9F Summary Sheets

Patterns of reactivity

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Metals may react with substances around them in the environment such as air, water and acids.

Some metals react very easily or quickly. They are **reactive**. Other metals do not react very easily and are described as **unreactive**. The most reactive metals are found on the left-hand side of the Periodic Table. Less reactive metals are found in the centre of the Periodic Table.

Some gases are more reactive than others. In the air, **oxygen** is the most reactive gas. **Nitrogen** is not very reactive. When metals react with the oxygen in the air they form **oxides**.

metal + **oxygen** ⟶ **metal oxide**

The metals that react quickly with air also tend to react with water. When metals react with water they form **hydrogen** gas and a metal **hydroxide**.

metal + **water** ⟶ **metal hydroxide + hydrogen**

The metals that react with water also react very quickly with acids. Some metals that don't react with water do react with acids. When metals react with acids, they produce hydrogen and a **salt.**

metal + **acid** ⟶ **salt** + **hydrogen**

The name of the salt formed depends on the name of the acid:

- **sulphuric** acid makes **sulphates**
- **nitric** acid makes **nitrates**
- **hydrochloric** acid makes **chlorides**.

Reactivity Series

Metals can be arranged in a **Reactivity Series**. The most reactive metals are placed at the top of the table.

More reactive metals can **displace** less reactive metals from their compounds. In a **displacement** reaction, the more reactive metal will form a compound, and the less reactive metal is left on its own as the pure element.

For example, iron is more reactive than copper, so it will displace copper from a compound.

iron + copper chloride ⟶ **iron chloride + copper**

Zinc is more reactive than iron, so iron will not displace zinc from a compound.

iron + zinc chloride ⟶ **no reaction**

You can use displacement reactions to work out the position of a metal in the Reactivity Series. For instance, zinc will displace lead from a compound, so we know that zinc is more reactive than lead.

The Reactivity Series can also be used to predict whether reactions will occur.

Summary Sheets (continued)

The reactivity of metals can be linked to their uses. Metals used for construction need to have a low reactivity, otherwise they will corrode away. Some metals, such as aluminium, have a natural protective oxide layer. Others, such as iron, have to be protected from corrosion, e.g. by painting.

Many low reactivity metals have been known for hundreds or thousands of years. They can be extracted by heating their compounds in a fire.

More reactive metals are extracted by electrolysis. This means that they have only been discovered in the last two hundred years, since the invention of the electric battery.