Electrolysis – 2021/20 GCSE Gateway Chemistry A

1. Nov/2021/Paper_J248/01/No.12

Molten lead bromide, $PbBr_2$, is electrolysed.

Which substance is formed at the **cathode**?

A Bromine

B Hydrogen

C Lead

D Oxygen

Your answer ☐ **[1]**

2. Nov/2020/Paper_J248/01/No.11

An aqueous solution of concentrated sodium chloride is electrolysed. Bubbles are seen at the **positive** electrode.

What is the name of the substance produced at the positive electrode?

A Chlorine

B Hydrogen

C Sodium

D Oxygen

Your answer ☐ **[1]**

3. Nov/2020/Paper_J248/01/No.18

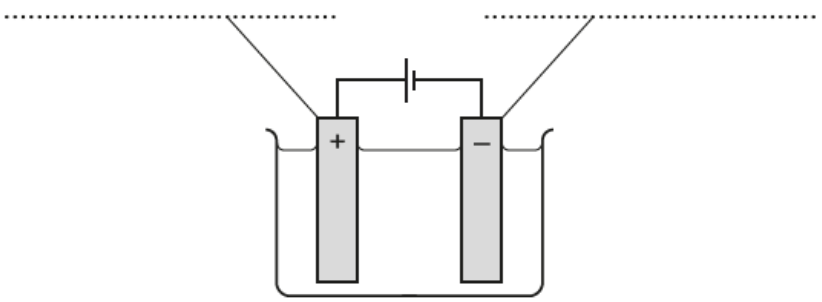
Electrolysis can be used to separate the elements in some compounds using electricity.

(a) (i) Look at the diagram of an electrolysis experiment.

Complete the diagram using the words in the list.

You may use each word once, more than once or not at all.

cathode **anode** **battery**



[2]

(ii) A teacher demonstrates the electrolysis of molten lead bromide.

Predict the products made at each electrode.

Positive electrode .....

Negative electrode .....

[2]

(iii) Molten lead bromide contains lead ions, Pb^{2+}, and bromide ions, Br^-.

What is the formula for lead bromide?

Tick (✓) **one** box.

PbBr ☐

$PbBr_2$ ☐

Pb_2Br ☐

Pb_2Br_2 ☐

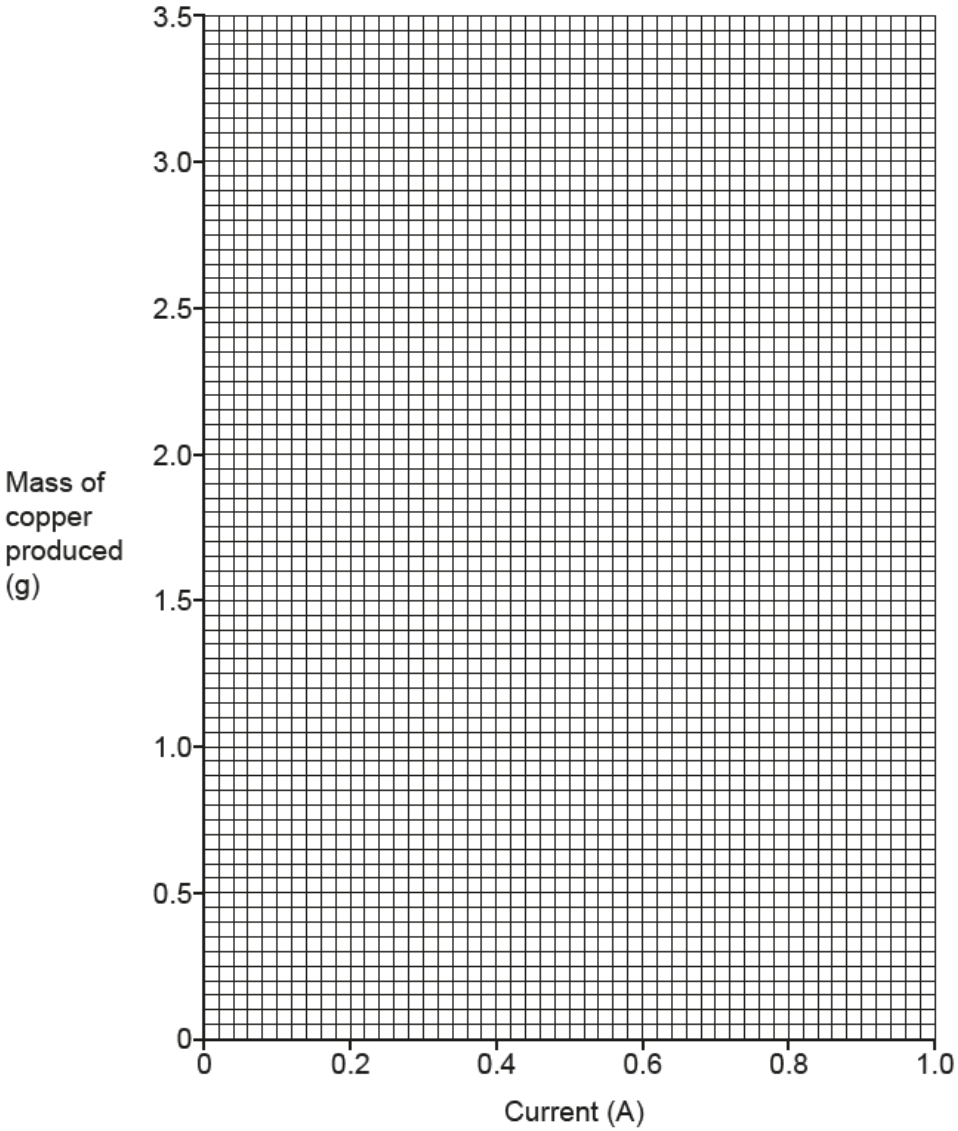
[1]

(b) The student investigates the mass of copper made during the electrolysis of aqueous copper chloride.

The student varies the electric current and passes the current for the same time in each experiment. Here is a table of their results.

Current (A)	Mass of copper produced (g)
0.2	0.6
0.4	1.3
0.6	1.8
0.8	2.5
1.0	3.1

(i) Plot a graph of the student's results and draw a line of best fit.



[3]

(ii) Use your graph to **estimate** the current needed to make 2.25 g of copper.

Current = ... A **[1]**

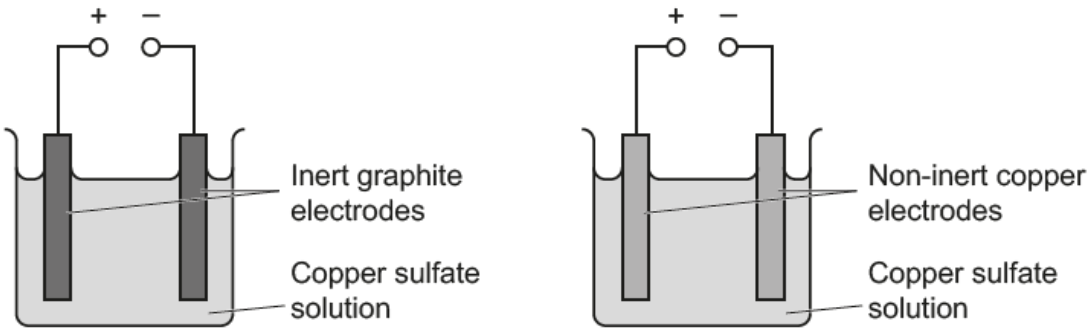
(iii) Use your graph, and a calculation, to find the mass of copper that would be produced using 15 A.

Give your answer to **2** significant figures.

Mass of copper produced = ... g **[2]**

4. Nov/2021/Paper_J248/03/No.20

The diagrams show the electrolysis of copper sulfate solution, $CuSO_4$.



(a) In both experiments, copper is deposited at the cathode.

Describe a **difference** between the electrolysis of copper sulfate solution using inert graphite electrodes and non-inert copper electrodes.

.....

..... **[1]**

(b) A student investigates the electrolysis of sodium chloride solution.

(i) Hydrogen gas, H_2, is formed at the cathode.

Write the **balanced half equation** for this reaction.

Use e^- to represent an electron.

..... **[2]**

(ii) State the name of the substance made at the anode.

..... **[1]**

(iii) Sodium chloride **cannot** conduct electricity when it is solid.

Explain why sodium chloride can conduct electricity when it is dissolved in water but **not** when it is solid.

.....

.....

..... **[2]**

(c) The student investigates materials to use as inert electrodes in the electrolysis of aqueous sodium chloride.

They compare four materials **A**, **B**, **C**, and **D**. Their results are shown in the table.

Material	Soluble in water?	Does it conduct electricity?	Density (g/cm^3)
A	yes	yes	7.87
B	no	yes	12.41
C	no	only when molten	2.17
D	yes	no	1.54

Which material, **A**, **B**, **C** or **D**, is the **most suitable** for use as an inert electrode?

Explain your answer.

Material .....

Explanation .....

.....

..... **[3]**

5. Nov/2020/Paper_J248/03/No.23

A student investigates the electrolysis of aqueous solutions of ionic compounds.

Aqueous solution	Product at cathode	Product at anode
Copper sulfate	Copper	Oxygen
Zinc bromide	Hydrogen	Bromine
Copper chloride	Copper	Chlorine
Sulfuric acid	Hydrogen	Oxygen

(a) Write the formulae of the **ions** that are present in aqueous copper sulfate solution.

..... **[2]**

(b) Why is it important that the investigation is done with **inert** electrodes?

.....

..... **[1]**

(c) Electroplating is used to cover a metal with another metal.

(i) Which aqueous solution would you use to electroplate a metal spoon with copper using a safe method?

Tick (✓) **one** box.

Copper sulfate ☐

Zinc bromide ☐

Copper chloride ☐

Sulfuric acid ☐

[1]

(ii) Give **two** reasons for your answer to **(c)(i)**.

1 .....

.....

2 .....

.....

[2]

(d) **(i)** Predict the product made at the anode when sodium sulfate solution is electrolysed.

..... **[1]**

(ii) Hydrogen gas is made at the cathode instead of sodium metal.

Explain why.

.....

.....

..... **[1]**

(iii) Write the **balanced half equation** for the formation of hydrogen gas.

Use e^- to represent an electron.

..... **[2]**

(e) The electrolysis products of ionic compounds can be different in the molten or aqueous states.

Suggest why.

.....

..... **[1]**