

Name:

Date:

C4 - Test 3
CHEMICAL CHANGES
Intermediate

GCSE

CHEMISTRY

AQA - Combined Science

Mark

Grade

Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

Information

- The marks for the questions are shown in brackets

1. Use the Formulae of Some Common Ions table on the Data Sheet to help you to answer this question.

Acids react with alkalis to form salts and water.

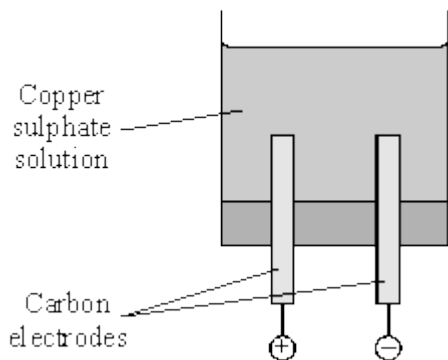
Complete the table below by writing in the name and formula of the salt formed in each reaction.

The first one has been done for you.

Acid	Alkali	Salt	Formula of salt
Hydrochloric acid	Sodium hydroxide	Sodium chloride	NaCl
Nitric acid	Sodium hydroxide		
Sulphuric acid	Potassium hydroxide		

(Total 4 marks)

2. An investigation into the *electrolyte* copper sulphate solution was carried out as shown.



(a) What does *electrolyte* mean?

(2)

(b) These were the observations.

Negative electrode	solid formed
Positive electrode	gas given off

(i) Name the solid formed.

(1)

(ii) Name the gas given off.

(1)

(c) How could a sample of gas be collected at the positive electrode?

(2)

(d) Suggest why the blue colour of copper sulphate becomes paler during the investigation.

(2)

(Total 8 marks)

3.

(i) Which acid from the list should the student add to sodium hydroxide solution to make sodium sulphate?

ethanoic acid

hydrochloric acid

nitric acid

sulphuric acid

(1)

(ii) When the acid was added to the alkali the beaker became warm.
Name the type of reaction that releases heat.

(1)

(iii) Use the Data Sheet to help you to write the formula of sodium sulphate.

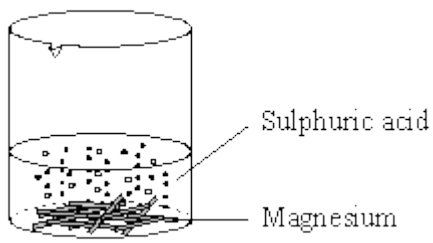
Formula: _____

(1)

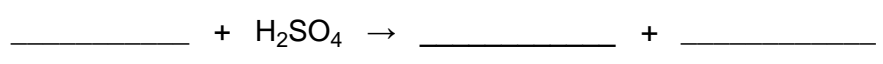
(Total 3 marks)

4.

A student tried to make some magnesium sulphate. Excess magnesium was added to dilute sulphuric acid. During this reaction fizzing was observed due to the production of a gas.



(i) Complete and balance the chemical equation for this reaction.

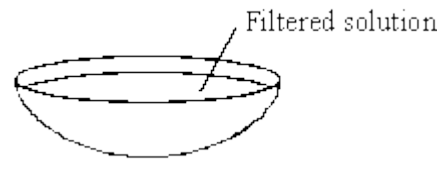


(3)

(ii) At the end of the reaction the solution remaining was filtered. Why was the solution filtered?

(1)

(iii) The filtered solution was left in a warm place.



Explain why the filtered solution was left in a warm place.

(2)

(Total 6 marks)

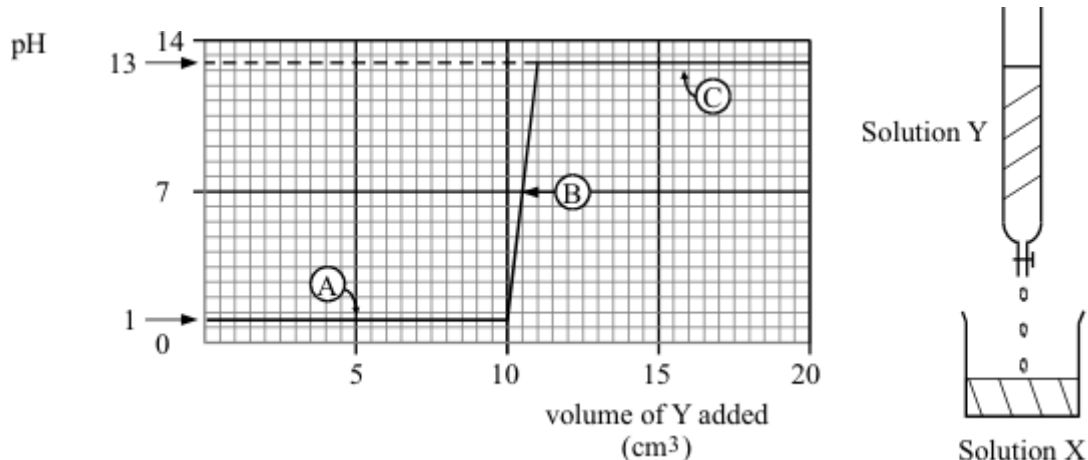
5.

Explain, in terms of ions and molecules, what happens when any acid reacts with any alkali.

(Total 3 marks)

6. Some students slowly add solution Y to solution X.

The graph shows what happens to the pH of the solution in the beaker as they do this.



(a) Choose words from this list to complete the sentences below.

acidic alkaline neutral

At point A on the graph the solution in the beaker is _____

At point B on the graph the solution in the beaker is _____

At point C on the graph the solution in the beaker is _____

(2)

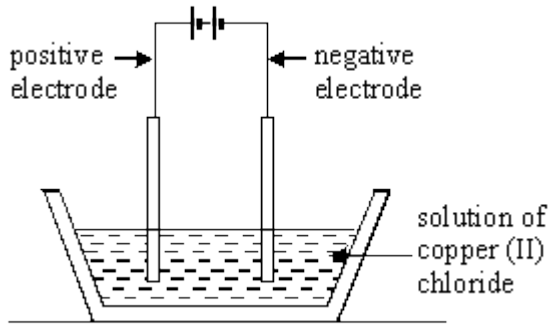
(b) Describe, as fully as you can, what happens to the pH of the mixture as solution Y is slowly added.

(5)

(Total 7 marks)

7.

Copper metal can be extracted from a solution of copper(II) chloride.



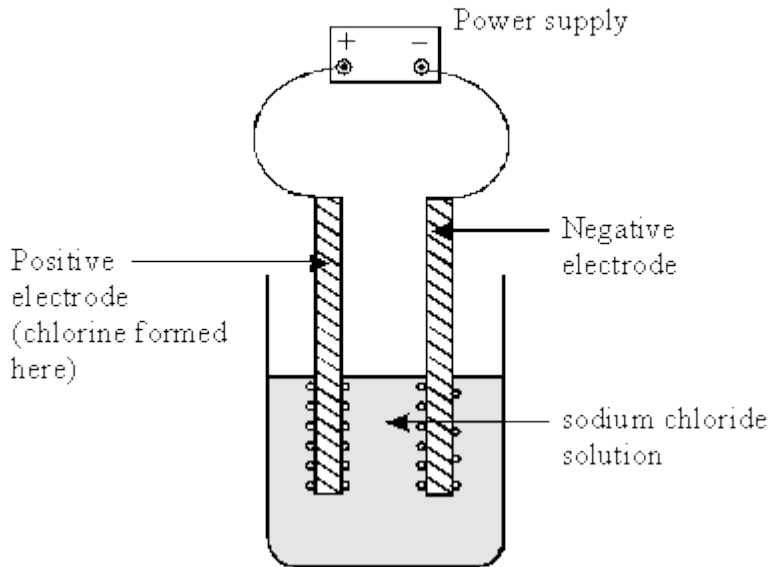
Copper chloride is an ionic compound.

State where the copper would collect and explain your answer fully.

(Total 2 marks)

8.

The diagram below shows the electrolysis of sodium chloride solution, in the laboratory.



(a) Which gas forms at the negative electrode? _____

(1)

(b) Explain why chlorine gas forms at the positive electrode.

(2)

(c) State **one** use of chlorine gas.

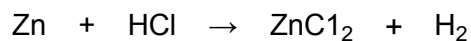
(1)

(Total 4 marks)

9.

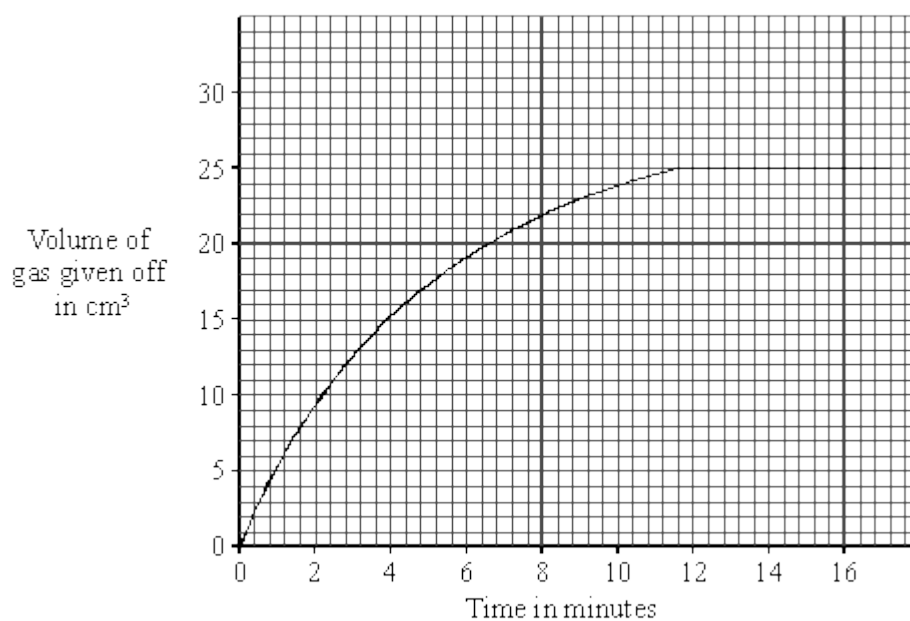
Zinc powder normally reacts slowly with hydrochloric acid.

(a) Balance the symbol equation for the reaction.



(1)

The graph shows the results from a reaction of 1.0 g of zinc powder with 20 cm³ of dilute hydrochloric acid. It gives off a gas and forms zinc chloride, ZnCl₂. Some unreacted zinc is left at the end.



(b) Copper powder is a good catalyst for the reaction of zinc with hydrochloric acid.

(i) A mixture of 10 cm³ of the same dilute hydrochloric acid and 1.0 g of copper powder was added to 1.0 g of zinc powder. What is the maximum volume of gas which could be given off?

_____ cm³

(1)

(ii) Draw a graph, on the axes above, for an experiment where 20 cm³ of the same dilute hydrochloric acid was added to 1.0 g of copper powder mixed with 1.0 g of zinc powder.

(2)

(iii) Give **two** other ways the reaction described in part (i) could be made to go faster.

1. _____

2. _____

(2)

(c) Copper powder can be formed by adding copper sulphate solution to the mixture of zinc powder and acid.

(i) Why does zinc react with copper sulphate solution to produce copper?

(1)

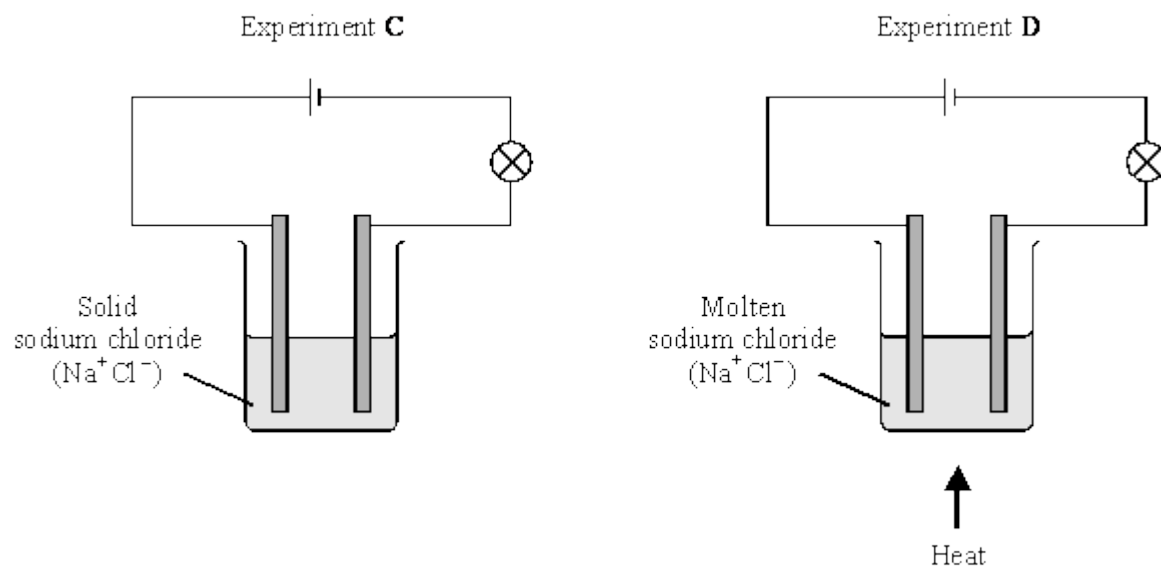
(ii) Write the word equation for the reaction.

(1)

(Total 8 marks)

10.

(a) Two experiments were set up as shown.



(i) Give **two** observations which would be seen only in Experiment D.

1. _____

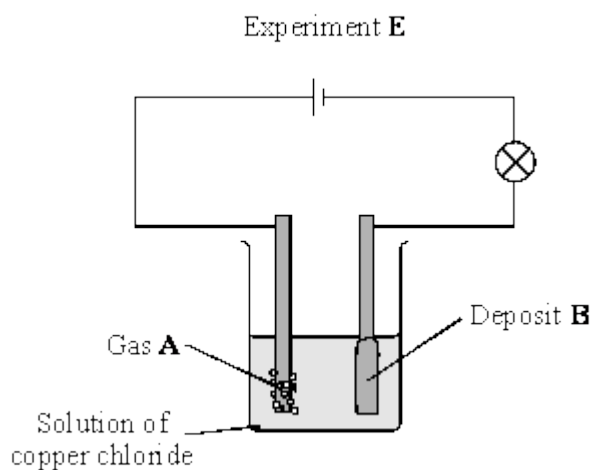
2. _____

(2)

(ii) Explain why in Experiment C no changes would be seen.

(2)

(b) Another *electrolysis* experiment used an aqueous solution of copper chloride.



(i) What does *electrolysis* mean?

(2)

(ii) Name the gas **A** and the deposit **B**.

(2)

(c) Give **one** industrial use of electrolysis.

(1)

(Total 9 marks)

11.

The table below shows information about three metals.

Metal	Mainly found as	% of metal in Earth's crust	Relative cost of 1 kg
Aluminium	Aluminium oxide, Al_2O_3	8.2	4.2
Gold	Gold	0.0000001	30000
Iron	Iron(III) oxide, Fe_2O_3	4.1	1

(a) Suggest why gold is a very expensive metal.

(1)

Iron is extracted from iron oxide by reduction with carbon.

Aluminium cannot be extracted by reduction with carbon.

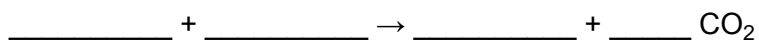
(b) (i) What is the name of the process used to extract aluminium from aluminium oxide?

(1)

(ii) Why is it more expensive to extract aluminium than iron?

(1)

(c) Complete and balance the symbol equation for the reaction to produce iron from iron(III) oxide.

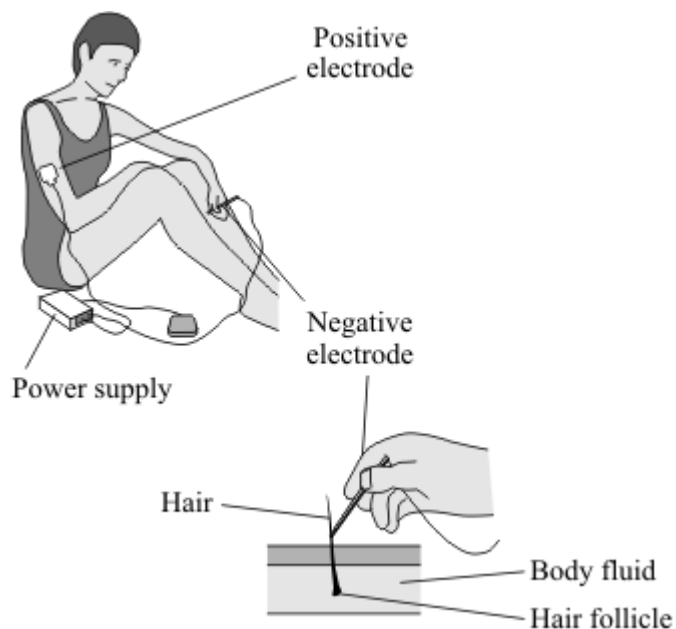


(2)

(Total 5 marks)

12.

Electrolysis can be used to remove unwanted hair from the skin.



The positive electrode is connected by a patch to the skin.

The negative electrode is connected to the hair.

The body fluid is a solution that contains sodium chloride. The electricity causes the electrolysis of a small amount of this solution.

- (a) In this solution hydrogen ions move to the negative electrode.

Complete the sentence using **one** word from the box.

negative	neutral	positive
-----------------	----------------	-----------------

Hydrogen ions move to the negative electrode because they have a _____ charge.

(1)

- (b) Draw a ring around the name of the gas produced at the positive electrode during the electrolysis of sodium chloride solution.

chlorine **hydrogen** **nitrogen**

(1)

- (c) The electrolysis of the sodium chloride solution forms a strong alkali around the hair follicle.

- (i) Complete the name of this strong alkali using **one** of the words from the box.

chloride **hydroxide** **nitrate**

The name of this strong alkali is sodium _____.

(1)

