

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE

General Certificate of Secondary Education



CYD-BWYLLGOR ADDYSG CYMRU

Tystysgrif Gyffredinol Addysg Uwchradd

240/01

ADDITIONAL SCIENCE

FOUNDATION TIER (Grades G-C)

CHEMISTRY 2

A. M. WEDNESDAY, 13 June 2007

(45 minutes)

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.

The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

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

Answer **all** questions.

1. A fluorine atom can be represented by



- (i) Use the numbers in the box below to answer this question.

1	7	9	10	11	19
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Each number can be used once, more than once or not at all.

Complete the following sentences.

- I. Fluorine has protons. [1]
- II. The atomic number of fluorine is [1]
- III. The mass number of fluorine is [1]
- IV. Fluorine has neutrons. [1]
- (ii) Tick (✓) the box next to the correct statement.

- I. An atom of fluorine has

no charge,

a positive charge,

a negative charge.

[1]

- II. An electron has a charge of

+1,

0,

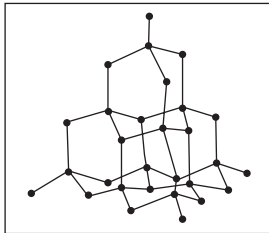
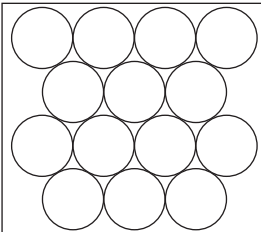
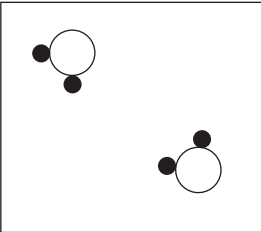
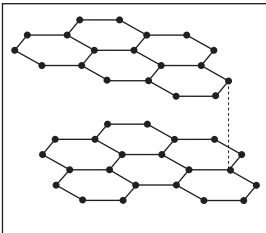
-1.

[1]

2. (i) Complete the following table by stating whether the substance is a metal, non-metal or a compound. [4]

<i>Substance</i>	<i>Metal, non-metal or compound</i>
aluminium	
diamond	
graphite	
water vapour	

- (ii) Draw lines to connect **each** substance to its correct structure. [4]

<i>Substance</i>	<i>Structure</i>
aluminium	
diamond	
graphite	
water vapour	

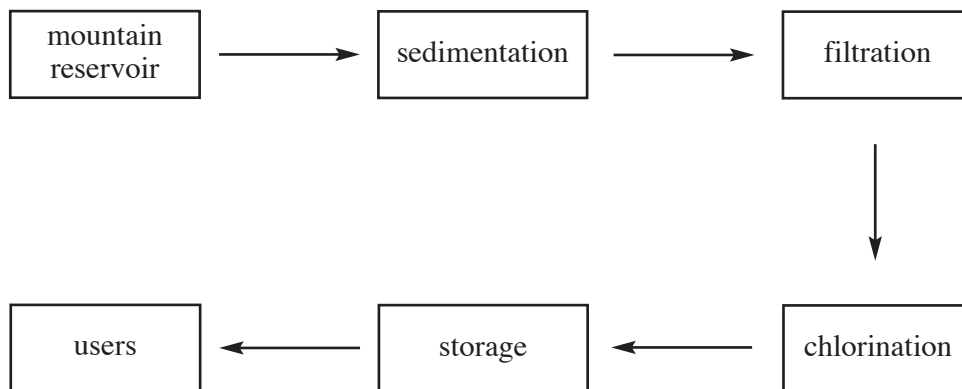
3. (i) Most of the tap water in the UK comes from mountain reservoirs. The water from these reservoirs is never pure.

It often contains

- solids such as sand, mud and twigs,
- dissolved substances such as nitrates from soil and calcium compounds from rocks,
- tiny living organisms, such as bacteria.

Before the water is safe to drink it must be treated.

The following flow chart shows stages in a water treatment process.



- I. At which stage are the solid impurities removed? [1]

.....

- II. State the reason for chlorination. [1]

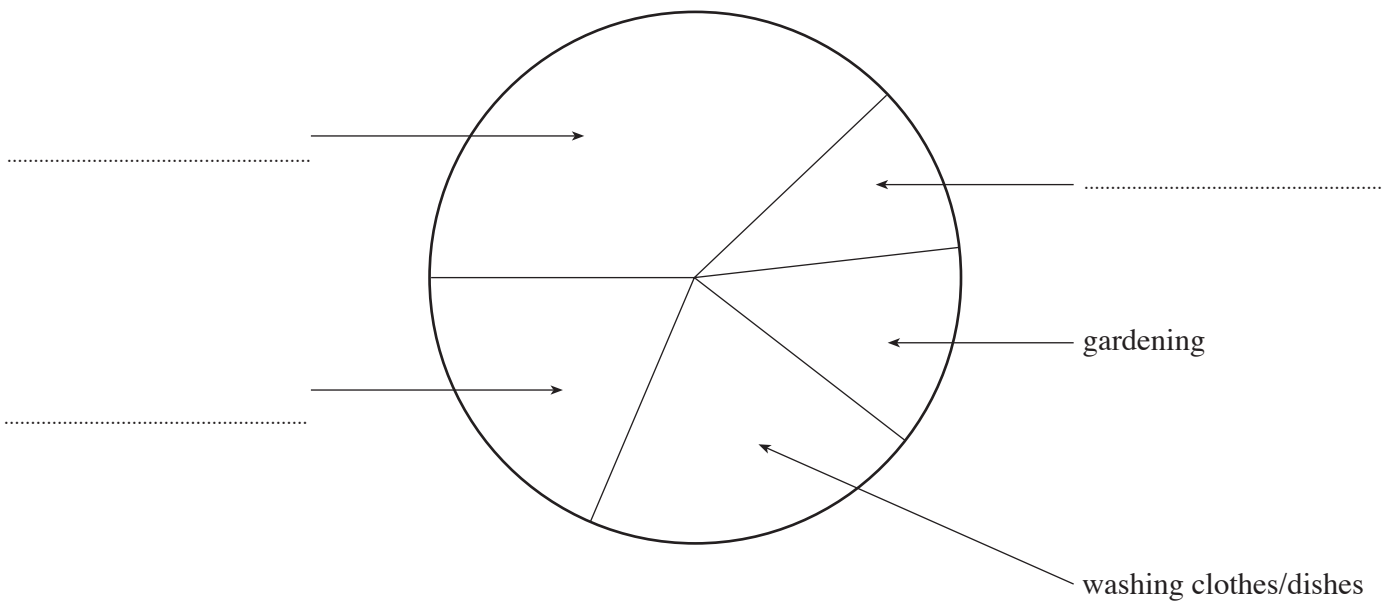
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- (ii) In the UK, it has been estimated that each person uses about 180 litres of water every day.
The following table shows how water is used by a person living in the UK.

<i>Use of water</i>	<i>Litres</i>
toilet flushing	72
personal washing	36
washing clothes/dishes	40
gardening	18
cooking/drinking	14

- I. Use the table above to label the pie chart below.
Two labels have been added for you.

[2]



- II. In very dry weather, we need to save water. State the first action a person would be advised to take by the Local Authority in order to save water. [1]

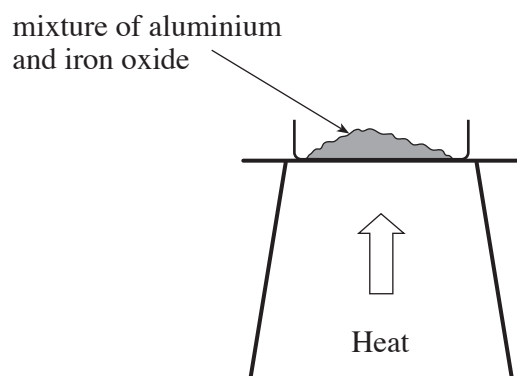
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4. This question is about the reactivity of metals.

(i) A teacher carried out the following two experiments in a fume-cupboard.

Experiment 1.

A mixture of aluminium powder and iron oxide was heated strongly using the equipment shown.



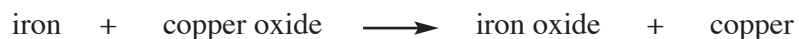
The reaction that took place can be summarised by the following word equation.



Experiment 2.

The above experiment was then repeated using a mixture of iron powder and copper oxide.

The word equation for this reaction is shown below.



Use the results of the two reactions to place the three metals aluminium, copper and iron in order of **decreasing** reactivity. [2]

most reactive

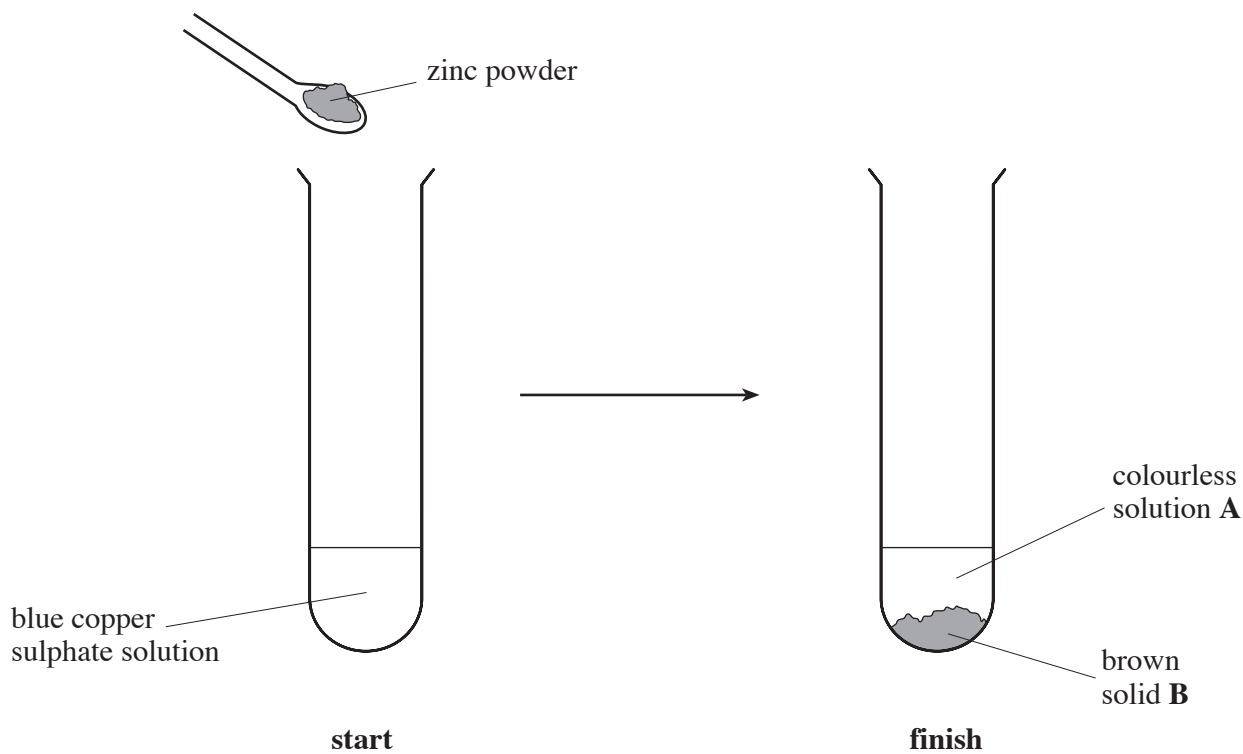
.....

least reactive

(ii) Zinc is more reactive than copper.

Excess zinc powder was added to blue copper sulphate solution.

During the reaction the blue solution became colourless and a brown solid was formed.



I. Name the colourless solution **A**.

[1]

.....

II. Name the brown solid **B**.

[1]

.....

5. Ammonia, NH_3 , was first made commercially over a hundred years ago by a German scientist called Fritz Haber. He succeeded in reacting *two elements* to make the gas ammonia by a *reversible* reaction.

- (i) Use the formula shown above to name the **two** elements that Fritz Haber reacted together to make ammonia. [2]

..... and

- (ii) Ammonia can be converted into two fertilisers, ammonium nitrate and ammonium sulphate. Ammonia is converted into ammonium nitrate by reacting with nitric acid. Name the acid used to convert ammonia into ammonium sulphate. [1]

.....

- (iii) Farmers often use fertilisers on their fields. There are two types of fertilisers – natural and man-made fertilisers. The following table shows the average yield of wheat and potatoes produced by a farmer in one year, using no fertiliser and a variety of fertilisers.

<i>Type of fertiliser</i>	<i>Average yield of wheat / tonnes</i>	<i>Average yield of potatoes / tonnes</i>
none	0.5	8.0
natural	7.2	31.9
man-made fertiliser A	6.8	24.5
man-made fertiliser B	7.5	25.9
man-made fertiliser C	4.9	9.1

Use the information in the table to answer parts I. and II.

I. State the **best** fertiliser for growing wheat.

[1]

.....

II. State the **best** fertiliser for growing potatoes.

[1]

.....

(iv) Give **two** advantages of using fertilisers.

[2]

1.

2.

6. (i) Polyvinylchloride (PVC) is an example of a polymer.
Name **two other** polymers.

[2]

1.

2.

- (ii) The following list gives some properties of PVC.

- strong
- light
- resistant to weathering
- non toxic
- does not conduct electricity
- good thermal insulator

Use **only** the properties in the above list to answer parts I., II. and III.

Give the **main** reason for using PVC in

- I. blood storage bags,

[1]

.....

- II. window frames,

[1]

.....

- III. cable-coverings for electric blankets.

[1]

.....

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7. Potassium nitrate dissolves in water to form a solution. The table below shows the maximum mass of potassium nitrate that can dissolve in 100 g of water at different temperatures. The maximum mass of solid that can dissolve in 100 g of water is called the solubility of a substance.

<i>Temperature / °C</i>	<i>Solubility of potassium nitrate / g per 100 g of water</i>
0	13
10	21
20	32
30	47
40	64
50	84

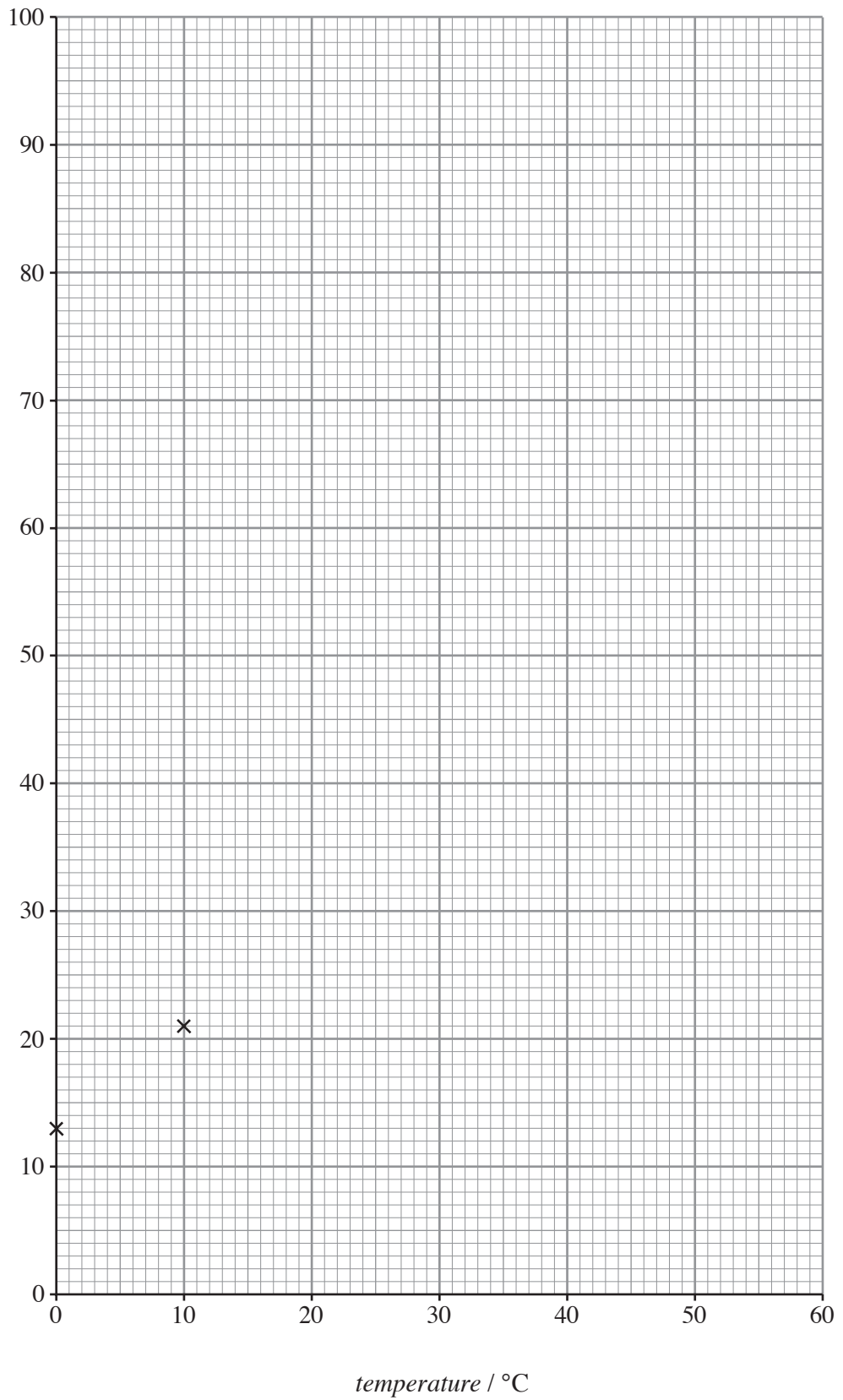
- (i) Plot the points on the grid opposite and draw a smooth curve through them. Two points have been plotted for you. [3]
- (ii) Use the graph to find the solubility of potassium nitrate at 35 °C. [1]
..... g per 100 g of water.
- (iii) Calculate the mass of potassium nitrate **crystals** that would form when a solution containing 64 g of potassium nitrate in 100 g of water was cooled to 20 °C. [2]

.....

.....

.....

*solubility of
potassium
nitrate / g per
100 g of water*

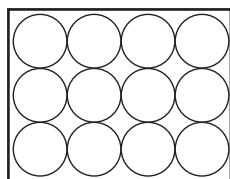


8. Nitinol (NiTi) is an example of a shape memory alloy which was first developed in 1962-63.

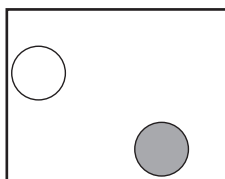
(i) Name the **two** metals present in this alloy. [1]

..... and

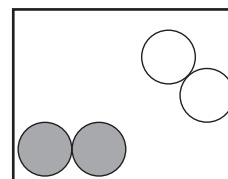
(ii) State which of the following, **A, B, C, D** or **E**, best represents the structure of solid nitinol. [1]



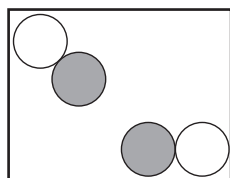
A



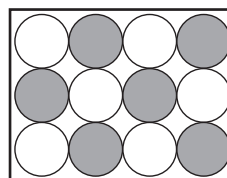
B



C



D



E

The structure of nitinol is best represented by

(iii) Give **one** use of nitinol. [1]

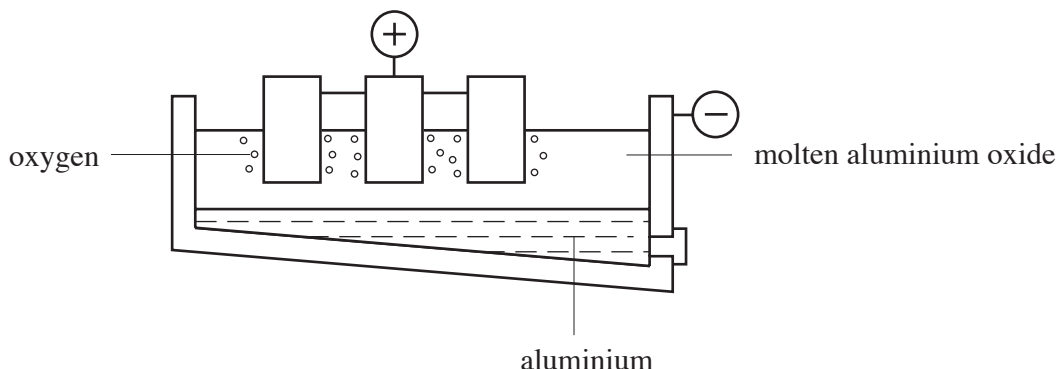
.....

(iv) State the special property that nitinol has compared with other alloys or metals. [1]

.....

.....

9. The following diagram shows how aluminium is extracted from its ore.



(i) Give the name of the process used in the extraction of aluminium. [1]

.....

(ii) Give the name of the electrolyte used in this extraction. [1]

.....

(iii) The word equation for the overall reaction that takes place during the extraction is shown below.



During the reaction, reduction takes place. Use the above word equation to explain the meaning of the term **reduction**. [1]

.....
.....

(iv) The extraction of aluminium from its ore uses large amounts of electricity and is therefore very expensive. State **one** method of reducing the cost of aluminium metal. [1]

.....

(v) Aluminium is a very good conductor of electricity and has a low density. Give **one** use of aluminium which relies on **both** of these properties. [1]

.....

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FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
Aluminium	Al^{3+}	Bromide	Br^-
Ammonium	NH_4^+	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^-
Calcium	Ca^{2+}	Fluoride	F^-
Copper(II)	Cu^{2+}	Hydroxide	OH^-
Hydrogen	H^+	Iodide	I^-
Iron(II)	Fe^{2+}	Nitrate	NO_3^-
Iron(III)	Fe^{3+}	Oxide	O^{2-}
Lithium	Li^+	Sulphate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^+		
Silver	Ag^+		
Sodium	Na^+		

