PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

CHEMISTRY



EXAM QUESTION PACK

TOPIC 3: CHEMICAL CHANGES: ELECTROLYTIC PROCESSES (PAPER 1)

SCORE	PERCENTAGE
/130	%

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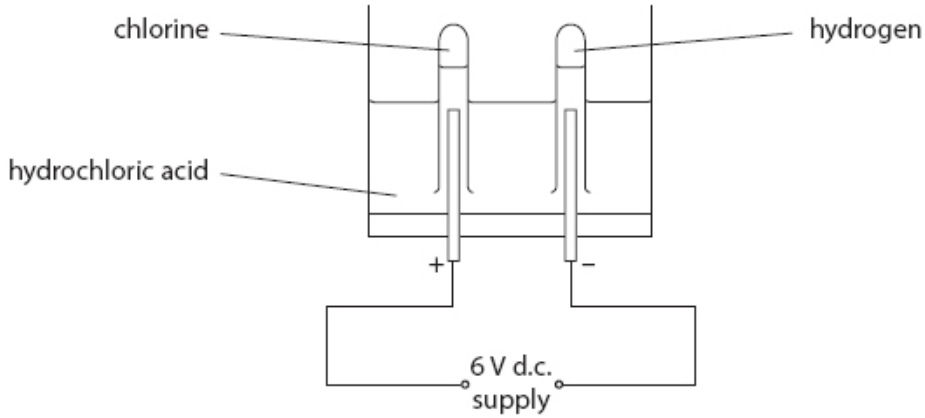
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Q1.

(a) In this apparatus hydrochloric acid is decomposed by passing a direct electric current through it.

Chlorine and hydrogen are formed.



(i) Give the name of this process in which substances, such as hydrochloric acid, are decomposed by a direct electric current.

(1)

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(ii) Describe what happens when a burning splint is applied to a mixture of hydrogen and air in a test tube.

(2)

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(b) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

An acid is present in the stomach of humans.

This acid is

(1)

☒ **A** ethanoic acid

☒ **B** hydrochloric acid

☒ **C** nitric acid

☒ **D** sulfuric acid

(ii) Some people suffer from indigestion and take indigestion remedies.

Which of these could cure indigestion caused by excess acid?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** sodium chloride

☒ **B** carbon dioxide

☒ **C** calcium carbonate

☒ **D** hydrogen chloride

(iii) Explain how an indigestion remedy works when it cures acid indigestion.

(2)

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(c) Metal oxides react with acids to form a salt and water.

Complete the word equation for the reaction of magnesium oxide with nitric acid.

(2)

magnesium oxide + nitric acid → ..... + ...

(Total for Question = 9 marks)

(**Q01 1SC0/1CF, June 2013**)

Q2.

Acids

(a) Magnesium carbonate reacts with dilute nitric acid.

Give the names of the products formed in this reaction.

(2)

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(b) Zinc oxide, ZnO, reacts with dilute hydrochloric acid to form zinc chloride, $ZnCl_2$, and water.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

This reaction is an example of

(1)

☒ **A** combustion

☒ **B** thermal decomposition

☒ **C** neutralisation

☒ **D** oxidation

(ii) Write the balanced equation for the reaction between zinc oxide and dilute hydrochloric acid.

(3)

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*(c) Electrolysis of hydrochloric acid can produce hydrogen and chlorine.

The apparatus for the electrolysis is

hydrochloric acid

two carbon rods

a suitable container for the electrolysis reaction

a suitable source of electricity

test tubes

Describe how the apparatus can be used to electrolyse hydrochloric acid and how the gases produced can be tested to show that they are hydrogen and chlorine.

You may use a diagram to help your answer.

(6)

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(Total for question = 12 marks)

(**Q01 1SC0/1CH, June 2014**)

Q3.

This question is about electrolysis.

Figure 3 shows the electrolysis of copper chloride solution.

(i) Use the words from the box to complete the labelling of the diagram in Figure 3.

(2)

anode	cathode	electrolyte

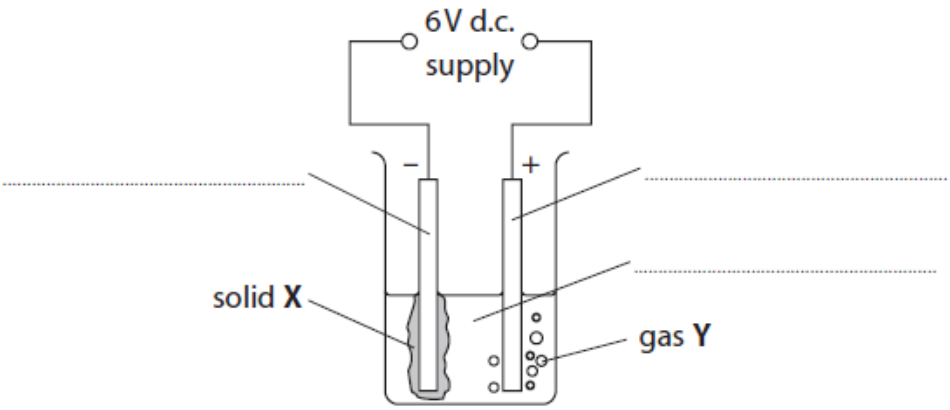


Figure 3

(ii) The products of the electrolysis shown in Figure 3 are solid **X** and gas **Y**.

Draw **one** straight line from each product to its name.

(2)

product	name
solid **X**	carbon
	chlorine
	copper
gas **Y**	hydrogen

(iii) The experiment is repeated using powdered solid copper chloride instead of copper chloride solution.

Nothing happens and no products are formed.

Explain why nothing happens and no products are formed.

(2)

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(Total for question = 6 marks)

(Q02b 1SC0/1CF, June 2023)

Q4.

Answer the question with a cross in the box you think is correct (☒). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒).

Figure 6 shows the equipment used to electrolyse a sample of sodium sulfate solution.

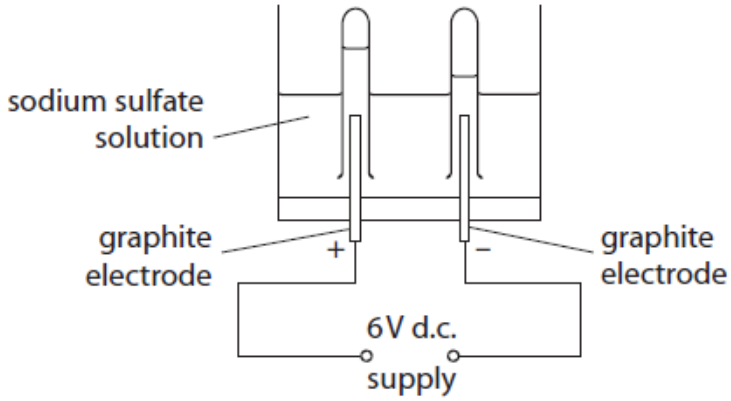


Figure 6

Graphite electrodes are used in the electrolysis.

(i) Give **two** reasons why graphite is a suitable material for the electrodes.

(2)

1 .....

2 .....

(ii) Sodium sulfate solution contains ions.

Which ions are attracted to the positive electrode during the electrolysis?

☒ **A** H^+ ions only

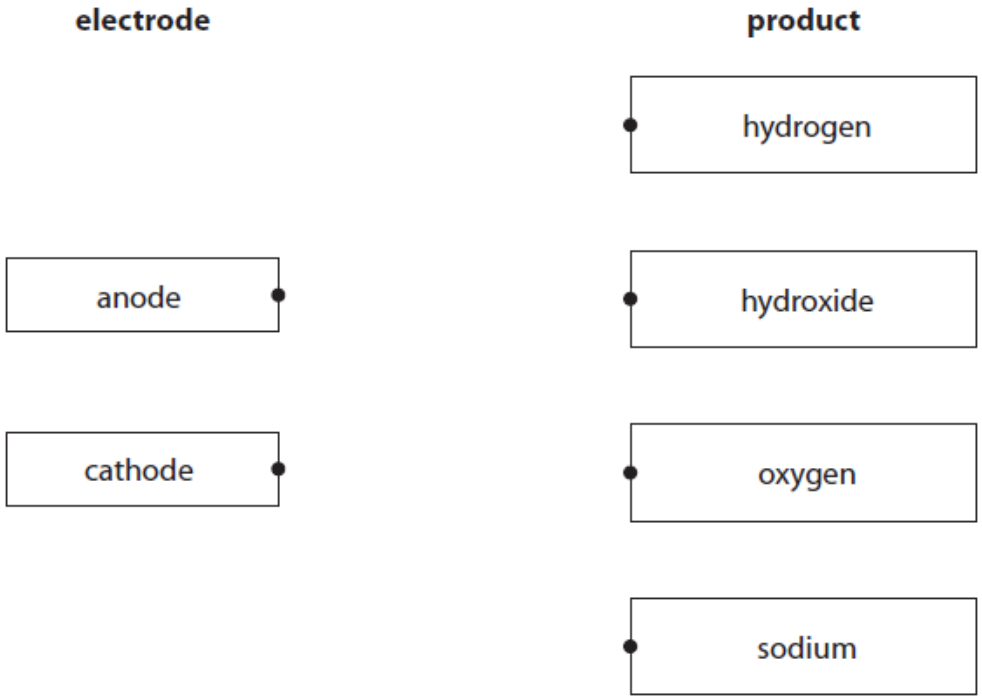
☒ **B** OH^- ions only

☒ **C** H^+ and Na^+ ions

☒ **D** $SO4^{2-}$ and OH^- ions

(iii) Draw **one** straight line from each electrode to the product formed at that electrode during the electrolysis of sodium sulfate solution.

(2)



(Total for question = 5 marks)

(**Q04c 1SC0/1CF, June 2024**)

Q5.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Water, acidified with dilute sulfuric acid, was electrolysed for 10 minutes using inert electrodes.

Figure 2 shows the apparatus used.

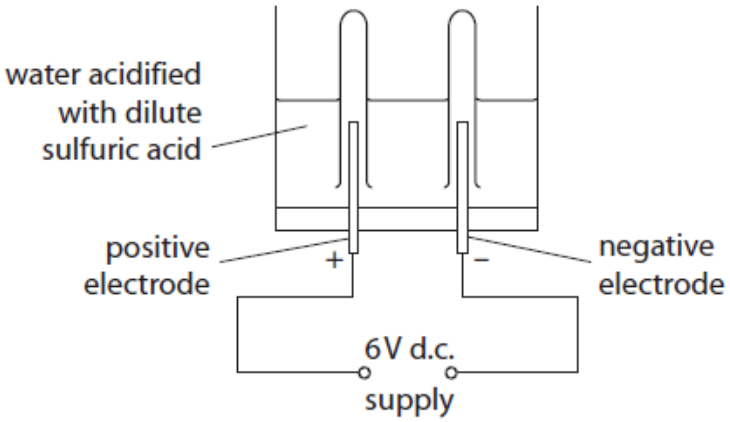


Figure 2

(i) In this electrolysis, the acidified water is an electrolyte.

Explain why acidified water is an electrolyte.

(2)

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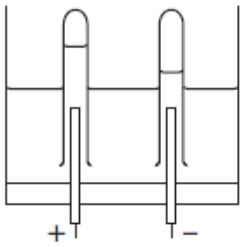
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(ii) Hydrogen collects at the negative electrode and oxygen collects at the positive electrode.

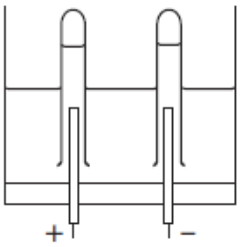
Which of these shows the results after 10 minutes of this electrolysis?

(1)

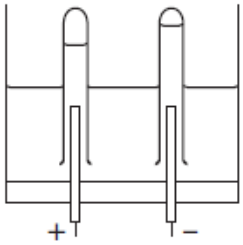
☒ **A**



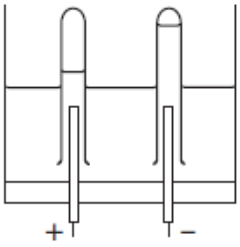
☒ **B**



☒ **C**



☒ **D**



(iii) Complete and balance the half equation for the formation of oxygen at the positive electrode in this electrolysis.

(2)

$4OH^- \rightarrow$ .....

(Total for question = 5 marks)

(**QU04a 1SC0/1CH, June 2024**)

Q6.

Copper sulfate solution was electrolysed for 10 minutes using copper electrodes.

Figure 3 shows the mass of the cathode and the appearance of the copper sulfate solution before electrolysis and after electrolysis.

	mass of cathode in g	appearance of copper sulfate solution
before electrolysis	5.32	pale blue solution
after electrolysis	5.87	pale blue solution

Figure 3

(i) Describe what should be done to the copper cathode, after it has been removed from the copper sulfate solution, before its final mass is determined.

(2)

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(ii) Explain, in terms of ions, the change in mass of the cathode shown in Figure 3.

(2)

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(iii) Explain why the appearance of the copper sulfate solution did not change during the electrolysis.

(2)

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(Total for question = 6 marks)

(**QU04b 1SC0/1CH, June 2024**)

Q7.

Copper sulfate solution was electrolysed for five minutes using copper electrodes.

Figure 5 shows the mass of the anode and of the cathode before electrolysis and after electrolysis.

	anode	cathode
mass of electrode before electrolysis / g	1.16	1.28
mass of electrode after electrolysis / g	0.85	1.57

Figure 5

Calculate the mass of copper deposited.

(2)

mass of copper deposited = ... g

(Total for question = 2 marks)

(**Q03b 1SC0/1CF, SAM 2016**)

Q8.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Molten lead bromide is electrolysed.

The products of this electrolysis are

(1)

☒ **A** hydrogen and bromine

☒ **B** hydrogen and oxygen

☒ **C** lead and bromine

☒ **D** lead and oxygen

(Total for question = 1 mark)

(**Q06b 1SC0/1CF, June 2019**)

Q9.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Molten lead bromide is electrolysed.

The products of this electrolysis are

(1)

☒ **A** hydrogen and bromine

☒ **B** hydrogen and oxygen

☒ **C** lead and bromine

☒ **D** lead and oxygen

(Total for question = 1 mark)

(**Q02b 1SC0/1CH, June 2019**)

Q10.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

Figure 6 shows the apparatus that can be used to electrolyse sodium sulfate solution using inert electrodes.

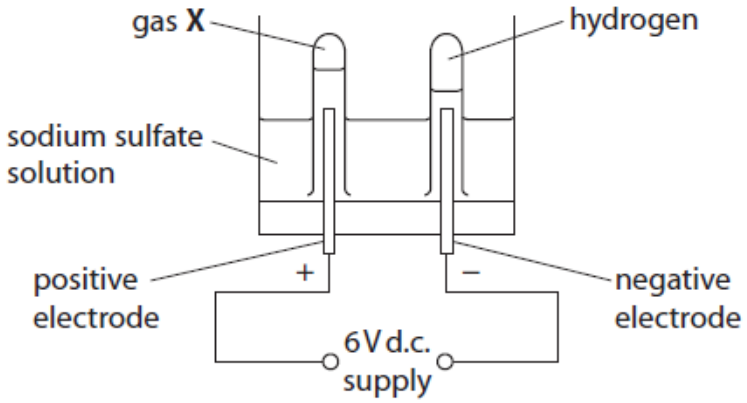


Figure 6

Hydrogen is produced at the negative electrode during electrolysis.

(i) Describe the test to show the gas is hydrogen.

(2)

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.....

(ii) What is the name of gas **X** that forms at the positive electrode?

(1)

☒ **A** ammonia

☒ **B** oxygen

☒ **C** nitrogen

☒ **D** sulfur dioxide

(iii) State what is meant by the term **electrolysis**.

(2)

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(Total for question = 5 marks)

(**Q05a 1SC0/1CF, Nov 2020**)

Q11.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Figure 1 shows the apparatus that can be used to electrolyse sodium sulfate solution using inert electrodes.

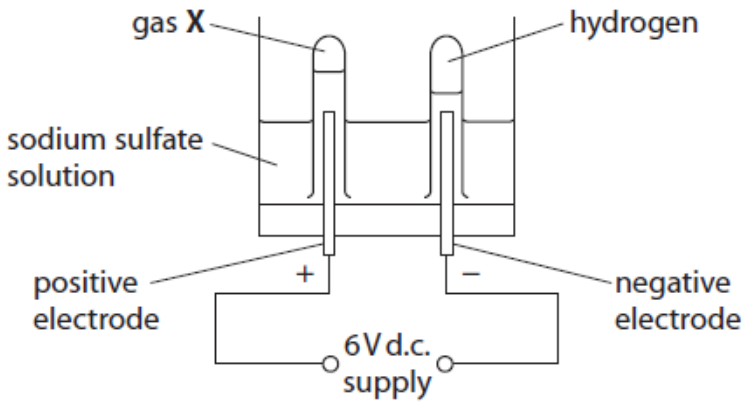


Figure 1

Hydrogen is produced at the negative electrode during electrolysis.

(i) Describe the test to show the gas is hydrogen.

(2)

.....

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.....

.....

(ii) What is the name of gas **X** that forms at the positive electrode?

(1)

☒ **A** ammonia

☒ **B** oxygen

☒ **C** nitrogen

☒ **D** sulfur dioxide

(iii) State what is meant by the term **electrolysis**.

(2)

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(Total for question = 5 marks)

(**Q01a 1SC0/1CH, Nov 2020**)

Q12.

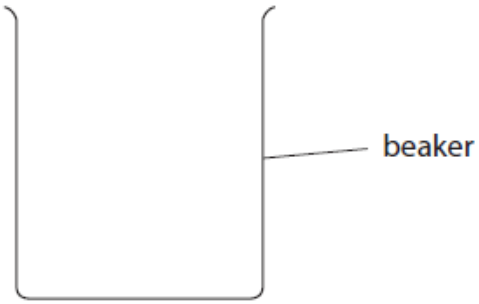
This question is about electrolysis.

A solution of copper sulfate in a beaker is electrolysed using copper electrodes.

(i) Draw a labelled diagram to show how this experiment would be set up.

The beaker has been drawn for you.

(2)



(ii) During the electrolysis, the anode gets smaller, the cathode gets larger and the solution remains the same shade of blue.

Give the reason for each of these observations.

(3)

the anode gets smaller .....

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the cathode gets larger.....

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the solution remains the same shade of blue.....

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(Total for question = 5 marks)

(**Q03d 1SC0/1CH, Nov 2021**)

Q13.

When copper sulfate solution is electrolysed using copper electrodes, the mass of each electrode changes.

Draw a labelled diagram to show the apparatus that can be used to electrolyse copper sulfate solution using copper electrodes.

(2)

(Total for question = 2 marks)

(**QU03a 1SC0/1CH, June 2022**)

Q14.

Figure 6 shows the equipment used to electrolyse a sample of sodium sulfate solution.

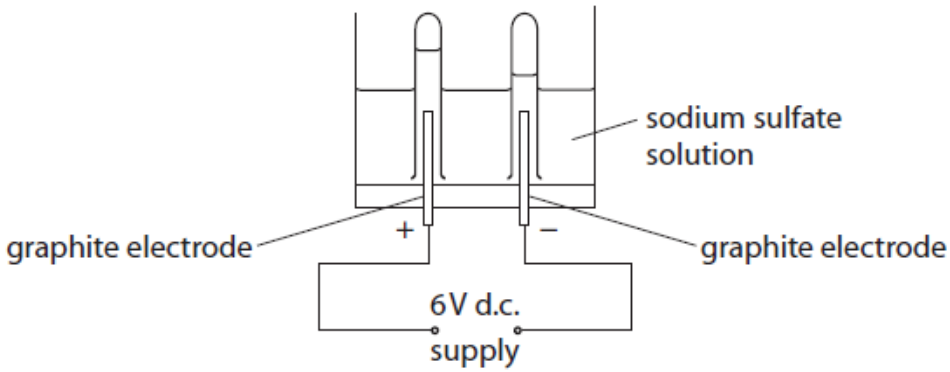


Figure 6

Graphite electrodes are used in the electrolysis of sodium sulfate solution.
Graphite is used because it is inert and conducts electricity.

(i) Figure 7 shows the ions in the sodium sulfate solution.

Draw a circle around each of the ions in Figure 7 that are attracted to the negative graphite electrode during the electrolysis.

(1)

H^+ OH^- Na^+ SO_4^{2-}

Figure 7

(ii) State why it is important that the electrodes are inert.

(1)

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(iii) Explain, in terms of its structure, how graphite conducts electricity.

(2)

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(Total for question = 4 marks)

(**Q04c 1SC0/1CF, June 2022**)

Q15.

Figure 6 shows the apparatus that can be used to electrolyse sodium chloride solution in the laboratory.

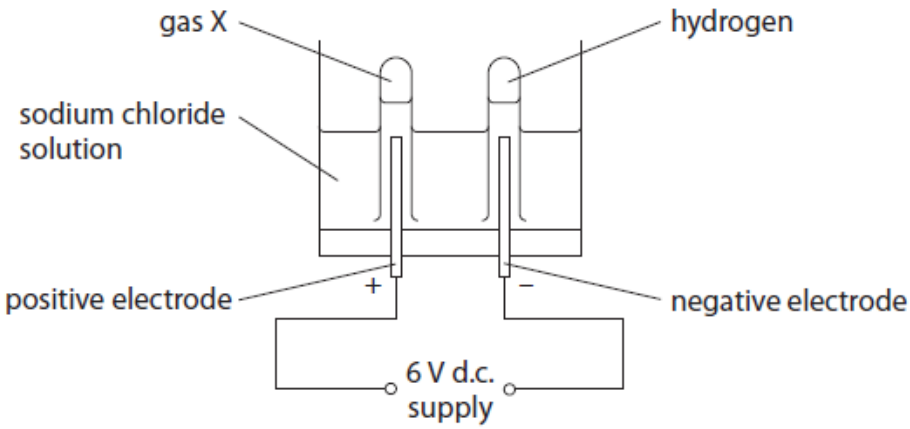


Figure 6

* Molten zinc chloride can be electrolysed.

Describe how this experiment can be carried out in a laboratory, explaining how the products of this electrolysis are formed.

(6)

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(Total for question = 6 marks)

(**Q06e 1SC0/1CF, SAM**)

Q16.

Copper sulfate solution was electrolysed using copper electrodes.

(i) Draw a labelled diagram to show the apparatus that is used to carry out this electrolysis in the laboratory.

(2)

(ii) Before the electrolysis, the masses of the electrodes were determined.

After the electrolysis, the electrodes were washed and dried and their masses re-determined.

Figure 6 shows these masses and the resulting changes in masses of the electrodes.

	mass of electrode before electrolysis in g	mass of electrode after electrolysis in g	change in mass of electrode in g
anode	11.27	10.42	−0.85
cathode	11.32	12.17	+0.85

Figure 6

Explain these results.

(4)

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(Total for question = 6 marks)

(**Q12 1SC0/1CH, June 2018**)

Q17.

(i) When copper sulfate solution is electrolysed using inert electrodes, oxygen is formed at the positively charged anode.

Explain how the oxygen is formed from ions in the solution.

(2)

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(ii) The other product is copper.

1.27 g of copper were produced in an experiment.

Calculate the number of moles of copper, Cu, produced in this experiment.

(Relative atomic mass: Cu = 63.5)

(1)

.....

amount of copper produced = ... mol

(**Q36 1SC0/1CH, June 2013**)

Q18.

Molten zinc chloride is an electrolyte.

(i) Which row shows the products formed at the anode and at the cathode when molten zinc chloride is electrolysed?

(1)

	product at anode	product at cathode
☒ A	oxygen	zinc
☒ B	chlorine	hydrogen
☒ C	chlorine	zinc
☒ D	oxygen	hydrogen

(ii) Which of the following is the reason why molten zinc chloride is an electrolyte?

(1)

☒ **A** it contains molecules that can move

☒ **B** it has a giant structure

☒ **C** it contains delocalised electrons

☒ **D** it contains ions that can move

(Total for question = 2 marks)

(**Q11 1SC0/1CH, June 2018**)

Q19.

Two compounds of barium are barium sulfide and barium chloride.

Solid sodium chloride is dissolved in water.

The sodium chloride solution is electrolysed in the apparatus shown in Figure 8.

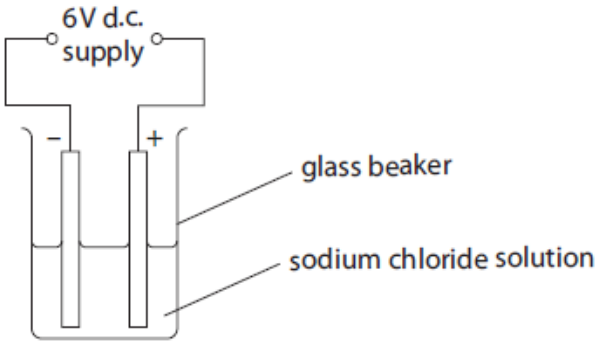


Figure 8

(i) State why sodium chloride solution, rather than solid sodium chloride, must be used in this experiment.

(1)

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(ii) The formulae of the ions present in the sodium chloride solution are

Na^+ Cl^- H^+ OH^-

Circle the ions that would be attracted to the anode.

(1)

(iii) Molten lead bromide can be electrolysed to form molten lead and bromine gas.

Explain how a student could modify the apparatus shown in Figure 8 to carry out this electrolysis.

(2)

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(Total for question = 4 marks)

(**Q13 1SC0/1CF, June 2018**)

Q20.

The ions in sodium chloride solution are

sodium ions, Na^+
chloride ions, Cl^-
hydrogen ions, H^+
hydroxide ions, OH^-

Sodium chloride solution is electrolysed using a direct electric current.

(i) Which of these ions will be attracted to the cathode during the electrolysis of sodium chloride solution?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** H^+ ions only

☒ **B** H^+ and Na^+ ions

☒ **C** Cl^- ions only

☒ **D** Cl^- and OH^- ions

(ii) Chlorine is one of the products of the electrolysis.

The half-equation for the production of chlorine is

$$2Cl^- \rightarrow Cl_2 + 2e$$

Explain how the half-equation shows that chloride ions are oxidised.

(2)

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(iii) Suggest why the solution remaining at the end of the electrolysis is alkaline.

(1)

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(iv) The electrolysis of sodium chloride solution does not produce metallic sodium.

State what change you would make to the electrolyte to obtain metallic sodium.

(1)

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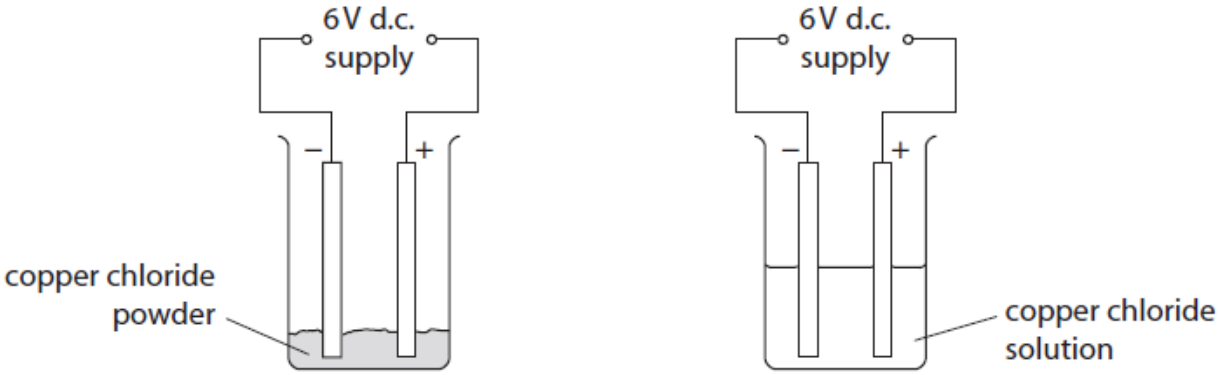
(**Q35 1SC0/1CH, June 2013**)

Q21.

* Carbon electrodes were placed in copper chloride powder.

Some more copper chloride was dissolved in water to make a solution and carbon electrodes were placed in this solution.

In both cases the electrodes were connected to a direct current supply.



The following results were obtained.

substance tested	observation at the cathode (–)	observation at the anode (+)
copper chloride powder	no change	no change
copper chloride solution	red-brown solid formed	bubbles of a yellow-green gas

Explain the results shown in the table for copper chloride powder and the copper chloride solution.

(6)

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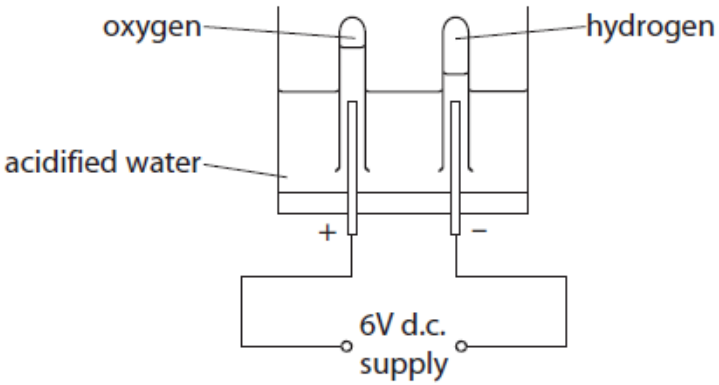
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(**Q12 1SC0/1CF, June 2015**)

Q22.

Water, acidified with a small amount of dilute sulfuric acid, can be decomposed by electrolysis using the apparatus shown.



(i) State the form of energy used to carry out the electrolysis.

(1)

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(ii) During the electrolysis, hydrogen is formed at one of the electrodes.

Describe a test to show that this gas is hydrogen.

(2)

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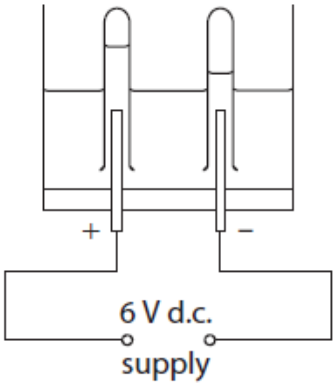
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(**Q01 5CH1H/01, June 2015**)

Q23.

Sodium sulfate solution is electrolysed in the apparatus shown.



Sodium sulfate solution contains sodium ions, Na^+, sulfate ions, SO_4^{2-}, hydrogen ions, H^+, and hydroxide ions, OH^-.

Hydrogen is produced at one electrode and oxygen is produced at the other electrode.

Explain how these products are formed from the ions in the electrolysis process, indicating how you would identify the products.

You may give ionic equations in your answer.

(6)

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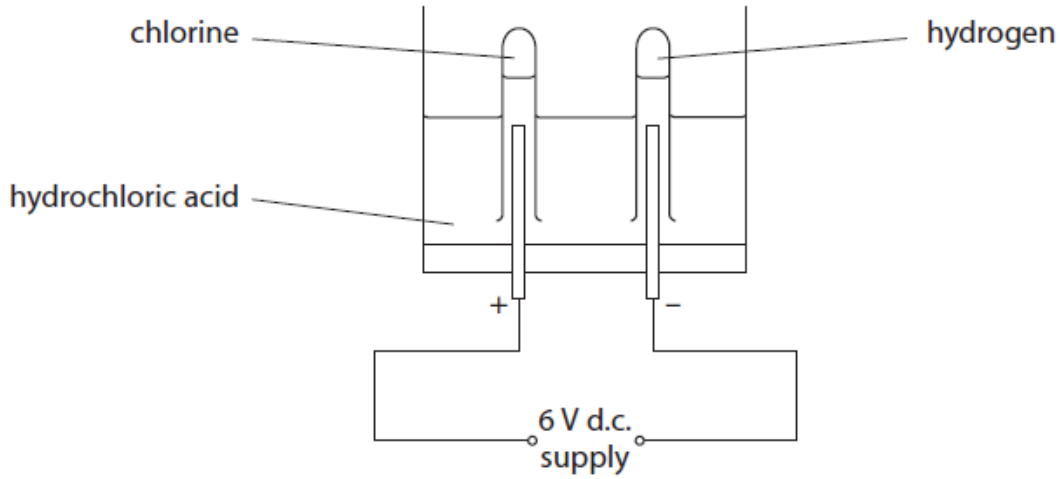
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(**Q11 5CH1H/01, June 2015**)

Q24.

Hydrochloric acid can be used to make chlorine in the apparatus shown.



(i) The experiment shown is an example of electrolysis.

Explain the meaning of **electrolysis**.

(2)

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(ii) Describe the test to show a gas is chlorine.

(2)

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(iii) Great care has to be taken when chlorine is manufactured on a large scale.

Explain the potential hazards of storing large volumes of chlorine.

(2)

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(iv) State a large-scale use of chlorine.

(1)

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(**Q03 1SC0/1CF, June 2015**)

Q25.

(a) A solution contains a mixture of ions with the formulae shown.

Na^+	Cl^-	Mg^{2+}	SO_4^{2-}

Give the formulae of **all** the ions that will be attracted to the negatively charged cathode during electrolysis.

(1)

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(b) During electrolysis, reduction takes place at the cathode.

Explain, in terms of electrons, what is meant by reduction.

(2)

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(c) Solid lead bromide cannot be electrolysed.
Molten lead bromide can be electrolysed.

Explain how, when solid lead bromide is melted and electrolysed, bromine is formed at the anode.

(3)

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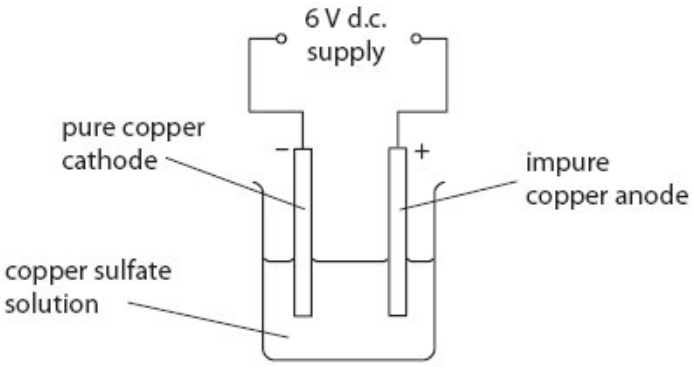
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*(d) Impure copper can be purified using electrolysis.

The impure copper is used as the anode.
A pure copper cathode is used.
The electrodes are placed in copper sulfate solution.
A direct electric current is passed through the solution.



Describe and explain what is seen when this apparatus is used to purify a piece of impure copper.

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(Total for Question = 12 marks)

(**Q44 1SC0/1CH, June 2013**)

Q26.

Electrolysis

(a) Some metal objects are electroplated to improve their appearance.

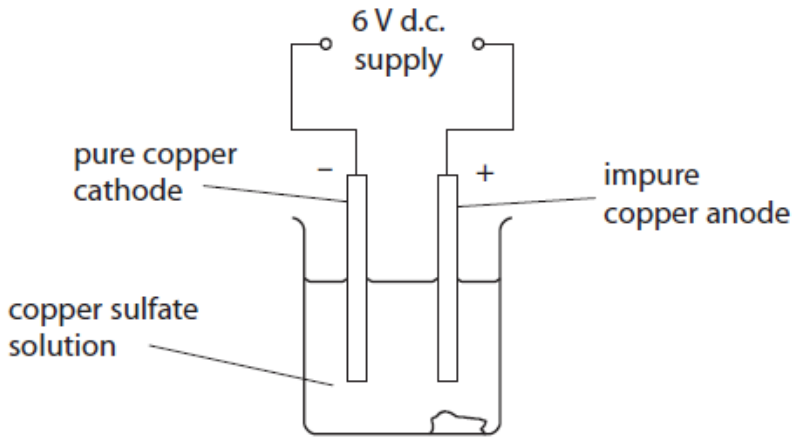
Give another reason why some metal objects are electroplated.

(1)

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(b) Copper sulfate solution was electrolysed using copper electrodes.
The mass of each electrode was determined before it was placed in the solution.



The electrolysis was carried out for a period of time.
The electrodes were removed, washed, dried and their masses redetermined.

The table shows the masses of the electrodes before and after electrolysis.

	mass of electrode before electrolysis / g	mass of electrode after electrolysis / g	change in mass
mass of impure copper anode	40.0	35.0	5.0 g decrease
mass of pure copper cathode	10.0	14.8	4.8 g increase

Explain these results.

(3)

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(c) In an electrolysis experiment, oxide ions, O^{2-}, form oxygen gas, O_2.

Write the balanced half equation for the reaction.

(2)

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*(d) Sodium chloride is an ionic compound.
It contains sodium ions, Na^+, and chloride ions, Cl^-.

When molten sodium chloride is electrolysed, sodium metal and chlorine gas are formed.

Describe how the sodium ions and chloride ions in solid sodium chloride are converted into sodium and chlorine by electrolysis.

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(Total for question = 12 marks)

(**Q10 1SC0/1CH, June 2014**)

Q27.

A solution of sodium chloride contains the four ions shown in the box.

Na^+	Cl^-	OH^-	H^+

(a) The sodium chloride solution is electrolysed.

Give the formulae of the **two** ions that will be attracted to the positively charged electrode.

(1)

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(b) Complete the sentence by putting a cross (☒) in the box next to your answer.

When molten lead bromide is electrolysed the products are

(1)

☒ **A** lead and hydrogen

☒ **B** hydrogen and bromine

☒ **C** hydrogen and oxygen

☒ **D** lead and bromine

(c) During electrolysis, oxidation takes place at the anode and reduction takes place at the cathode.

Explain, in terms of electrons, what is meant by **oxidation** and **reduction**.

(2)

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(d) Explain why some metal objects are electroplated.

(2)

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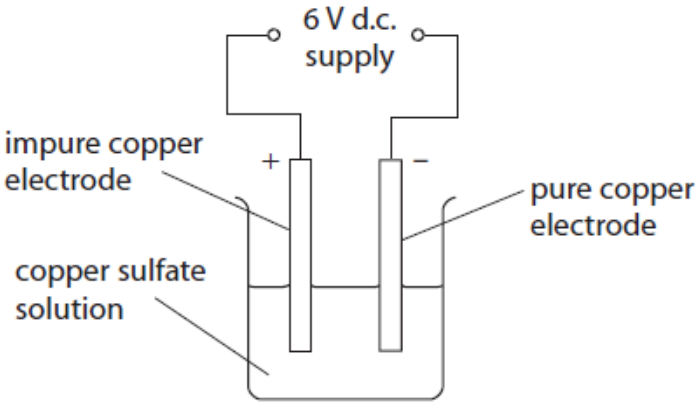
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(**Q12 5CH1H/01, June 2015**)

Q28.

Impure copper is purified by electrolysis using the apparatus shown.



(i) Give the name of the electrode which is made of pure copper.

(1)

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(ii) Describe how each electrode will have changed at the end of the electrolysis process.

(2)

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(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

$$Cu^{2+}(aq) + 2e^{-} \rightarrow Cu(s)$$

This half equation shows the process of

(1)

☒ **A** displacement

☒ **B** oxidation

☒ **C** redox

☒ **D** reduction

(iv) Copper sulfate solution is the electrolyte used in this electrolysis process.

Explain how copper sulfate solution conducts electricity.

(2)

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(**Q10 5CH1H/01, June 2015**)

Q29.

Electrolysis

(a) When molten sodium chloride is electrolysed, the products are sodium and chlorine.

(i) Give the formula of sodium chloride.

(1)

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(ii) State why molten sodium is used in some nuclear reactors.

(1)

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(b) Molten lead bromide is electrolysed.

(i) Complete the sentence describing the type of reaction.

(1)

During the electrolysis the lead ions gain electrons at the cathode.

The type of reactions in which metal ions gain electrons is called
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(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Molten lead bromide, rather than solid lead bromide, has to be electrolysed because

(1)

☒ **A** ions can only move freely in molten lead bromide

☒ **B** electrolysis is too fast in solid lead bromide

☒ **C** molten lead bromide contains free electrons

☒ **D** lead bromide has a very low melting point

(iii) When molten lead bromide is electrolysed, a silver-coloured liquid is produced at the cathode and a red-brown gas is produced at the anode.

Complete the word equation by showing the products formed when molten lead bromide is electrolysed.

(2)

lead bromide → ..... + ...

(c) Three colourless liquids, **A**, **B** and **C**, are tested.

Tests 1, 2 and 3 are carried out on each of these liquids.

Test 1: the liquid is tested to see if it conducts electricity.

Test 2: 20 cm^3 of the liquid is shaken vigorously with a few drops of soap solution.

Test 3: 20 cm^3 of the liquid is boiled and then test 2 is carried out on the boiled liquid.

The results are shown in the table.

liquid	observations		
	test 1	test 2	test 3
A	conducts	scum formed, no lather	scum formed, no lather
B	conducts	scum formed, no lather	lather formed
C	does not conduct	lather formed	lather formed

(i) State which of the liquids are electrolytes.

(1)

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(ii) Use the results of the tests to explain whether each of the liquids **A**, **B** and **C** is soft, shows permanent hardness, or shows temporary hardness.

(3)

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(Total for question = 10 marks)

(**Q12 1SC0/1CH, June 2014**)

Q30.

(a) The ions in sodium chloride solution are

sodium ions, Na^+
chloride ions, Cl^-
hydrogen ions, H^+
hydroxide ions, OH^-

Sodium chloride solution is electrolysed using a direct electric current.

(i) Which of these ions will be attracted to the cathode during the electrolysis of sodium chloride solution?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** H^+ ions only

☒ **B** H^+ and Na^+ ions

☒ **C** Cl^- ions only

☒ **D** Cl^- and OH^- ions

(ii) Chlorine is one of the products of the electrolysis.

The half-equation for the production of chlorine is

$$2Cl^- \rightarrow Cl_2 + 2e$$

Explain how the half-equation shows that chloride ions are oxidised.

(2)

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(iii) Suggest why the solution remaining at the end of the electrolysis is alkaline.

(1)

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(iv) The electrolysis of sodium chloride solution does not produce metallic sodium.

State what change you would make to the electrolyte to obtain metallic sodium.

(1)

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(b) (i) When copper sulfate solution is electrolysed using inert electrodes, oxygen is formed at the positively charged anode.

Explain how the oxygen is formed from ions in the solution.

(2)

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(ii) The other product is copper.

1.27 g of copper were produced in an experiment.

Calculate the number of moles of copper, Cu, produced in this experiment.

(Relative atomic mass: Cu = 63.5)

(1)

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amount of copper produced = ... mol

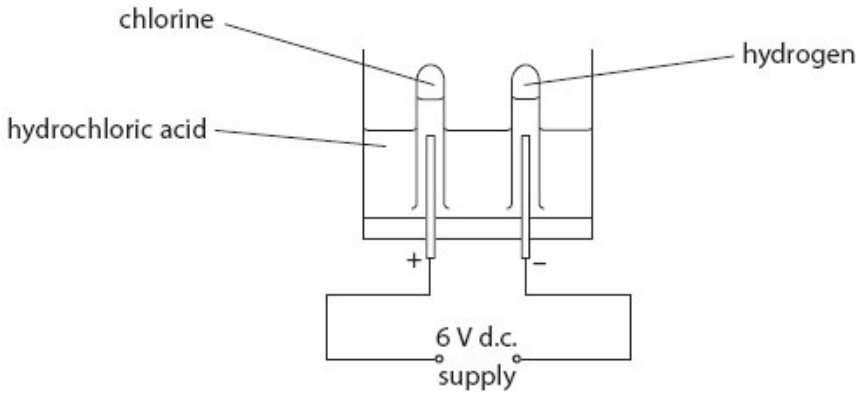
(Total for Question = 8 marks)

(**Q29 1SC0/1CH, June 2013**)

Q31.

Electrolysis of hydrochloric acid produces chlorine and hydrogen.

The apparatus used is shown.



(i) Explain what is meant by **electrolysis.**

(2)

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(ii) Describe the test to show that a gas is chlorine.

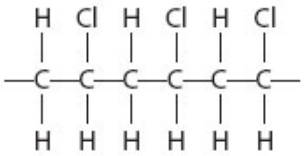
(2)

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(iii) Chlorine is used in the manufacture of a polymer.
Part of this polymer molecule is



State the name of the polymer.

(1)

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(**Q05 1SC0/1CH, June 2013**)

Q32.

Magnesium sulfate is an ionic compound.

* Magnesium sulfate solution can be electrolysed using the apparatus shown in Figure 3.

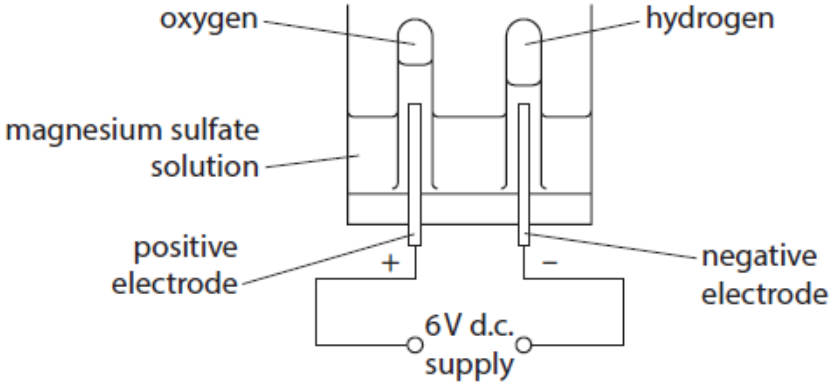


Figure 3

Explain how the products are formed at the electrodes in terms of

- the ions present in the solution
- the oxidation and reduction reactions that take place at the electrodes.

You should include ionic equations as part of your answer.

(Total for question = 6 marks)

(**QU05c 1SC0/1CH, June 2025**)

Q33.

Figure 2 shows the results obtained from an electrolysis experiment when copper sulfate solution was electrolysed for 10 minutes.

	electrodes	
	anode	cathode
mass of electrode before electrolysis in g	6.43	6.17
mass of electrode after electrolysis in g	5.62	6.95
change in mass in g	− 0.81	+ 0.78

Figure 2

(i) Explain, in terms of ions, the changes in mass of the two electrodes shown in the results in Figure 2.

(3)

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(ii) The electrolysis was repeated using another pair of copper electrodes of the same masses.

Explain a change that could be made to the electrolysis experiment to cause the mass of the cathode to increase by 2.34 g in 10 minutes.

(2)

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(Total for question = 5 marks)

(**QU03c 1SC0/1CH, June 2022**)

Q34.

Calcium nitrate and calcium carbonate are both ionic compounds.

Calcium nitrate mixed with water behaves as an electrolyte.

Calcium carbonate mixed with water does not behave as an electrolyte.

Explain, in terms of solubility and movement of ions, this difference in behaviour.

(2)

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(Total for question = 2 marks)

(**Q06c 1SC0/1CF, June 2019**)

Q35.

When a solution of sodium sulfate, Na_2SO_4, is electrolysed, the products formed at the electrodes are hydrogen and oxygen.

Explain the formation of the products at the electrodes.

(4)

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(Total for question = 4 marks)

(**Q04c 1SC0/1CH, SAM 2016**)

Q36.

* Impure copper can be purified using electrolysis.

In this electrolysis

- the anode is made of impure copper
- the cathode is made from pure copper
- the electrolyte is copper sulfate solution.

The apparatus at the start of the experiment is shown in Figure 7.

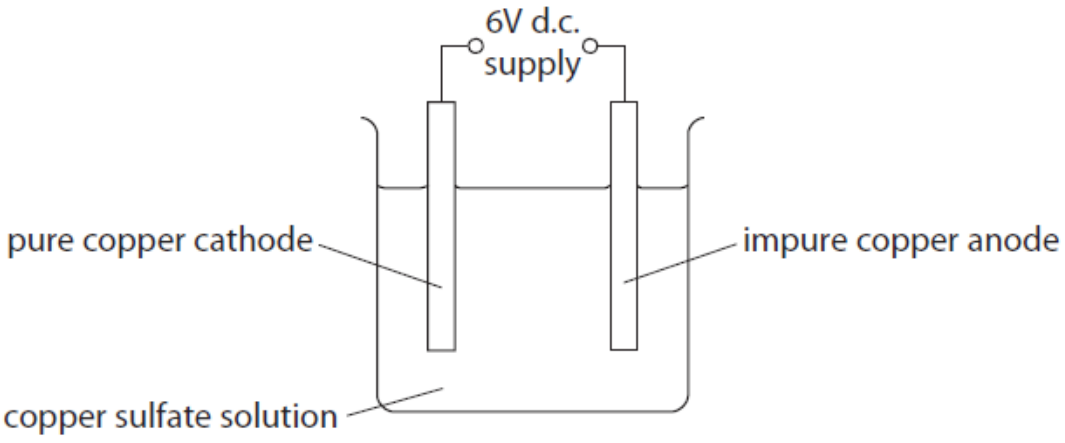


Figure 7

During the electrolysis three observations are made

- the sizes of both the anode and the cathode change
- a solid appears directly beneath the anode
- the colour of the copper sulfate solution does not change.

Explain all three observations.

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(Total for question = 6 marks)

(**Q06d 1SC0/1CF, June 2019**)

Q37.

Before the electrolysis is carried out, the mass of each electrode is determined.

Explain what should be done to the copper electrodes before their masses are determined.

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(Total for question = 2 marks)

(**QU03b 1SC0/1CH, June 2022**)

Q38.

Crystals of copper sulfate are prepared by reacting copper oxide, a base, with dilute sulfuric acid.

In this reaction, copper oxide, CuO, forms copper sulfate, $CuSO_4$.

Explain, in terms of electrons, whether the copper in copper oxide has been oxidised, has been reduced, or has not been oxidised or reduced.

(2)

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(Total for question = 2 marks)

(**QU05e 1SC0/1CH, June 2023**)

Q39.

Figure 2 shows the apparatus that can be used to electrolyse sodium chloride solution in the laboratory.

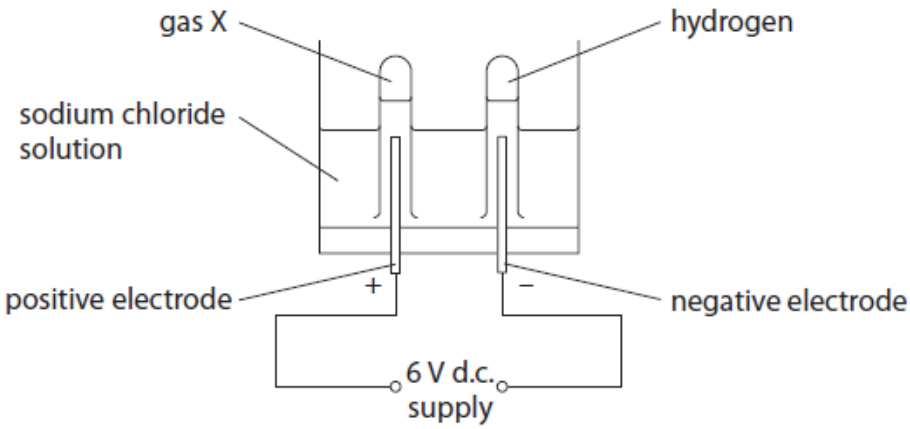


Figure 2

Some of the solution remaining after the electrolysis was tested with litmus paper.
The paper turned blue.

Explain why the litmus paper turned blue.

(2)

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(Total for question = 2 marks)

(**Q03c 1SC0/1CH, SAM**)

Q40.

Figure 6 shows the apparatus that can be used to electrolyse sodium chloride solution in the laboratory.

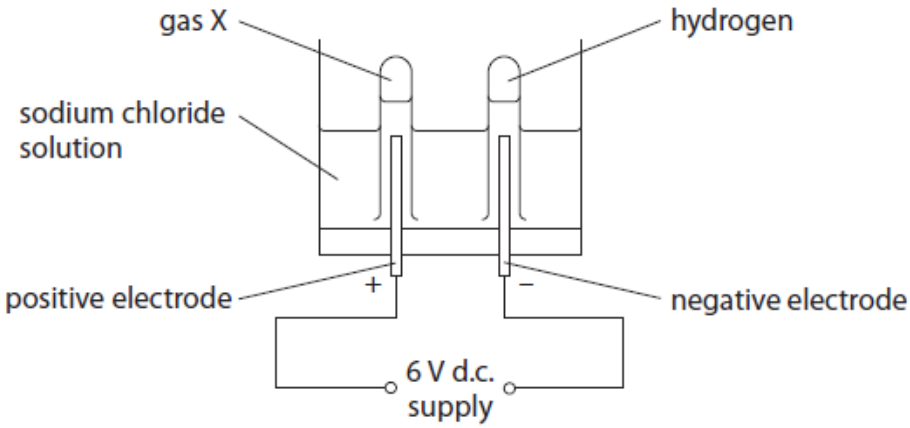


Figure 6

Explain why sodium chloride solution can conduct electricity.

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(Total for question = 2 marks)

(**Q06d 1SC0/1CF, SAM**)