

The electrolysis of solutions

Topic

Electrolysis of aqueous solutions leading to the ability to predict results, reactivity series.

Timing

60 min.

Description

Students electrolyse some aqueous solutions and identify the products.

Apparatus and equipment (per group)

- 100 cm³ Beaker
- Electrodes (S-shaped are preferable)
- Small test-tubes for gas collection
- Two leads
- Two crocodile clips
- DC power supply (6 V is reasonable)
- Eye protection.

Chemicals (per group)

- Universal Indicator paper
- Access to solutions of :
 - Sodium chloride 0.5 mol dm⁻³
 - Copper chloride 0.5 mol dm⁻³ (**Harmful**)
 - Potassium iodide 0.5 mol dm⁻³
 - Sodium bromide 0.5 mol dm⁻³
 - Potassium sulfate 0.5 mol dm⁻³
 - Copper(II) sulfate 0.5 mol dm⁻³
 - Silver nitrate 0.1 mol dm⁻³.

Teaching tips

Teachers may wish to show students how to fill and invert the small test-tubes over the electrodes. With care, these can be inverted without spilling the liquid. Using small tubes filled with water rather than the test solution is safer. These are then inverted into the solution to be tested. The tubes may be clamped or supported by rubber bands wound round the test-tubes and round the electrode. The class results can be pooled as there will not be time to test all the solutions individually.

Students may need reminding of, or introducing to, the common tests for hydrogen, oxygen, chlorine, bromine and iodine.

Solution	Product at anode	Product at cathode
Sodium chloride	Chlorine	Hydrogen



Copper chloride	Chlorine	Copper
Potassium iodide	Iodine	Hydrogen
Sodium bromide	Bromine	Hydrogen
Potassium sulfate	Oxygen	Hydrogen
Copper(II) sulfate	Oxygen	Copper
Silver nitrate	Oxygen	Silver

Background theory

Students should know what happens when molten ionic solids are electrolysed. If students do not know the tests to identify the products, this is an appropriate time to introduce them.

Safety

Wear eye protection.

Chlorine is toxic and harmful to the lungs, eyes and respiratory tract.

Bromine vapour is an irritant and very toxic if inhaled.

Iodine is harmful by skin contact.

Hydrogen is extremely flammable.

Oxygen supports combustion.

Ensure good ventilation. Do not allow chlorine or bromine vapour to be produced for very long.

Answers

1. Metals or hydrogen.
2. Non-metals.
3. From the water.
4. (a) The metal is produced if it is lower than hydrogen in the reactivity series, otherwise hydrogen is produced.
(b) Halides give halogens, sulfates and nitrates give oxygen.

Credits

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