

Splitting compounds with electricity

Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Test

Name: _____ Date: _____ Class: _____ Mark: ____ / 20

This test lasts 45 minutes and is worth 20 marks. Answer every question and show each step of any calculation. Use the atomic masses given and write half equations with the correct charges and electrons. A calculator is allowed but the answers rely on method more than on long arithmetic.

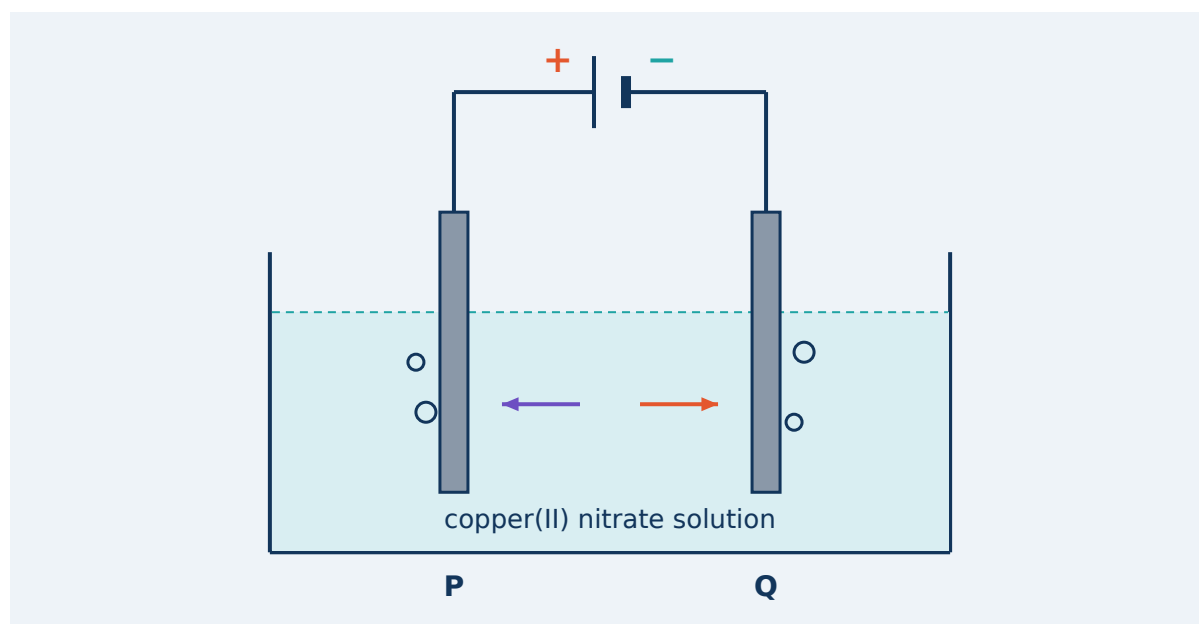
Level: Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** GCSE C4

Time: 45 minutes · 8 questions · Total: 20 marks · Calculator allowed

Question 1 Reading the cell (2 marks)

Study the figure. The electrodes are inert.

- State which electrode, P or Q, is the cathode and give a reason. (1 mark)
- State what happens to copper ions at that electrode. (1 mark)



A cell with inert electrodes P and Q.

Question 2 Molten lithium chloride (3 marks)

Molten lithium chloride, LiCl , is electrolysed with inert electrodes.

- Name the product at each electrode. (1 mark)
- Write the half equation at the cathode. (1 mark)

- c. Write the half equation at the anode. (1 mark)

Question 3 Copper(II) nitrate solution (3 marks)

Copper(II) nitrate solution is electrolysed with inert electrodes.

- a. Name the product at the cathode and explain why it forms instead of hydrogen. (2 marks)
- b. Name the gas at the anode. (1 mark)

Question 4 Splitting acidified water (3 marks)

Dilute sulfuric acid is electrolysed and 40 cm³ of hydrogen is collected at the cathode.

- a. Calculate the volume of oxygen formed at the anode. (1 mark)
- b. Explain your answer using the electrons in the half equations $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$ and $4\text{OH}^- \rightarrow \text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^-$. (2 marks)

Question 5 Making aluminium (3 marks)

Aluminium is extracted by electrolysing aluminium oxide dissolved in molten cryolite.

- a. Explain why cryolite is used. (1 mark)
- b. Write the half equation at the cathode. (1 mark)
- c. Explain why the carbon anodes must be replaced. (1 mark)

Question 6 Uses of brine products (2 marks)

Name two products of the electrolysis of concentrated sodium chloride solution and give one use of each. (2 marks)

Question 7 Sodium hydroxide mass (2 marks)

The reaction is $2\text{NaCl} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2 + \text{Cl}_2$. Calculate the mass of sodium hydroxide formed with 0.10 mol of chlorine (Ar: Na = 23, O = 16, H = 1). (2 marks)

Question 8 Electroplating (2 marks)

A steel key is coated with nickel by electrolysis. Explain why the key is made the cathode and why the anode is nickel. (2 marks)