

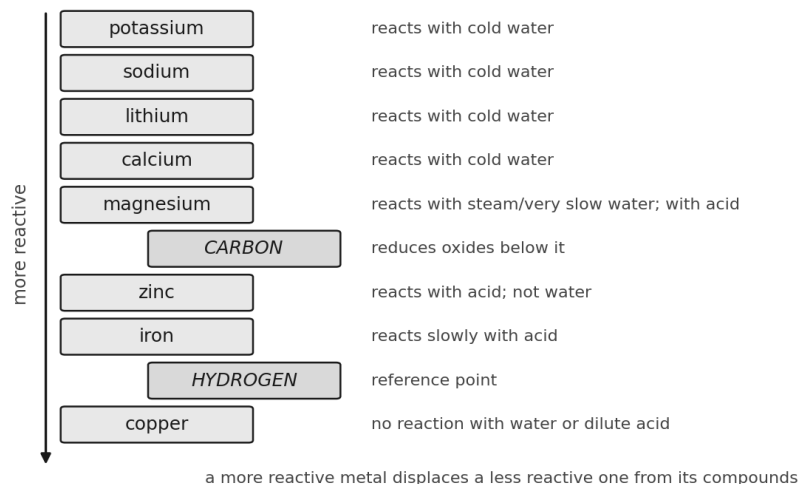
Exercise walk-through

4.1

Reactivity of metals and displacement (4.4.1.1–4.4.1.3)

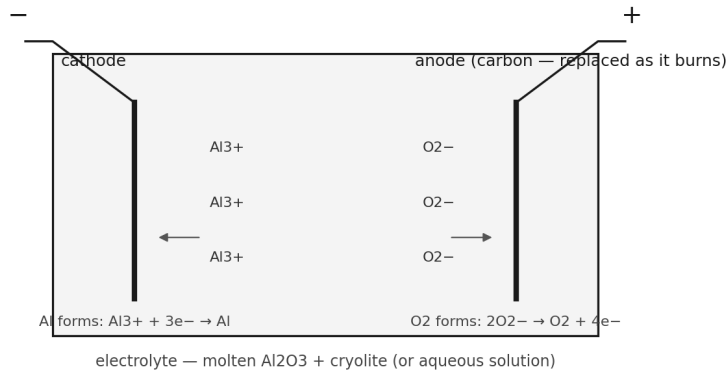
AQA · GCSE · Chemistry

The reactivity series



- K, Na, Li, Ca, Mg, (C), Zn, Fe, (H), Cu — learn the order.
- Water reactions fade down the series; acids react from Mg up.
- More reactive metal displaces a less reactive one.

Electrolysis



- Molten or dissolved — ions free to move to the electrodes.
- Cathode collects the metal or hydrogen; anode the non-metal.
- Aluminium — cryolite mixture; carbon anode burns away.

Exercises 2.1·2.3

2.1 Place in reactivity order: calcium, copper, magnesium, sodium. [1]

2.2 Which metal in the series does not react with dilute hydrochloric acid? [1]

2.3 Why is aluminium extracted by electrolysis rather than carbon reduction? [1]

Exercises 2.1·2.3

2.1 Place in reactivity order: calcium, copper, magnesium, sodium. [1]

2.1 Sodium > calcium > magnesium > copper.

2.2 Which metal in the series does not react with dilute hydrochloric acid? [1]

2.2 Copper.

2.3 Why is aluminium extracted by electrolysis rather than carbon reduction? [1]

2.3 Aluminium is more reactive than carbon, so carbon cannot reduce its oxide.

Exercises 3.1·3.3

3.1 Iron displaces copper from copper sulfate solution but cannot displace magnesium from magnesium sulfate. Deduce the reactivity order of the three metals and explain in terms of ions. [4]

3.2 Explain, in terms of oxygen, why iron is oxidised and carbon dioxide is reduced in:
 $2 \text{Fe}_2\text{O}_3 + 3 \text{C} \rightarrow 4 \text{Fe} + 3 \text{CO}_2$. [3]

3.3 (HT) For $\text{Mg} + \text{Fe}^{2+} \rightarrow \text{Mg}^{2+} + \text{Fe}$, write the two half-equations and state which

Exercises 3.1·3.3

3.1 Iron displaces copper from copper sulfate solution but cannot displace magnesium from magnesium sulfate. Deduce the reactivity order of the three metals and explain in terms of ions. [4]

3.1 Iron > copper, because iron displaces copper – iron atoms form ions more readily; magnesium > iron, because iron cannot displace magnesium; order: Mg > Fe > Cu; reactivity is the tendency to lose electrons and form positive ions.

3.2 Explain, in terms of oxygen, why iron is oxidised and carbon dioxide is reduced in:
 $2 \text{Fe}_2\text{O}_3 + 3 \text{C} \rightarrow 4 \text{Fe} + 3 \text{CO}_2$. [3]

3.2 Iron oxide loses oxygen to become iron – iron is reduced; carbon gains oxygen to become carbon dioxide – carbon is oxidised; overall, carbon reduces iron oxide to iron. (Correction to the question's premise is expected: iron is REDUCED, carbon is OXIDISED.)

3.3 (HT) For $\text{Mg} + \text{Fe}^{2+} \rightarrow \text{Mg}^{2+} + \text{Fe}$, write the two half-equations and state which

3.3 $\text{Mg} \rightarrow \text{Mg}^{2+} + 2\text{e}^-$; $\text{Fe}^{2+} + 2\text{e}^- \rightarrow \text{Fe}$; the iron(II) ion gains electrons, so Fe^{2+} is