Your notes

GCSE Chemistry: revision notes

# Chemical cells and fuel cells

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## Chemical cells

- **Cells** contain chemicals that react to produce electricity.
- A simple **cell** can be made by connecting two different metals in contact with an **electrolyte**.
- The voltage depends on the type of electrodes and the **electrolyte**: the bigger the difference in reactivity between the two metals, the bigger the voltage.
- Batteries are two or more **cells** connected in series to give a bigger voltage.

## Rechargeable and non-rechargeable

- In non-**rechargeable cells** and batteries, such as alkaline batteries, the chemical reactions stop when one of the reactants has been used up.
- **Rechargeable cells** and batteries can be recharged, because the chemical reactions are reversed when an external electric current is supplied.

## Fuel cells

- **Fuel cells** are supplied with a fuel (such as hydrogen) and oxygen or air from outside. The fuel is oxidised electrochemically to produce a **potential difference**.
- In a **hydrogen fuel cell**, hydrogen is oxidised to produce water: $2H_2 + O_2 \rightarrow 2H_2O$. Water is the only product.
- (Higher) At the negative electrode: $2H_2 \rightarrow 4H^+ + 4e^-$. At the positive electrode: $O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$.

## Fuel cells compared with batteries

- Advantages of **hydrogen fuel cells**: they only produce water, they don't need recharging (they work while fuel is supplied), and they have fewer parts to wear out.

- Disadvantages: hydrogen is a gas that is hard to store and is flammable; it is often made using fossil fuels; there are few places to refuel.
- Batteries are easy to store and use, but contain toxic chemicals, eventually wear out, and recharging uses electricity that may come from fossil fuels.

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## Key terms

| | |
|---|---|
| **Cell** | A device containing chemicals that react to produce electricity. |
| **Battery** | Two or more cells connected in series. |
| **Electrolyte** | A solution or liquid containing ions that allows charge to flow in a cell. |
| **Rechargeable cell** | A cell whose reactions can be reversed by supplying an external current. |
| **Fuel cell** | A cell that uses a fuel and oxygen from outside to produce electricity. |
| **Hydrogen fuel cell** | A fuel cell in which hydrogen reacts with oxygen to produce water and electricity. |
| **Potential difference** | The voltage produced by a cell. |

## Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. What is needed to make a simple chemical cell?
2. What affects the voltage of a simple cell?
3. What is a battery?
4. Why does a non-rechargeable battery stop working?
5. How can a rechargeable battery be recharged?
6. What is the only product of a hydrogen fuel cell?
7. Give a disadvantage of hydrogen fuel cells.
8. What happens to hydrogen in a fuel cell?

### Answers

1. Two different metals in contact with an electrolyte
2. The type of electrodes and electrolyte
3. Two or more cells connected in series
4. One of the reactants is used up
5. An external current reverses the reactions
6. Water
7. Hydrogen is difficult to store
8. It is oxidised

## What to do next

**Practise 10 questions on this topic**

**Try 7 exam questions, with mark schemes**

**Read the lesson, one step at a time**

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