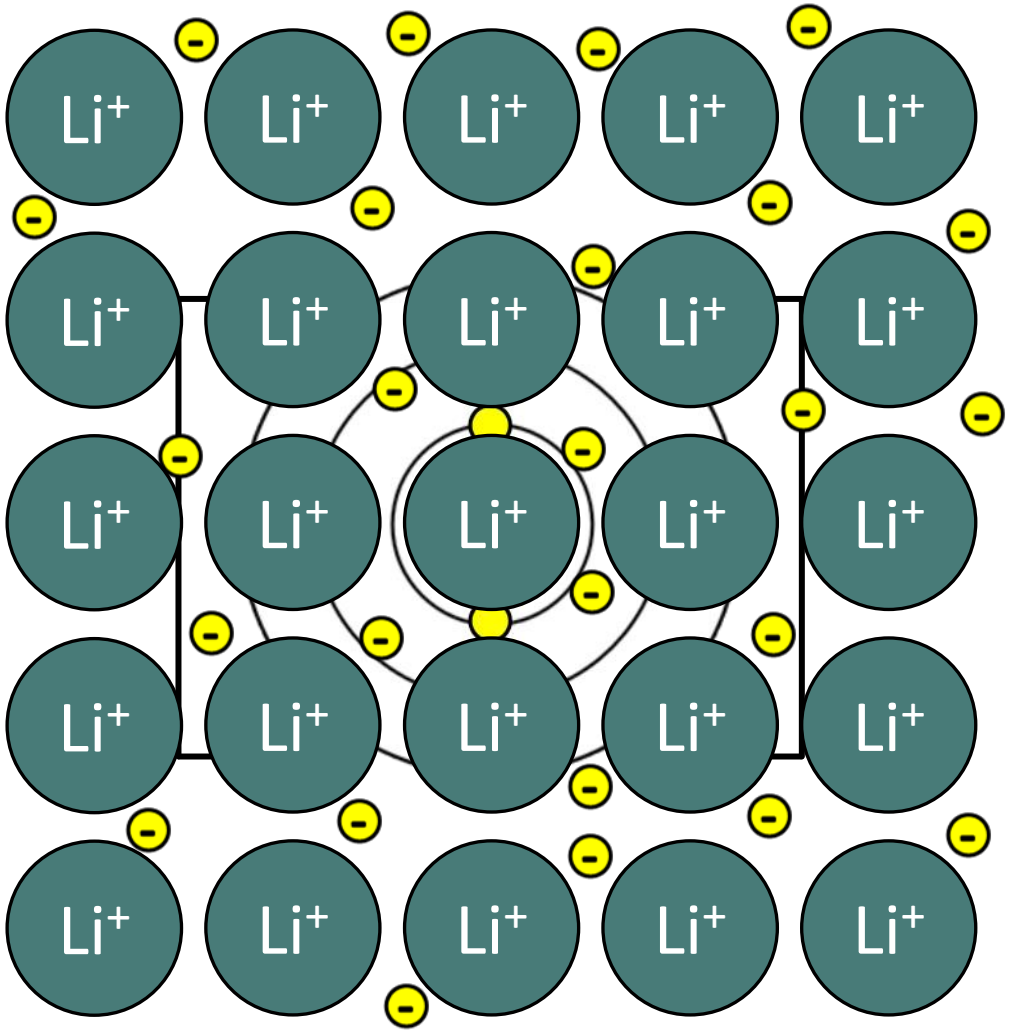
METALLIC BONDING



A lump of metal is made up of lots of metal ions in a regular **lattice**.

The ions are all positively charged, so they should **repel** each other…

But, they are held together by a **strong electrostatic attraction to the electrons**.

The electrons are **free to move** around – they act as the ‘glue’ holding the metal together

Metallic bonding is sometimes described as 'metal ..... in a sea of .....'.

A solid metal is a ..... of ..... metal ions.

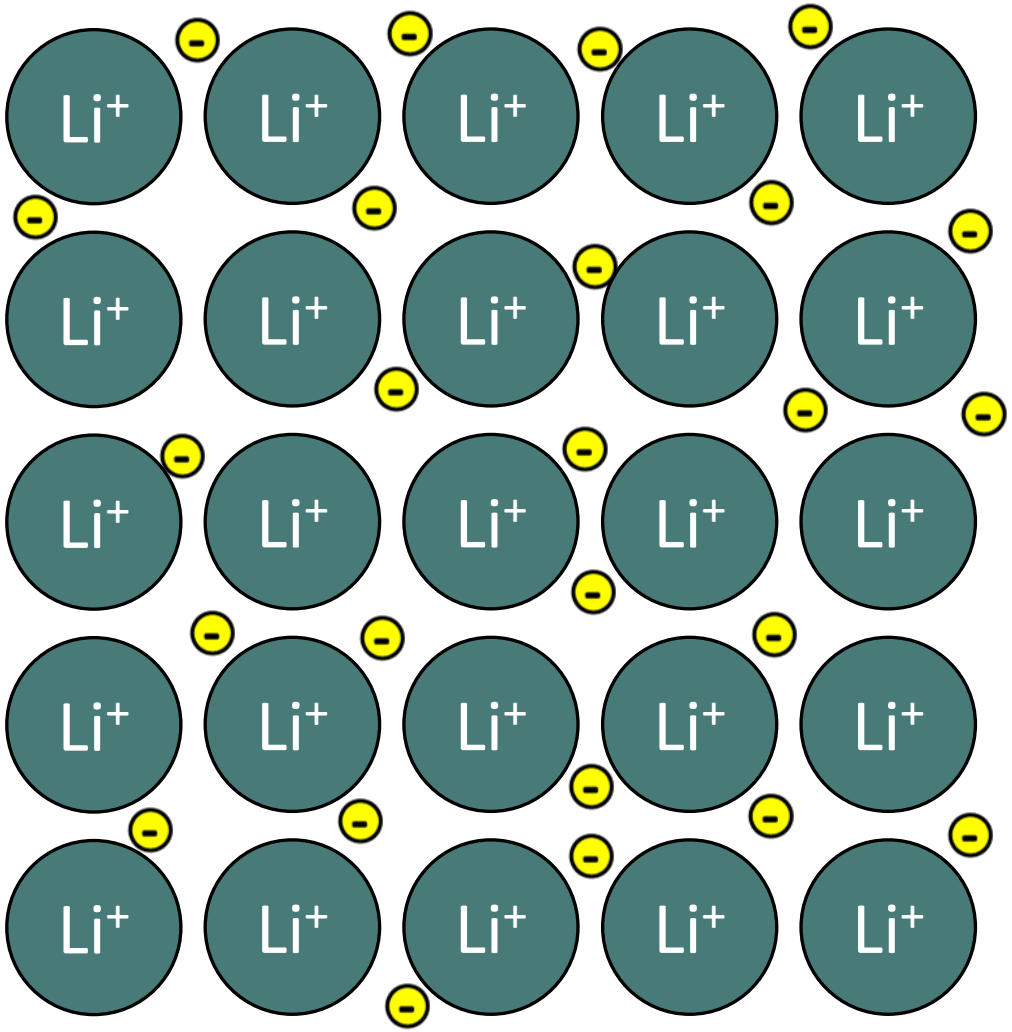
Normally the positive ..... ions would ..... because they have the same ..... .

The positive metal ions are held together by a strong ..... attraction to the electrons.

The ..... are free to move in a metallic bond.

Charge Lattice Electrons (x2) Ions Repel Metal Electrostatic Positive

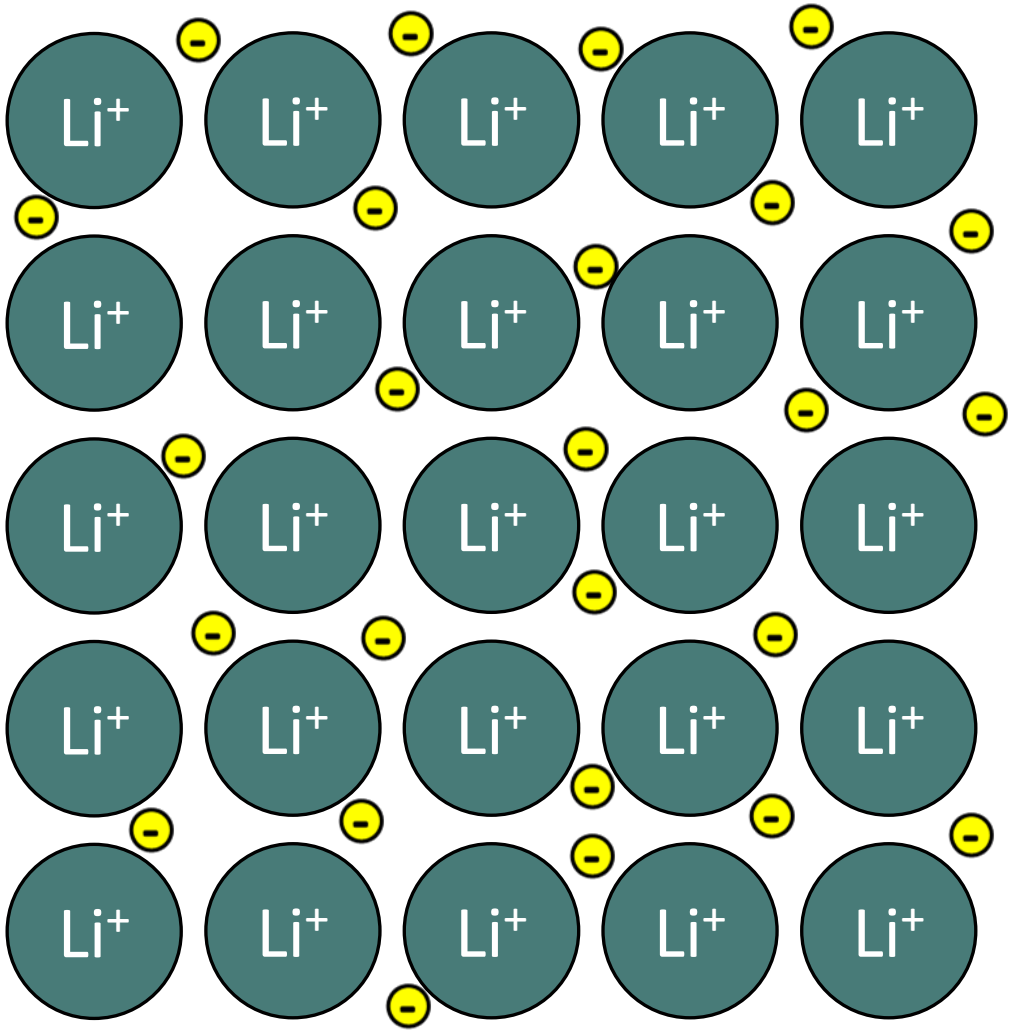
PROPERTIES OF METALS



Metals are **malleable** (they can be shaped) because the layers of ions can **easily slide over each other**.

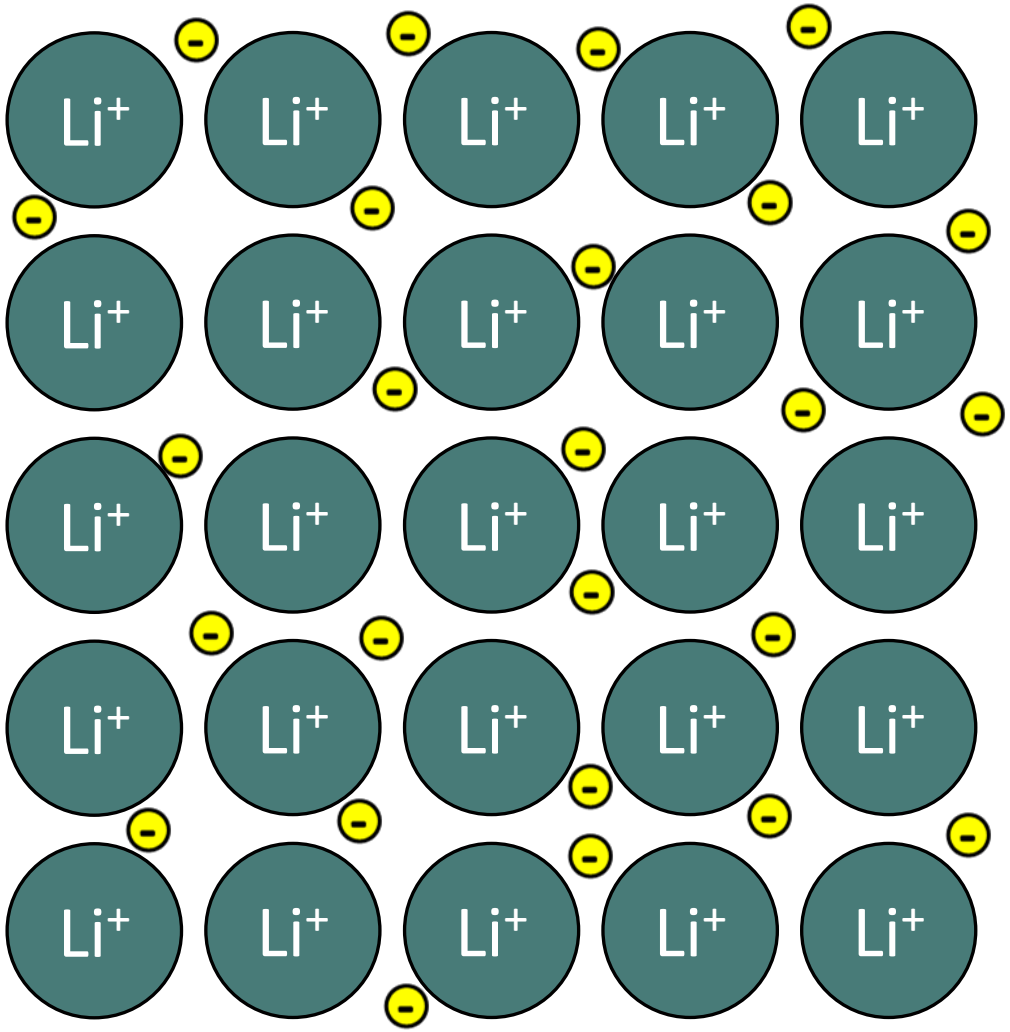
The **electrons move** to hold the ions together, maintaining the **strong electrostatic attraction**.

PROPERTIES OF METALS



Metals are **good electrical conductors** because the **electrons can move to carry a charge**.

PROPERTIES OF METALS



Metal ions are held together by a **strong electrostatic attraction** to the **electrons**.

Vibration (**heat energy**) travels **easily** through **strong bonds**

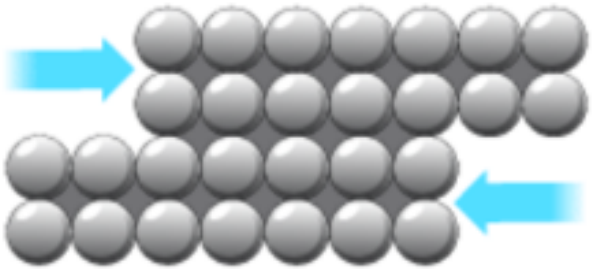
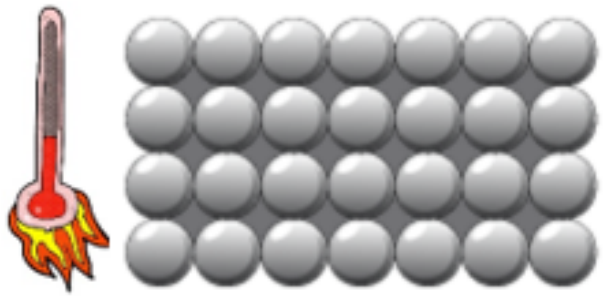
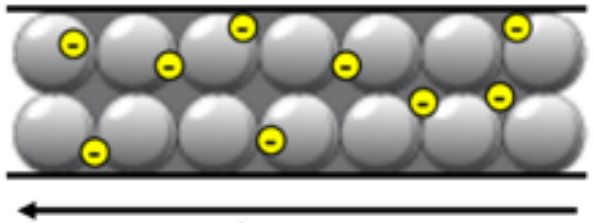
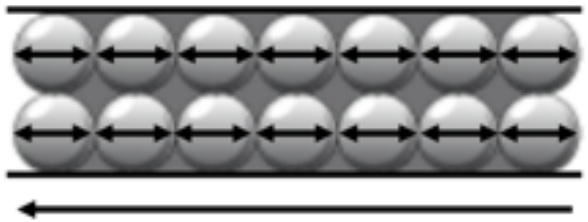
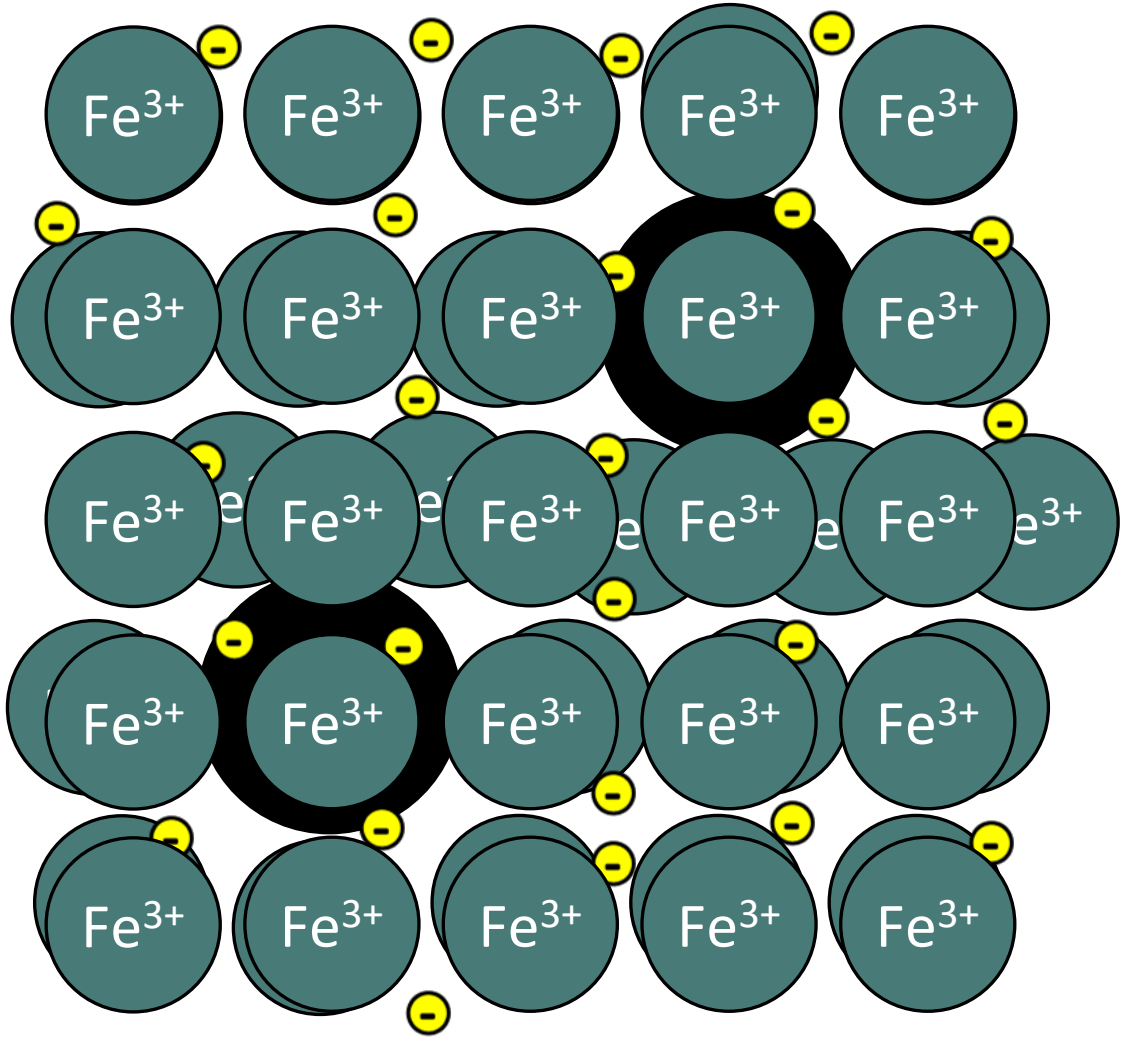
Diagram	Property	Explanation
	…… …… ……	…… …… …… …… …… (Use these words: lattice, easily, electrons, move)
	…… …… ……	…… …… …… …… …… (Use these words: melting, high, electrostatic, energy)

Diagram	Property	Explanation
	....	.... (Use these words: electrons, move, charge, conductor)
	....	.... (Use these words: strong, electrostatic, vibration, easily)

ALLOYS

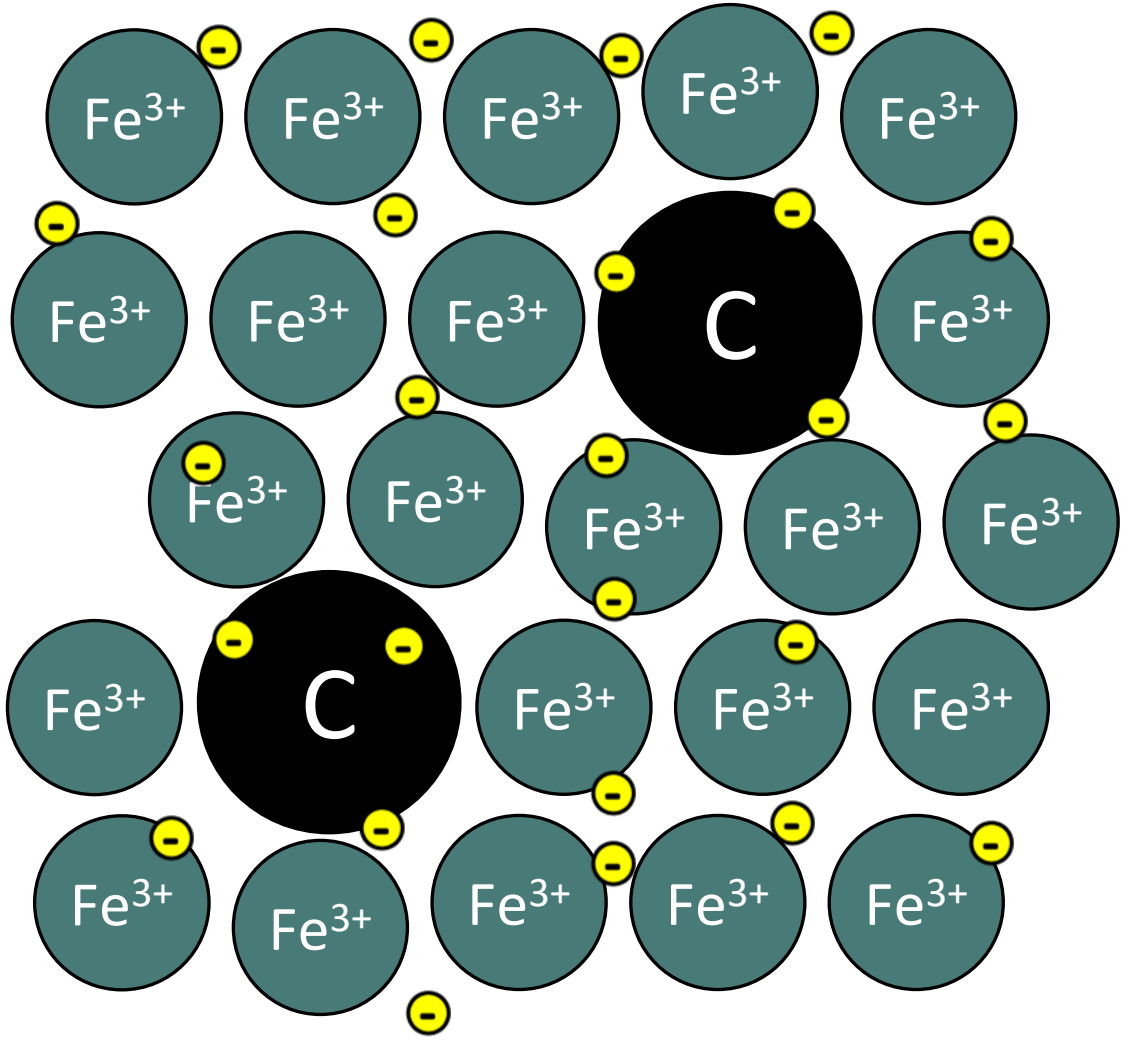


An alloy is a **mixture** of a **metal** and another **element**.

A common alloy is **Steel**, a mixture of **Iron** and **Carbon**.

Making **alloys** can change the **properties** of a metal.

ALLOYS



Steel is **stronger** and **harder** than pure Iron

This is because the carbon atoms change the shape of the **lattice**.

The **layers** now **cannot** easily slide over each other.

4. What is an alloy?

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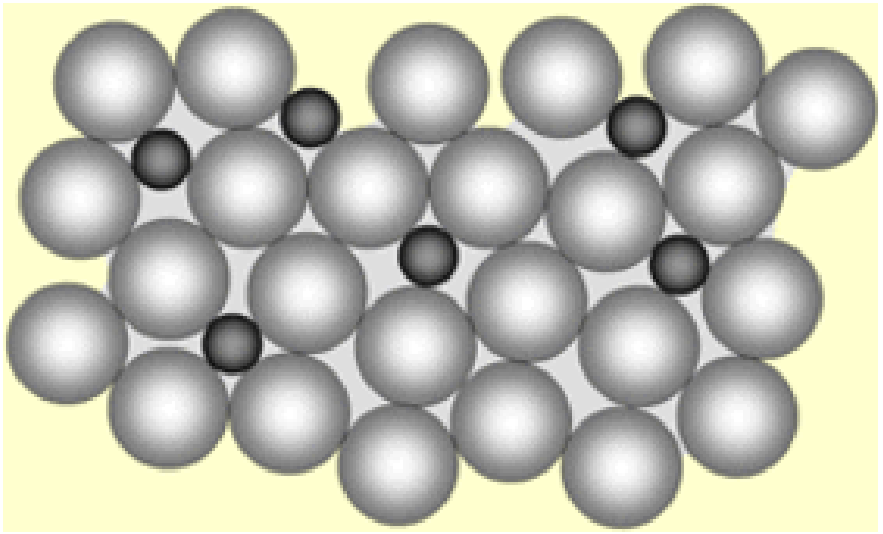
5. Using the diagram to help you, explain why an alloy is likely to be harder than a pure metal.



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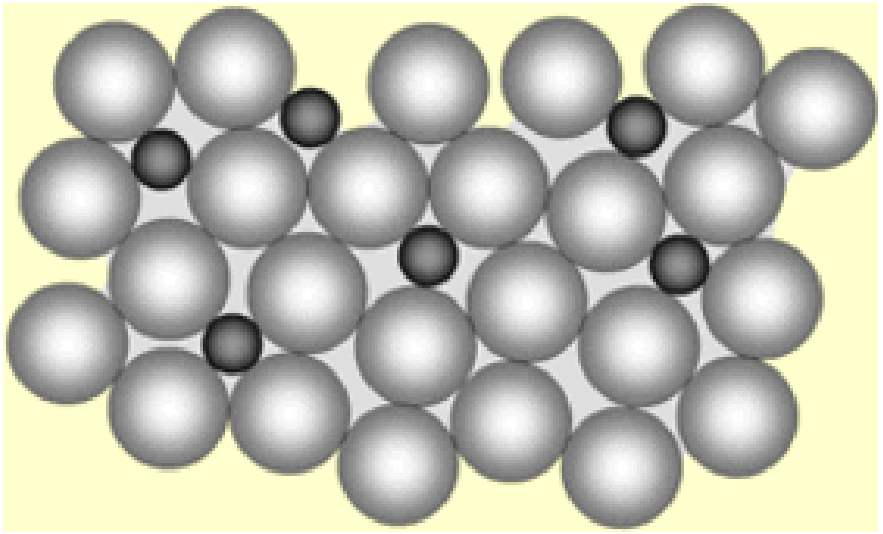

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