

GCSE Combined Science: Trilogy

Worksheet: Electrolysis of aqueous solutions

TIME 30 min	TOTAL 30 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Electrolysis of aqueous solutions

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Dilute sulfuric acid is electrolysed using inert electrodes. It contains H^+ and SO_4^{2-} ions, and OH^- ions from water.

0 1 . 1

Which gas forms at the negative electrode?

Tick (✓) **one** box.

Oxygen

☐

Hydrogen

☐

Sulfur dioxide

☐

Water vapour

☐

[1 mark]

0 1 . 2

Name the gas formed at the positive electrode.

.....

.....

.....

.....

[1 mark]

0 2

A student electrolyses two solutions, sodium chloride solution and copper(II) sulfate solution, using inert graphite electrodes.

0 2 . 1

What forms at the negative electrode when copper(II) sulfate solution is electrolysed?

Tick (✓) **one** box.

Copper

☐

Hydrogen

☐

Oxygen

☐

Sulfur

☐

[1 mark]

0 2 . 2

When sodium chloride solution is electrolysed, the gas produced at the positive electrode bleaches damp litmus paper.

Name this gas.

.....

.....

.....

[1 mark]

0 2 . 3

Describe the test for the gas produced at the negative electrode when sodium chloride solution is electrolysed.

Give the result of the test.

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.....

.....

.....

[2 marks]

0 2 . 4

Suggest why graphite electrodes are used.

.....

.....

[1 mark]

0 2 . 5

Give **one** safety precaution the student should take when electrolysing sodium chloride solution. Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

0 3

A student electrolysed sodium chloride solution using inert electrodes.

0 3 . 1

Name the gas produced at the negative electrode.

.....

.....

.....

.....

[1 mark]

0 3 . 2

Name the gas produced at the positive electrode.

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.....

.....

[1 mark]

0 3 . 3

Describe the test for chlorine and give the result.

.....

.....

.....

.....

[2 marks]

0 4

A student electrolysed copper(II) chloride solution and then copper(II) sulfate solution, using inert electrodes.

0 4 . 1

Describe what the student would see at the negative electrode during the electrolysis of copper(II) chloride solution.

.....

.....

[1 mark]

0 4 . 2

Describe what the student would see at the positive electrode during the electrolysis of copper(II) chloride solution.

.....

.....

[1 mark]

0 4 . 3

Oxygen is produced at the positive electrode when copper(II) sulfate solution is electrolysed.

Describe the test for oxygen and give the result.

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[2 marks]

0 4 . 4

The blue colour of the copper(II) sulfate solution fades during the electrolysis. Explain why.

.....

.....

[1 mark]

0 5

When sodium sulfate solution is electrolysed using inert electrodes, hydrogen is produced at the negative electrode and oxygen at the positive electrode. The volume of hydrogen should be exactly twice the volume of oxygen, so the true value of the ratio (volume of hydrogen ÷ volume of oxygen) is 2.0.

Two students each measured this ratio three times. Table 1 shows their results.

Table 1

Student	Ratio: trial 1	trial 2	trial 3
A	2.3	2.2	2.3
B	1.7	2.3	2.0

0 5 . 1

Calculate the mean ratio for each student.
Give your answers to 2 significant figures.

.....

.....

.....

.....

.....

[2 marks]

0 5 . 2

Which student's results are more precise?
Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

0 5 . 3

Which student's mean is more accurate?
Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

0 5 . 4

All of student A's ratios are higher than the true value. What type of error does this suggest?

Tick (✓) **one** box.

A random error

☐

A systematic error

☐

An anomalous result

☐

A zero error

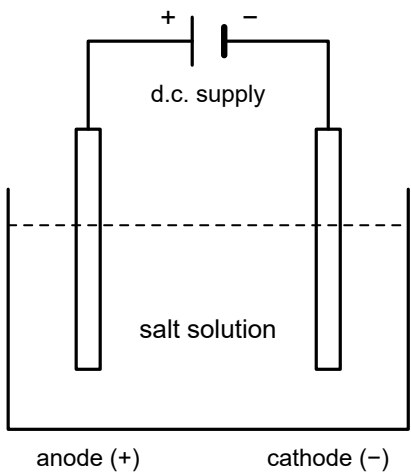
☐

[1 mark]

0 6

A student electrolysed three different salt solutions using the apparatus shown in Figure 1. The electrodes were inert.

Figure 1



0 6 . 1

Table 2

Solution	Product at cathode (negative electrode)	Product at anode (positive electrode)
Copper(II) sulfate		
Sodium iodide		
Potassium nitrate		

Complete Table 2 to show the product at each electrode.

.....

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.....

.....

.....

.....

[3 marks]

0 6 . 2

Explain why hydrogen, and not sodium, is produced at the cathode when sodium iodide solution is electrolysed.

.....

.....

.....

.....

[2 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Electrolysis of aqueous solutions · 30 marks

Question 1 (2 marks)

01.1 [1 mark]

Correct: Hydrogen

01.2 [1 mark]

Answer: oxygen

- oxygen (1)
-

Question 2 (7 marks)

02.1 [1 mark]

Correct: Copper

02.2 [1 mark]

Answer: Chlorine.

- chlorine (1)

Notes: Do not accept chloride or Cl.

02.3 [2 marks]

Answer: Hold a burning splint at the mouth of the tube: it burns with a (squeaky) pop.

- hold a burning / lit splint at the mouth of the tube (of gas) (1)
- (squeaky) pop (1)

Notes: Do not accept a glowing splint. The result mark depends on a burning splint.

02.4 [1 mark]

Answer: Graphite is inert: it conducts electricity but does not react with the solution or the products.

- graphite is inert / does not react with the solution or the products (and it conducts electricity) (1)
-

02.5 [2 marks]

Answer: Work in a fume cupboard (or a well-ventilated room), because chlorine is toxic.

- work in a fume cupboard / a well-ventilated room / run the electrolysis for a short time only (1)
 - because chlorine is toxic (1)
-

Question 3 (4 marks)

03.1 [1 mark]

Answer: hydrogen

- hydrogen (1)

03.2 [1 mark]

Answer: chlorine

- chlorine (1)

03.3 [2 marks]

- (hold) damp litmus paper (in the gas) (1)
- the litmus paper is bleached / turns white (1)

Notes: Allow damp blue litmus paper turns red then white. Do not accept dry litmus paper for the first mark. The second mark depends on the first.

Question 4 (5 marks)

04.1 [1 mark]

- a pink / brown / orange-brown solid (copper) coats the electrode (1)

04.2 [1 mark]

- bubbles (of gas) (1)

Notes: Allow pale green gas / smell of chlorine / bleach smell.

04.3 [2 marks]

- (insert a) glowing splint (1)
- it relights (1)

Notes: Do not accept a lit / burning splint. The second mark depends on the first.

04.4 [1 mark]

- copper(II) ions (which make the solution blue) are removed from the solution as copper forms at the negative electrode (1)
-

Question 5 (7 marks)

05.1 [2 marks]

Answer: A: 2.3; B: 2.0

- A: $(2.3 + 2.2 + 2.3) \div 3 = 2.3$ (1)
 - B: $(1.7 + 2.3 + 2.0) \div 3 = 2.0$ (1)
-

05.2 [2 marks]

Answer: Student A: the results are closer together (a range of 0.1 compared with 0.6).

- student A (1)
- A's results are closer together / have a smaller range (0.1 compared with 0.6) (1)

Notes: The reason mark depends on choosing student A.

05.3 [2 marks]

Answer: Student B: the mean (2.0) is equal to the true value.

- student B (1)
- B's mean (2.0) is closer to / equal to the true value (2.0) (1)

Notes: Allow ECF from part (a). The reason mark depends on choosing student B.

05.4 [1 mark]

Correct: A systematic error

Question 6 (5 marks)

06.1 [3 marks]

Answer: copper and oxygen; hydrogen and iodine; hydrogen and oxygen

- copper (cathode) and oxygen (anode) (1)
- hydrogen (cathode) and iodine (anode) (1)
- hydrogen (cathode) and oxygen (anode) (1)

Notes: Each mark needs both products for that solution, at the correct electrodes.

06.2 [2 marks]

- sodium is more reactive than hydrogen (1)
 - so hydrogen ions (from the water) gain electrons / are discharged instead of sodium ions (1)
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