**1.** Molten aluminium oxide, $Al_2O_3$, is electrolysed.

Which row of the table shows the reactions at the electrodes?

| | Cathode | Anode |
|---|---|---|
| **A** | $Al^{3+} + 3e^- \rightarrow Al$ | $O^{2-} \rightarrow O_2 + 2e^-$ |
| **B** | $Al^{3+} \rightarrow Al + 3e^-$ | $O^{2-} + 2e^- \rightarrow O_2$ |
| **C** | $Al^{3+} + 3e^- \rightarrow Al$ | $2O^{2-} \rightarrow O_2 + 4e^-$ |
| **D** | $Al^{3+} \rightarrow Al + 3e^-$ | $2O^{2-} + 4e^- \rightarrow O_2$ |

Your answer ☐ **[1]**

**2.** Which equipment is needed to set up an electrolysis experiment?

**A** A battery, a beaker, a funnel and wires
**B** A battery, a beaker, electrodes and wires
**C** A battery, crocodile clips, electrodes and a thermometer
**D** A beaker, electrodes, a funnel and a thermometer

Your answer ☐ **[1]**

**3.** Which products are formed in the electrolysis of sodium chloride solution?

| | Anode | Cathode |
|---|---|---|
| **A** | chlorine | hydrogen |
| **B** | chlorine | sodium |
| **C** | oxygen | hydrogen |
| **D** | oxygen | sodium |

Your answer ☐ **[1]**

**4(a).** A scientist wants to make copper using electrolysis.
They consider two different electrolysis experiments using inert electrodes as shown in the table.

| | **Experiment 1** | **Experiment 2** |
|---|---|---|
| **Electrolyte** | molten copper chloride | copper sulfate solution |
| **Electrode the scientist collects product from** | anode | cathode |

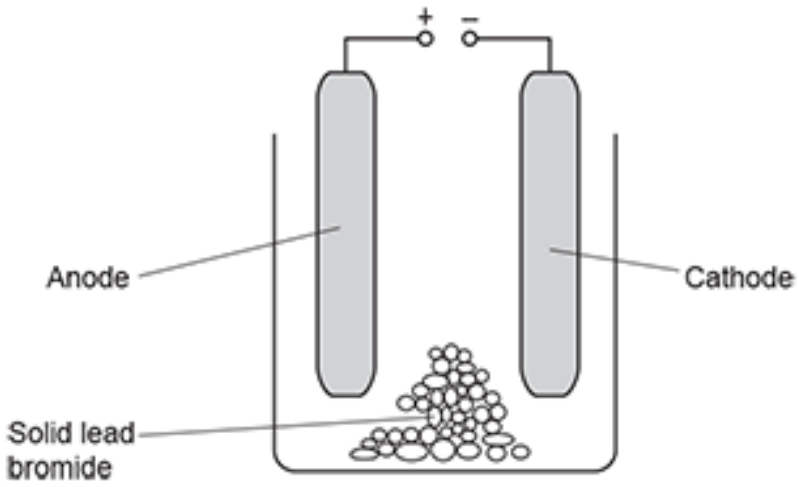
Predict and explain what will be made at the electrode the scientist collects the product from in each experiment.

Determine which experiment the scientist should use to make copper.

**[6]**

**(b).** A scientist investigates the electrolysis of lead bromide.

The diagram shows their experiment.




The experiment does **not** make any lead.

State **two** changes the scientist should make so that lead is made.

1 _____

_____

2 _____

_____

**[2]**

**(c).** Complete the **balanced half** equation for the production of bromine from bromide ions.

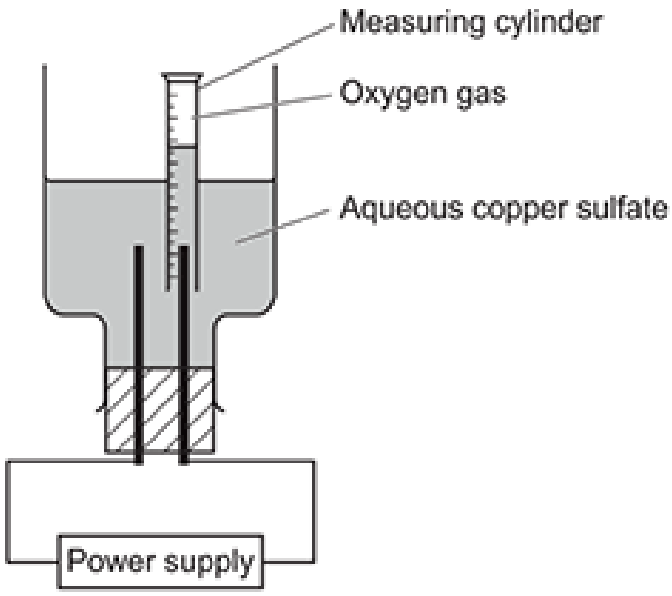
$$2Br^- - \text{.....} \rightarrow \text{.....}$$

**[2]**

**5(a).**

In the electrolysis of aqueous copper sulfate, copper is made.

The teacher sets up an experiment to measure the volume of oxygen gas made.

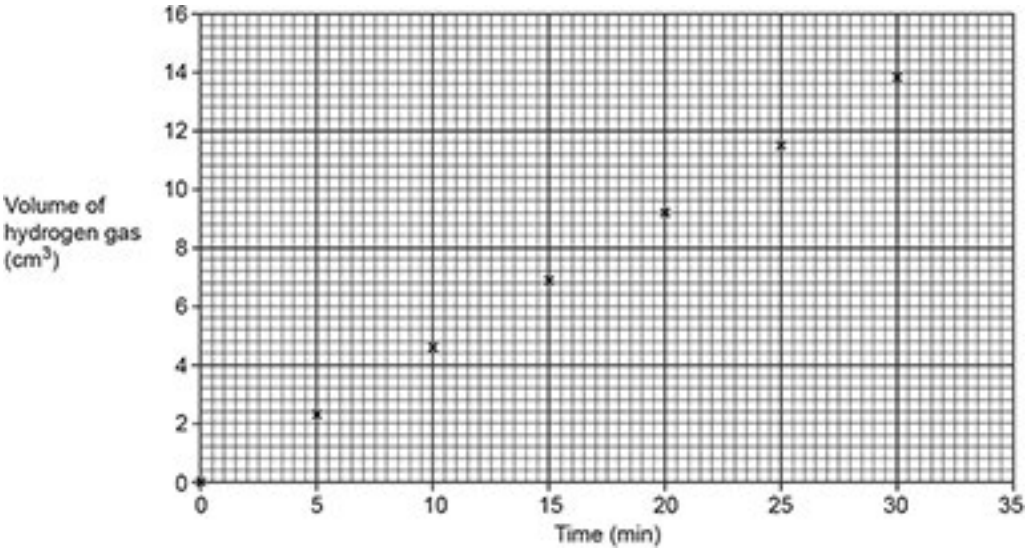



Explain how the student could change the experiment to measure the amount of copper formed.

**[3]**

**(b).** A teacher sets up an experiment to investigate the electrolysis of aqueous sodium chloride, NaC*l*. The teacher measures the volume of hydrogen gas given off.

The teacher plots the results on a graph.



i. Draw a line of best fit on the graph.

**[1]**

ii. What is the volume of hydrogen gas given off after 23 minutes?

Volume of hydrogen gas = ..... $cm^3$ **[1]**

iii. Which electrode is hydrogen gas given off at?

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**[1]**

iv. State the name of the product made at the other electrode.

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**[1]**

**(c).** A student repeats the teacher's experiment with aqueous copper sulfate, $CuSO_4$.

The student finds that **no** hydrogen gas is given off.

Explain why hydrogen gas is given off in the electrolysis of aqueous NaC*l*, but **not** in the electrolysis of aqueous $CuSO_4$.

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**[3]**

**6.** Molten sodium chloride can be electrolysed.

What is the correct half equation for the reaction at the negative electrode (cathode)?

**A** $2Cl^- - 2e^- \rightarrow Cl_2$
**B** $2H^+ + 2e^- \rightarrow H_2$
**C** $Na^+ + e^- \rightarrow Na$
**D** $4OH^- - e^- \rightarrow O_2 + 2H_2O$

Your answer ☐ **[1]**