



Edexcel GCSE Chemistry



Your notes

Chemical Cells & Fuel Cells

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Your notes

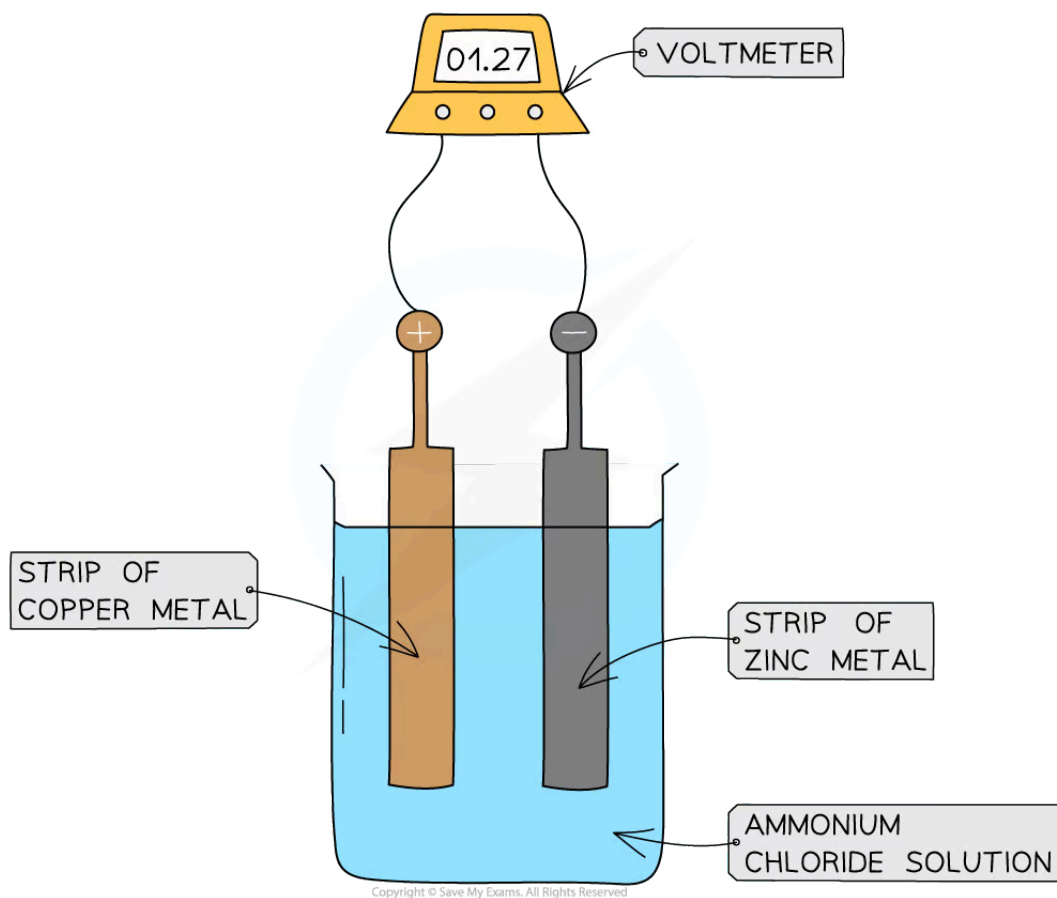
Electrochemical Cells

Electrochemical Cells

- A simple cell is a source of electrical **energy**
- The simplest design consists of two electrodes made from metals of **different reactivity** immersed in an electrolyte and connected to an external voltmeter by wire, creating a complete circuit
- A common example is zinc and copper
- Zinc is the more reactive metal and forms ions more easily, readily **releasing electrons**
- The electrons give the more **reactive electrode** a **negative** charge and sets up a **charge difference** between the electrodes
- The electrons then flow around the circuit to the copper electrode which is now the more **positive** electrode
- The **difference** in the ability of the electrodes to release electrons causes a voltage to be produced
- The greater the difference in the metals **reactivity** then the greater the **voltage** produced
- The electrolyte used also affects the voltage as different ions react with the electrodes in different ways
- Cells produce a **voltage** until one of the **reactants** is used up

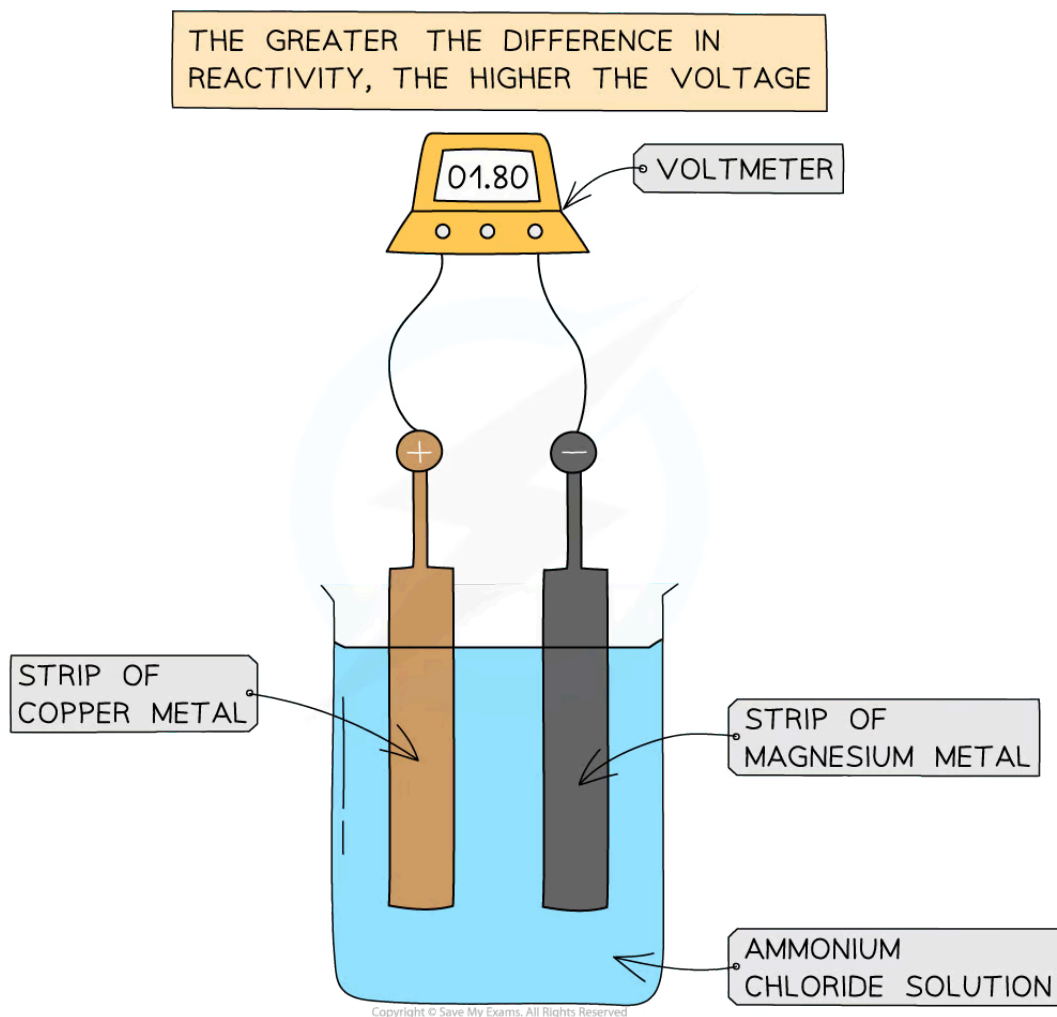


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Simple cell made with Cu and Mg. These metals are further apart on the reactivity series than Cu and Zn and produce a greater voltage



Examiner Tips and Tricks

Use the reactivity series of metals to compare different cells and deduce the relative voltages.

Fuel Cells



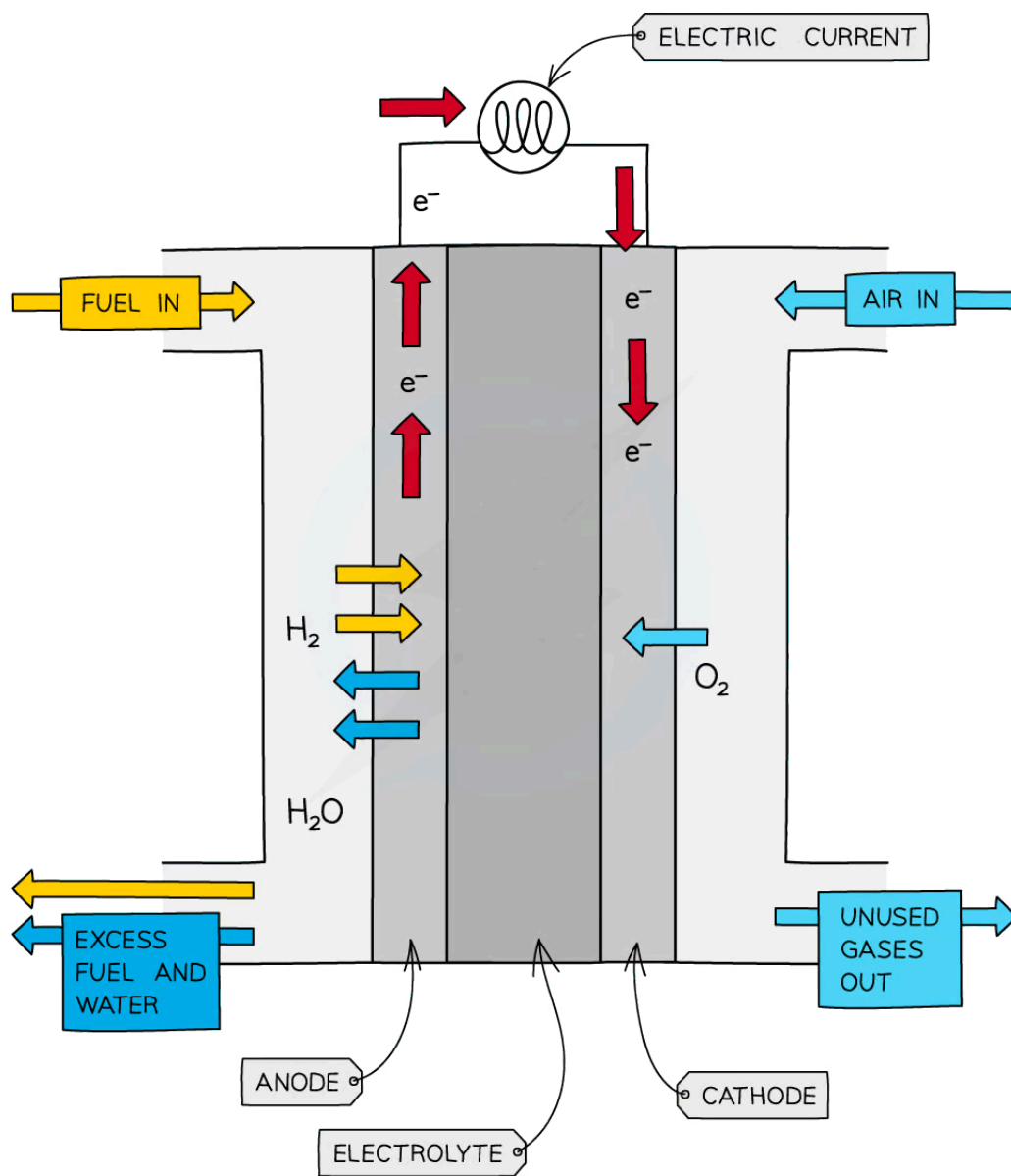
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Fuel Cells

- A fuel cell is an electrochemical cell in which a fuel **donates** electrons at one electrode and oxygen **gains** electrons at the other electrode
- These cells are becoming more common in the automotive industry to replace petrol or diesel engines
- As the fuel enters the cell it becomes oxidised which sets up a **potential difference** or voltage within the cell
- Different electrolytes and fuels can be used to set up different types of fuel cells
- An important cell is the **hydrogen-oxygen** fuel cell which combines both elements to release energy and water



Your notes



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Diagram showing the movement of hydrogen, oxygen and electrons in a Hydrogen-Oxygen fuel cell





Your notes

Examiner Tips and Tricks

In fuel cells the polarity on the electrodes are the other way around: the anode is the negative electrode and the cathode is the positive electrode.

Evaluating Fuel Cells

Advantages

- They **do not produce any pollution**: the only product is water
- They produce **more energy** per kilogram than either petrol or diesel
- No power is lost in transmission as there are no moving parts, unlike an internal combustion engine
- No batteries to dispose of which is better for the environment
- Continuous process and will keep producing energy as long as fuel is supplied
- Quieter so less noise pollution

Disadvantages

- Materials used in producing fuel cells are **expensive**
- **High pressure** tanks are needed to store the oxygen and hydrogen in sufficient amounts which are dangerous and difficult to handle
- Fuel cells are affected by **low** temperatures, becoming less efficient
- Hydrogen is **expensive** to produce and store
- Quieter so potential danger to pedestrians if used in cars and lorries



Examiner Tips and Tricks

You should be able to state advantages and disadvantages of the hydrogen-oxygen fuel cells.