

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE
General Certificate of Secondary Education



CYD-BWYLLGOR ADDYSG CYMRU
Tystysgrif Gyffredinol Addysg Uwchradd

125/01

SCIENCE: CHEMISTRY
FOUNDATION TIER (Grades G-C)

A.M. WEDNESDAY, 13 June 2007

(2 hours)

For Examiner's use only	
Total Marks	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator.

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

You are reminded to show all your working. Credit is given for correct working even when the final answer given is incorrect.

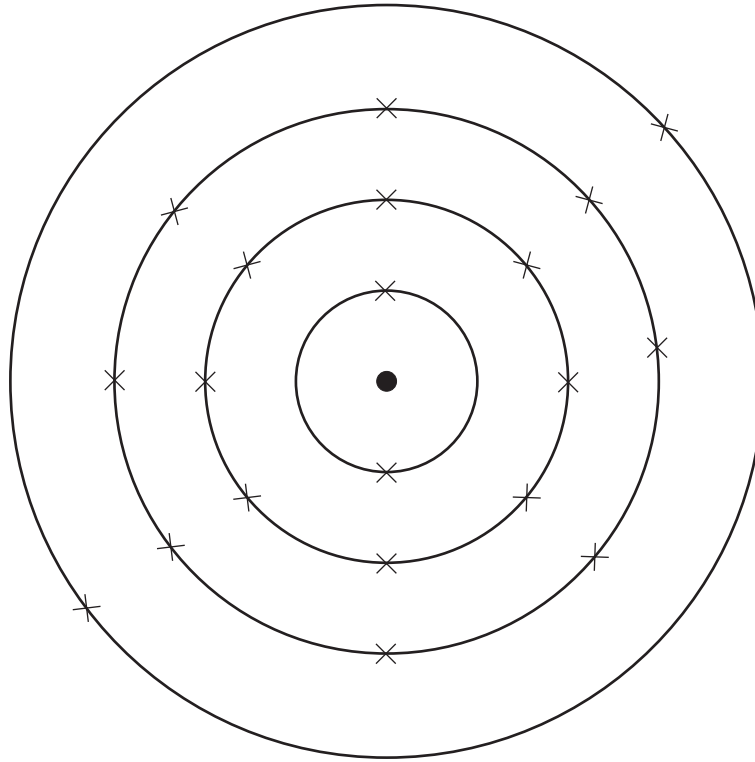
A mark is available for the quality of written communication in question 6(i).

The Periodic Table is printed on page 24 and the formulae for some common ions on page 23.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

Answer **all** questions in the spaces provided.

1. (a) The diagram below shows an atom of calcium.
Atoms contain particles called electrons, neutrons and protons.



- (i) Use the words in the box below to complete the sentences which follow.

electrons neutrons protons

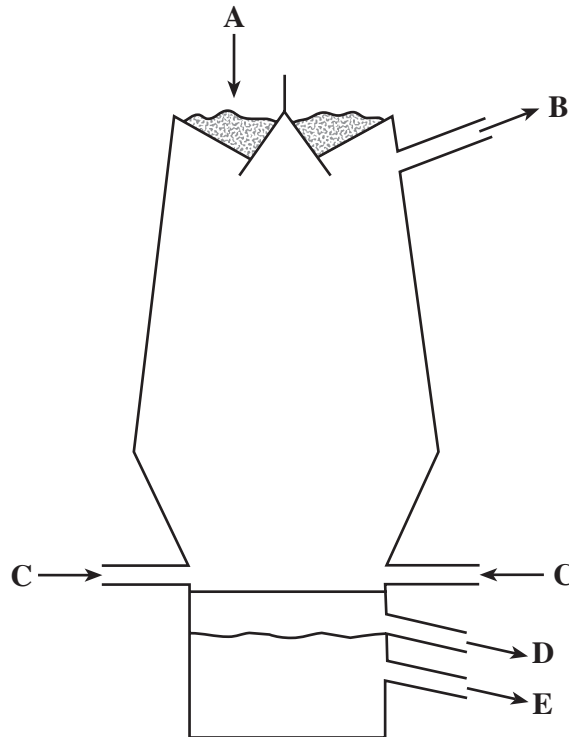
- I. The two particles found in the nucleus of an atom are called
..... and [2]
- II. The particles which have a negative charge are called
..... [1]

- (ii) Use the numbers in the box below to complete the sentences I. and II. that follow.

2	8	10	18	20
---	---	----	----	----

- I. The number of electrons in an atom of calcium is [1]
- II. Calcium is found in Group of the Periodic Table of Elements. [1]
- (b) The chemical formula of sulphuric acid is H_2SO_4 .
- (i) Give the number of sulphur atoms shown in the formula H_2SO_4 . [1]
.....
- (ii) Give the **total** number of atoms shown in the formula. [1]
.....

2. The diagram below shows where materials enter and leave the blast furnace in the extraction of iron.



- (i) Give the letter, **A – E**, on the diagram above, where

- | | | |
|------------------------------------|-------|-----|
| I. iron ore enters, | | [1] |
| II. iron leaves, | | [1] |
| III. hot air enters, | | [1] |
| IV. waste gases leave the furnace. | | [1] |

- (ii) Choose materials from the box below to answer this question.

coke	iron ore	limestone	oxygen
------	----------	-----------	--------

Name the

- I. fuel used,
- II. gas needed to burn the fuel,
- III. substance used to remove impurities in the blast furnace.

[3]

- (iii) During the extraction, one of the reactions in the furnace is



Choose from the word equation the

- I. reactant which is an element,
- II. product which is a compound.

[2]

3. Read the information in the box below.

Carbon dioxide in the Earth's atmosphere prevents the escape of some of the heat energy radiated by the Earth. The amount of carbon dioxide in the atmosphere is increasing as a result of burning fossil fuels and deforestation. As the amount of carbon dioxide in the atmosphere increases, so does the temperature of the Earth's atmosphere. This is called global warming. Global warming is causing dramatic climate changes and sea-levels to rise. A reduction in the burning of fossil fuels can help reduce global warming.

Use only the information in the box above to answer this question.

- (i) Name the gas responsible for trapping heat in the Earth's atmosphere. [1]

- (ii) Give **two** causes of the increase of carbon dioxide in the Earth's atmosphere. [2]
 1.
 2.
- (iii) Give **two** consequences of the increase in the temperature of the Earth's atmosphere (global warming). [2]
 1.
 2.
- (iv) State **one** way of reducing global warming. [1]

4. Group VII of the Periodic Table of Elements is shown below.

<i>Group VII</i>
Fluorine
Chlorine
Bromine
Iodine
Astatine

Choose elements from the table above to answer parts (i) to (iv).

Each element can be used once, more than once or not at all.

(i) Give the name of the element which is liquid at room temperature. [1]

.....

(ii) Name the **most** reactive element in Group VII. [1]

.....

(iii) Sodium burns in a yellow/green gas to form sodium chloride.
Name the gas in this reaction. [1]

.....

(iv) Which element is used as an antiseptic? [1]

.....

5. Powdered chalk (calcium carbonate) reacts with dilute hydrochloric acid forming carbon dioxide.

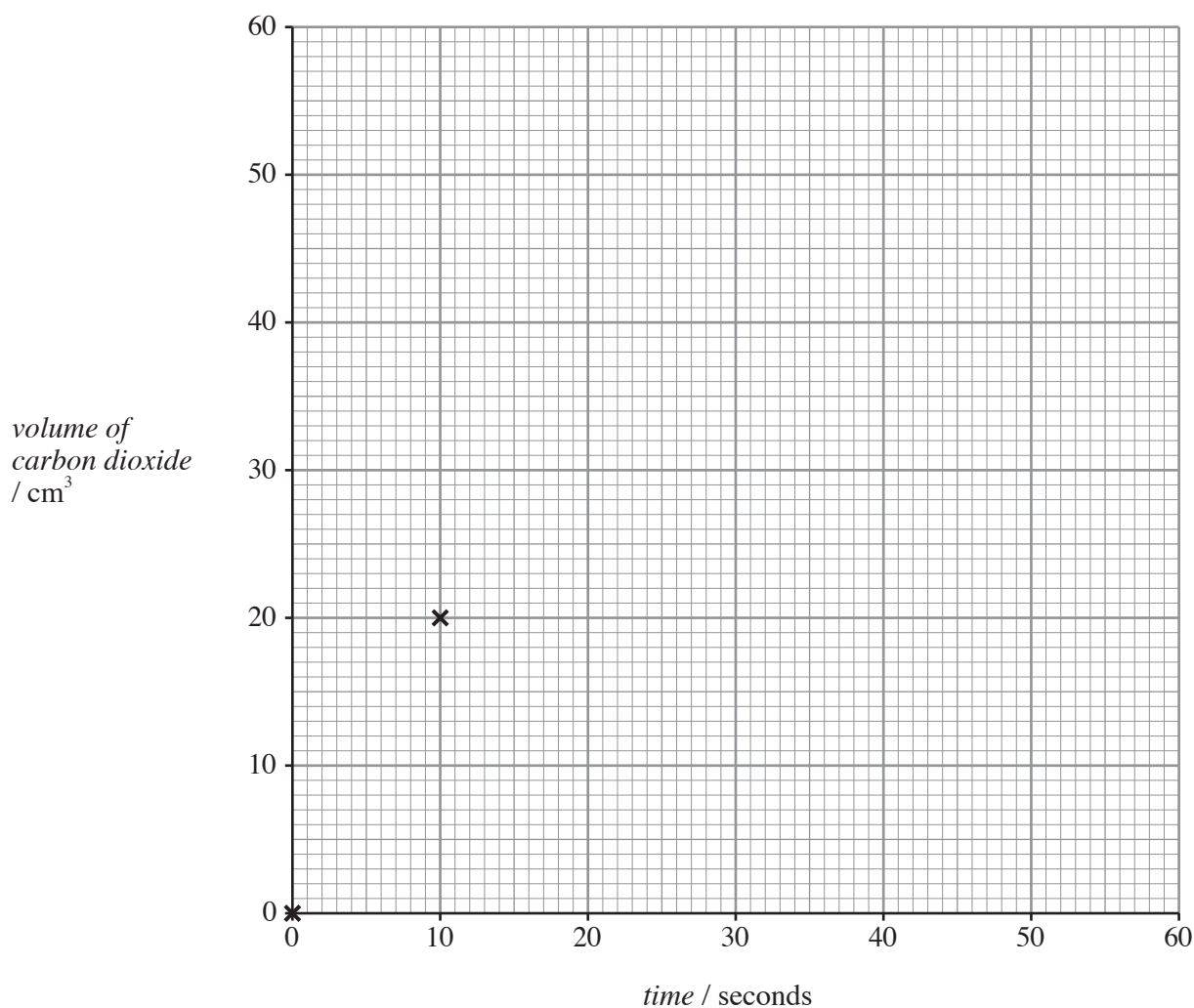
0.2 g of powdered chalk was placed in *excess* dilute hydrochloric acid.

The volume of carbon dioxide produced was recorded every 10 seconds.

The experiment was carried out at room temperature. The results obtained are shown below.

<i>Time</i> / seconds	0	10	20	30	40	50	60
<i>Volume of carbon dioxide</i> / cm ³	0	20	32	40	45	48	48

- (i) Plot the results from the table on the grid below and draw a smooth curve through the points. The first two points have been plotted for you. [3]



- (ii) Use the graph to find the

I. volume of carbon dioxide produced after 25 seconds, cm³ [1]

II. time taken to produce 35 cm³ of carbon dioxide. s [1]

(iii)

electronic balance	gas syringe	thermometer	stop clock
--------------------	-------------	-------------	------------

Choose, from the box above, the name of the piece of apparatus you would use to accurately measure,

I. 0.2 g of chalk,

.....

[1]

II. the volume of carbon dioxide produced during the experiment.

.....

[1]

(iv) Choose statements from the box below to complete the sentences that follow.

decrease	increase	stay the same
----------	----------	---------------

I. Using a **lower** concentration of hydrochloric acid causes the **reaction time**

to

[1]

II. Using hydrochloric acid at a **higher** temperature causes the **reaction time**

to

[1]

6. (i) Plastics are used to make everyday items, such as carrier bags and guttering.

Describe **two** properties of plastics that allow them to be used in these ways. [2+1]

One mark is available for the quality of written communication in your answer.

.....

.....

.....

.....

(ii) Give **two** reasons for it being difficult to dispose of plastics. [2]

Reason 1

Reason 2

7. Read the information in the box below.

Water is a very important raw material. Water is used industrially in the manufacture of sulphuric acid and as a coolant in power stations. It is also used in agriculture.

In homes, water is used for washing, cooking and flushing the toilet. During long periods of dry weather, household water is saved by enforcing a hose-pipe ban.

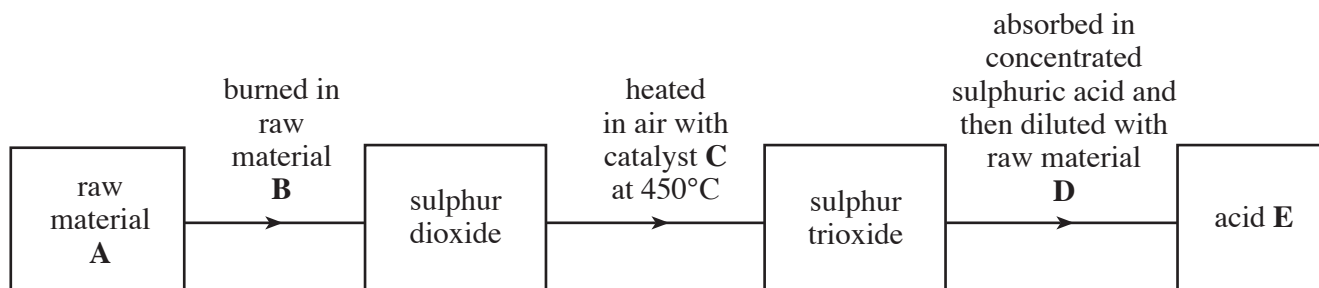
Drinking water is sterilised by adding chlorine. Sodium fluoride is also added to some drinking water to prevent tooth decay.

Some bottled water contains carbon dioxide to make it fizzy.

Use only the information in the box above to answer the following questions.

- (i) Name **two** industrial uses of water. [2]
1.
2.
- (ii) Give **two** ways in which water is used in our homes. [2]
1.
2.
- (iii) State how household water is saved during long periods of dry weather. [1]
-
- (iv) Give the reason why each of the following is added to water:
- I. chlorine; [1]
- II. sodium fluoride; [1]
- III. carbon dioxide. [1]
- (v) Give **one** substance which is
- I. an element, [1]
- II. a compound. [1]

8. (a) The flow diagram below shows the Contact process.



Choose substances from the box below to name **A-E** in the flow diagram above. [5]

air sulphur sulphuric acid vanadium oxide water

Raw material **A** is

Raw material **B** is

Catalyst **C** is

Raw material **D** is

Acid **E** is

(b)



A



B



C



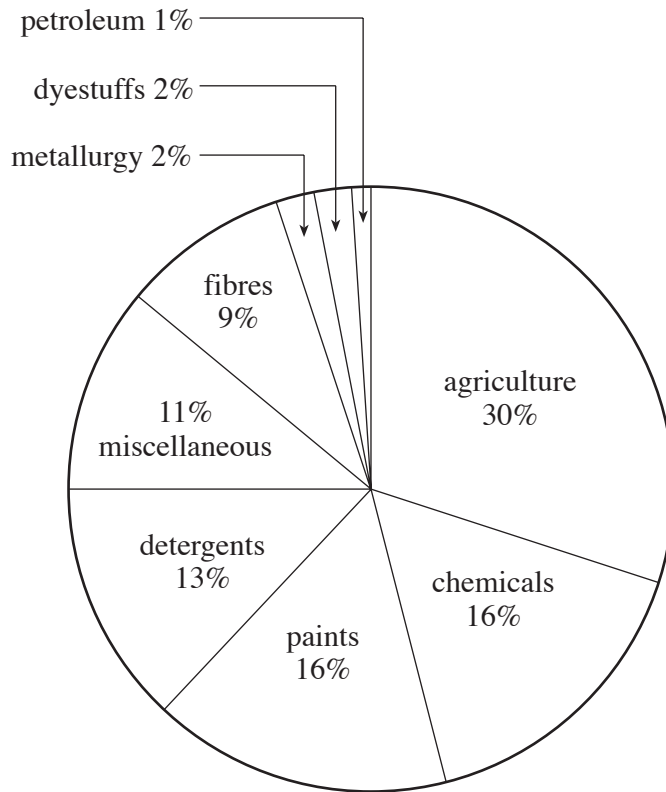
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- (i) State which of the hazard symbols above you would expect to see on a bottle of sulphuric acid in a laboratory. [1]

- (ii) What does this symbol mean? [1]
-

- (iii) State **one** safety precaution carried out by laboratory technicians when they handle concentrated sulphuric acid. [1]
-

(c) The pie chart below shows some uses of sulphuric acid.



(i) Give the percentage of sulphuric acid that is used in agriculture. [1]

..... %

(ii) State the use that requires 13% of sulphuric acid. [1]

.....

9. (a) Use the **data** and **key** on the Periodic Table of Elements, shown on the **back page** of the examination paper, to complete the following sentences.

(i) The chemical symbol for rubidium is [1]

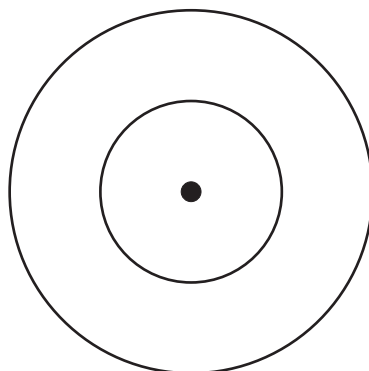
(ii) The atomic number of rubidium is [1]

(iii) The number of protons in an atom of boron is [1]

(iv) The element which has the electronic structure 2,8,3 is [1]

(v) The element which has the smallest atom in Group VI is [1]

(b) Using **X** to represent an electron, complete the following diagram to show the electronic structure for an atom of carbon. [1]



(c) Chlorine has two isotopes, ${}_{17}^{35}\text{Cl}$ and ${}_{17}^{37}\text{Cl}$.

Complete the table below which shows the number of protons, electrons and neutrons in each isotope. [4]

<i>Isotope</i>	<i>Number of protons</i>	<i>Number of electrons</i>	<i>Number of neutrons</i>
${}_{17}^{35}\text{Cl}$	17		
${}_{17}^{37}\text{Cl}$		17	

10. (a) The table below shows some physical properties of Group I elements.

<i>Element</i>	<i>Melting point / °C</i>	<i>Boiling point / °C</i>	<i>Density / g cm⁻³</i>	<i>Electrical conductivity</i>
Lithium	180	1340	0.50	good
Sodium	98	880	0.97	good
Potassium	63	460	0.86	good

Use the information in the table above to answer part (a) (i) to (iii).

(i) Give **one** property of Group I elements which is typical of metals. [1]

.....

(ii) State **one** property of Group I elements which is **not** typical of metals. Explain your answer. [2]

.....

.....

(iii) Rubidium lies below potassium in Group I. Predict the approximate value for the melting point of rubidium. Give a reason for your answer. [2]

Melting point °C

Reason

(b) When a freshly cut piece of potassium is left exposed to air, it immediately reacts with oxygen.

(i) Give the chemical name of the compound formed when potassium reacts with oxygen. [1]

.....

(ii) Complete and balance the **symbol** equation for this reaction. [2]



(iii) State how this change is normally prevented when storing potassium in the laboratory. [1]

.....

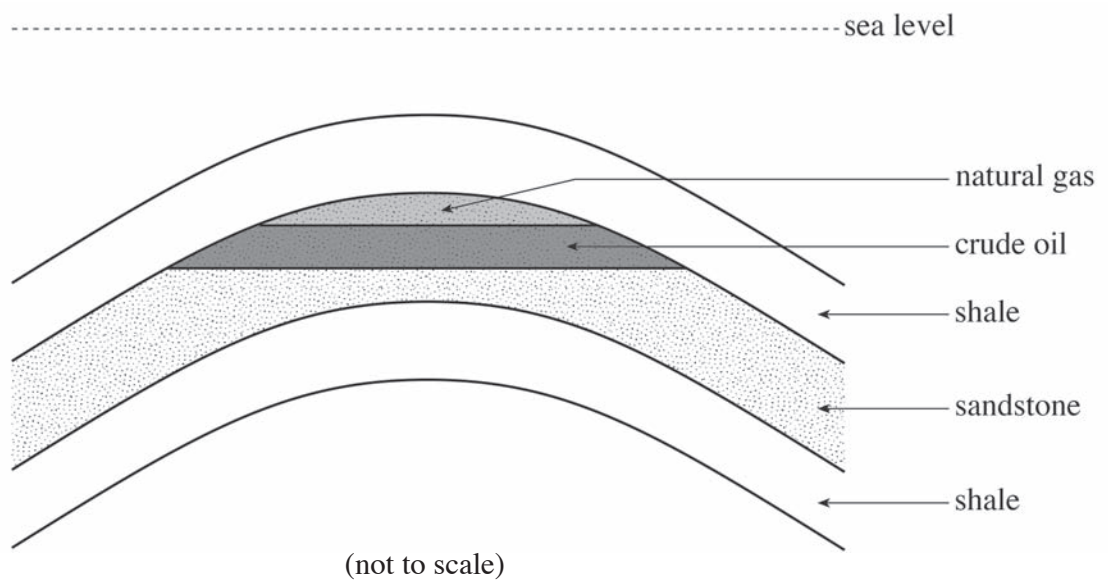
(iv) Give **one** safety precaution required when cutting a small piece of potassium. [1]

.....

11. (a) Sandstone is a sedimentary rock. Describe the formation of sedimentary rock. [2]

.....
.....
.....
.....

(b) The diagram below shows a crude oil (petroleum) deposit found in the North Sea.



I. Crude oil deposits were formed in the geological past from decaying marine life.
Give **two** conditions needed to change decaying marine life into crude oil. [2]

Condition 1

Condition 2

II. Explain how crude oil becomes trapped in the sandstone layer. [2]

.....
.....

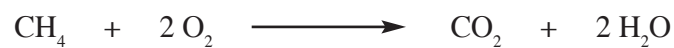
III. Crude oil is a mixture of many substances, most of which are hydrocarbon compounds.

Name the elements present in all hydrocarbons. [1]

..... and

(c) Natural gas, which is mainly methane, is the gas burned in domestic appliances.

The equation below shows the combustion of methane.



If combustion is incomplete, carbon monoxide is formed instead of carbon dioxide.

(i) Give the reason for incomplete combustion. [1]

.....

(ii) State why it is important to prevent the formation of carbon monoxide. [1]

.....

12. (a) The following table shows the colours of Universal indicator at different pH values.

Colour	Red	Orange	Yellow	Green	Blue	Navy Blue	Purple
pH	0 - 2	3 - 4	5 - 6	7	8 - 9	10 - 12	13 - 14

(i) Sodium carbonate solution turns Universal indicator navy blue. [1]

Give the pH range of this solution.

(ii) The pH of hydrochloric acid is 1. Give the colour of Universal indicator in a solution of hydrochloric acid. [1]

.....

(b) (i) Sodium carbonate, Na_2CO_3 , reacts with hydrochloric acid forming sodium chloride solution and a colourless gas. The colourless gas turns limewater milky.

Write a balanced **symbol** equation for this reaction. [3]

..... + \longrightarrow + +

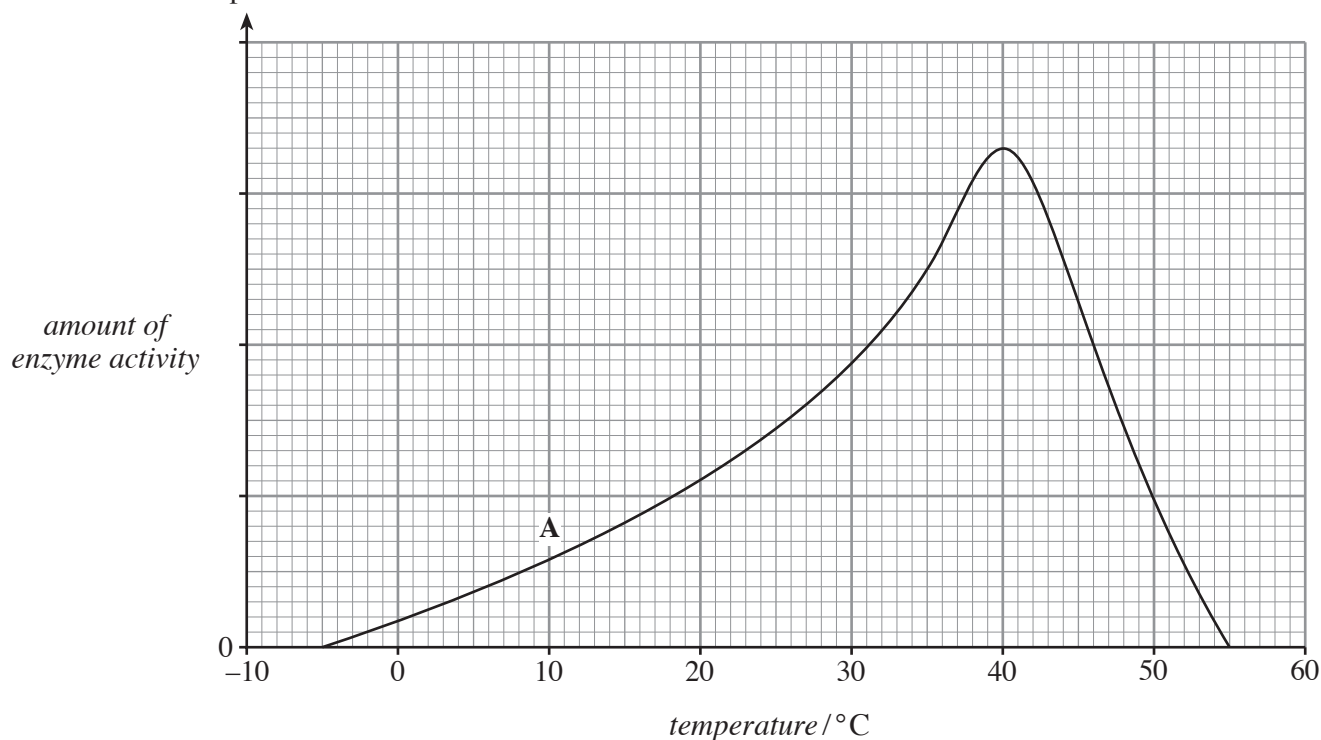
(ii) The reaction in part (b)(i) is an exothermic reaction.

State what is meant by the term **exothermic**. [1]

.....

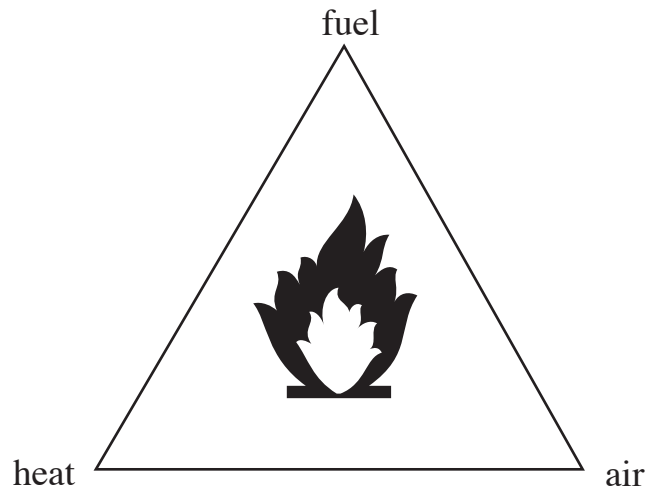
13. (a) The temperature range over which enzyme activity occurs can be different for different enzymes.

The graph below shows how the amount of activity of an enzyme, **A**, changes with temperature.



- (i) Use the graph to give the temperature range over which the enzyme activity is increasing. [1]
 to °C
- (ii) Sketch the graph of the enzyme activity of a different enzyme, **B**, which is active between 5 and 50 °C and has the greatest amount of activity at 30 °C. Label the graph **B**. [2]
- (iii) Give a temperature value at which **both** enzymes would not be active. [1]
 °C
- (b) Enzymes are used in biotechnology. Name **one** industry which uses enzymes in its production process. [1]

14. The fire triangle shows the factors necessary to start and maintain a fire.



State and explain a different fire-fighting method for each of the following situations:

(i) a house on fire;

method [1]

explanation

..... [1]

(ii) a forest fire;

method [1]

explanation

..... [1]

(iii) a chip pan fire.

method [1]

explanation

..... [1]

15. (i) Three samples of bottled water, **A**, **B** and **C**, were being tested for hardness using soap solution.

It was suspected that sample **A** was the most hard and sample **C** the least hard.

Describe an experiment you would do to show that the above statement is true. Include the expected observations. [4]

.....

.....

.....

.....

.....

- (ii) Use the list of formulae for some common ions on page 23 and the Periodic Table of Elements on the **back page** of the examination paper to help you answer this question.

Hard water is caused by the presence of dissolved calcium and magnesium compounds.

- I. Give the **formulae** of the ions of calcium and magnesium. [1]

Calcium ion Magnesium ion

- II. Give the number of the group in the Periodic Table in which both calcium and magnesium are found. [1]

Group

- (iii) State **one** method of softening hard water. [1]

.....

- (iv) State why hard water is considered to be

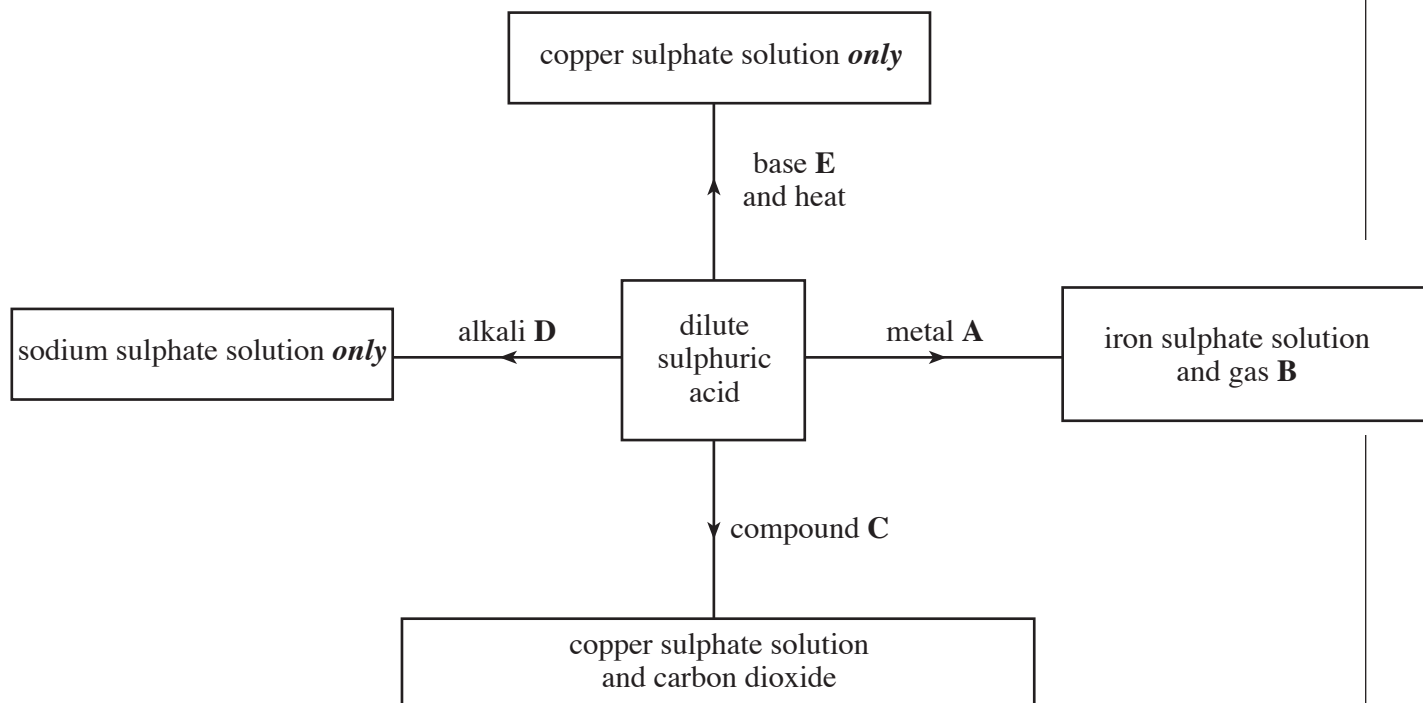
- I. good for our health, [1]

.....

- II. a problem in kettles and boilers. [1]

.....

16. The diagram below shows some reactions of dilute sulphuric acid.



Give the name of

- | | | |
|--------------------------|-------|-----|
| I. metal A , | | [1] |
| II. gas B , | | [1] |
| III. compound C , | | [1] |
| IV. alkali D , | | [1] |
| V. base E . | | [1] |

FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
Aluminium	Al³⁺	Bromide	Br⁻
Ammonium	NH₄⁺	Carbonate	CO₃²⁻
Barium	Ba²⁺	Chloride	Cl⁻
Calcium	Ca²⁺	Fluoride	F⁻
Copper(II)	Cu²⁺	Hydroxide	OH⁻
Hydrogen	H⁺	Iodide	I⁻
Iron(II)	Fe²⁺	Nitrate	NO₃⁻
Iron(III)	Fe³⁺	Oxide	O²⁻
Lithium	Li⁺	Sulphate	SO₄²⁻
Magnesium	Mg²⁺		
Nickel	Ni²⁺		
Potassium	K⁺		
Silver	Ag⁺		
Sodium	Na⁺		

