Centre No.					
Candidate No.					

Paper reference	1524/5H	
Paper reference	1036/3H	

Surname	Other names
Signature	

For Examiner's use only

For Team Leader's use only

1524/5H
1036/3H

Edexcel GCSE

Science: Double Award (Combined) [**1524**]

Paper 5H

Science: Chemistry [**1036**]

Paper 3H

HIGHER TIER

Monday 12 June 2000 – Morning

Time: 1 hour 30 minutes

M4324

Materials required for examination:

Nil.

Items included with these question papers:

Nil.

Question numbers	Leave blank
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

Instructions to Candidates

In the boxes above, write your Centre Number, Candidate Number, your surname, other names and signature, then tick the box to show the correct Paper reference for your examination.

The Paper reference is shown in the top left-hand corner. If more than one Paper reference is shown, you should tick the one for which you have been entered.

Answer ALL questions in the spaces provided in this book.

Show all stages in any calculations and state the units. Calculators may be used.

Include diagrams in your answers where these are helpful.

Information for Candidates

The marks for the various parts of questions are shown in round brackets: e.g. (2).

This paper has 9 questions. There are three blank pages.

Advice to Candidates

Additional Answer Sheets may be used.

Turn over

M4324 83016/R1524 7/7/3/3/1

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THE PERIODIC TABLE

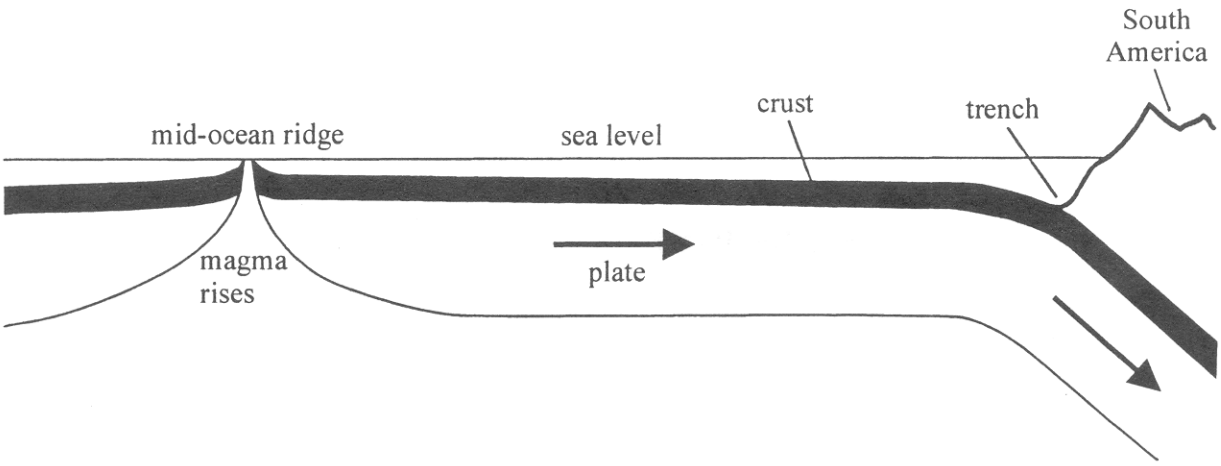
Period	1	2											Group 3	4	5	6	7	0
1	1 H Hydrogen 1																	4 He Helium 2
2	7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
3	23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
4	39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	63.5 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
5	86 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	99 Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
6	133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	179 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
7	223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89															

Key

Relative atomic mass
Symbol
Name
Atomic number

Leave blank

1. The diagram below shows one of the plates under the Pacific Ocean. It is always moving, very slowly, towards and under the South American land mass.



(*a*) On the diagram write:

(i) **S** where molten rock is solidifying;

(1)

(ii) **M** where solid rock is melting.

(1)

(*b*) Sedimentary rock forms on top of the plate.
Describe how sedimentary rock is formed.

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

(3)

(Total 5 marks)

QUESTION 1

TURN OVER FOR QUESTION 2

BLANK PAGE

Leave blank

2. Calcium carbonate reacts with dilute hydrochloric acid.
During the reaction carbon dioxide and water are formed.

(*a*) (i) Write the word equation for this reaction.

. . . . . .

. . . . . .

(2)

(ii) Describe the test for carbon dioxide.

. . . . . .

. . . . . .

. . . . . .

. . . . . .

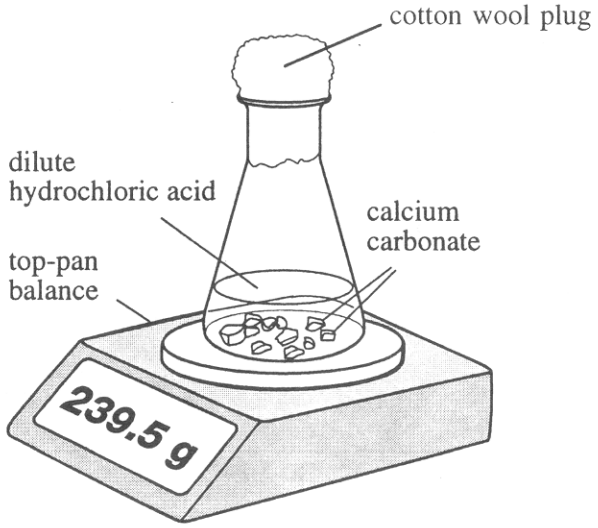
. . . . . .

(3)

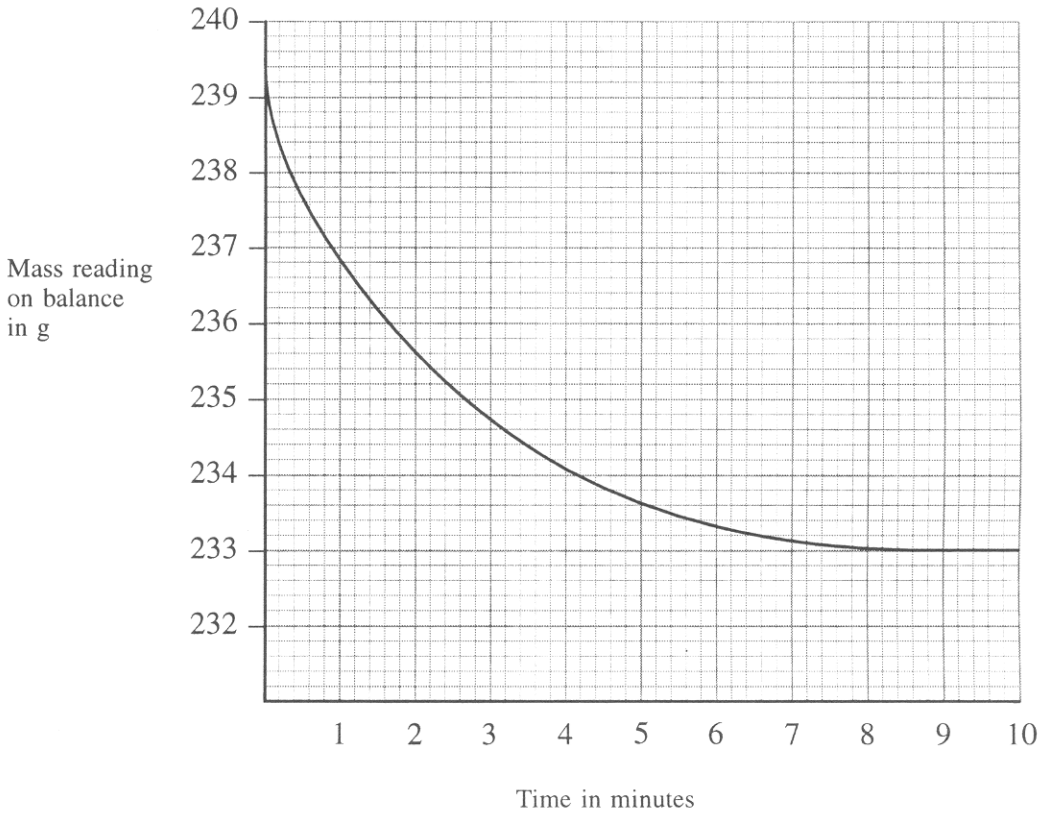
QUESTION 2 CONTINUES ON NEXT PAGE

Leave blank

(*b*) Some students investigated the rate of reaction of lumps of calcium carbonate with hydrochloric acid.
They carried out the reaction in a flask on a top pan balance as shown below.



The students recorded the mass at known times after the start. Their results are shown on the graph.



Leave blank

(i) How does the mass of the reaction mixture change during the reaction?

. . . . . .

(1)

(ii) Explain why this change in mass takes place.

. . . . . .

. . . . . .

. . . . . .

(2)

(iii) Use the graph to find the reading on the balance at the end of this reaction.

. . . . . .

(1)

(*c*) The experiment was repeated using the same masses of acid and calcium carbonate as in the first experiment but using powdered calcium carbonate instead of lumps.
How did the rate of reaction change when powder was used instead of lumps?

. . . . . .

(1)

(*d*) Suggest THREE ways of increasing the rate of reaction of a finely powdered solid with an acid.

1. . . . . .

2. . . . . .

3. . . . . .

(3)

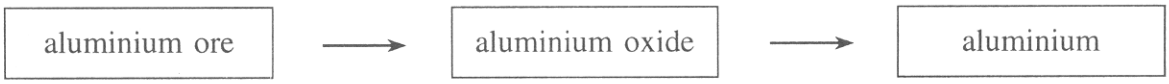
(Total 13 marks)

QUESTION 2

TURN OVER FOR QUESTION 3

Leave blank

3. The flow chart gives an outline of the extraction of aluminium.



(*a*) (i) Name the aluminium ore used.

. . . . . .

(1)

(ii) Name the type of process used to extract aluminium from aluminium oxide.

. . . . . .

(1)

(*b*) The word equation for the extraction of aluminium is:

aluminium oxide ⟶ aluminium + oxygen

The reaction is endothermic.

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

. . . . . .

. . . . . .

(1)

(ii) Suggest why this reaction is endothermic.

. . . . . .

. . . . . .

(1)

Leave blank

(*c*) Aluminium oxide contains aluminium ions (Al^{3+}).
The atomic number of aluminium is 13.
The mass number of aluminium is 27.

(i) Complete the table to show the number of protons, neutrons and electrons in an aluminium atom (Al) and an aluminium ion (Al^{3+}).

Formula of particle	Number of protons	Number of neutrons	Number of electrons
Al	. . . . .	. . . . .	. . . . .
Al^{3+}	. . . . .	. . . . .	. . . . .

(4)

(ii) Name the type of bonding present in aluminium oxide.

. . . . . .

(1)

(iii) State ONE physical property you would expect aluminium oxide to have.

. . . . . .

. . . . . .

(1)

(Total 10 marks)

QUESTION 3

TURN OVER FOR QUESTION 4

Leave blank

4. This question is about alkali metals and their compounds.

(*a*) An alkali metal (**X**) reacts violently with water. A gas (**Y**) and a solution (**Z**) are formed during this reaction. A lilac-coloured flame is seen.

(i) Name the substances **X**, **Y** and **Z**.

alkali metal **X** .....

gas **Y** .....

solution **Z** .....

(3)

(ii) State what you SEE when Universal indicator is added to solution **Z**.
Give a reason for your answer.

.....

.....

(2)

(*b*) Glauber's salt is a naturally occurring form of sodium sulphate. On heating, Glauber's salt loses water to form pure sodium sulphate. In an experiment, 20.0 g of Glauber's salt gives 8.8 g of pure, dry sodium sulphate when heated.

(i) What mass of water is lost?

.....

(1)

(ii) Calculate the percentage of water present in Glauber's salt.

.....

.....

(1)

(iii) Give the names of the acid and the alkali which react together to produce sodium sulphate.

Acid .....

Alkali .....

(2)

Leave blank

(*c*) Find lithium (atomic number 3) in the periodic table.

(i) Name a non-metal **in the same period** as lithium.

. . . . . .

(1)

(ii) Name another metal **in the same period** as lithium.

. . . . . .

(1)

(*d*) (i) Draw a diagram to show the arrangement of electrons in a lithium atom.

(1)

(ii) What is similar about the arrangement of electrons in the atoms of all the alkali metals?

. . . . . .

. . . . . .

. . . . . .

. . . . . .

(2)

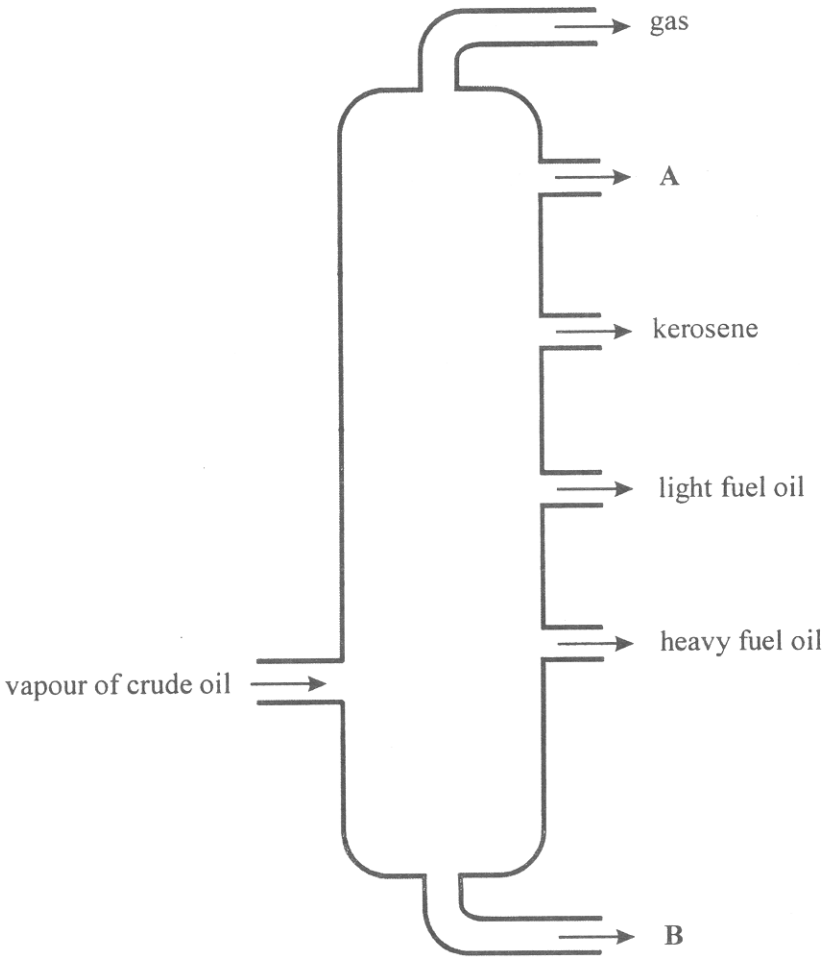
(Total 14 marks)

QUESTION 4

TURN OVER FOR QUESTION 5

Leave blank

5. The diagram shows a simplified fractionating tower. Some of the products which may be obtained when crude oil is fractionally distilled are labelled.



(*a*) Give the names of fractions **A** and **B** and state a use for each.

Fraction **A** . . . . . .

Use . . . . . .

Fraction **B** . . . . . .

Use . . . . . .

(4)

(*b*) When completely burned in excess air, all the fractions form the same two compounds. Give the **formulae** of these two compounds.

. . . . . and . . . . . .

(2)

Leave blank

(*c*) When fractions from crude oil are cracked, ethane and ethene can be formed.
Draw the structural formulae of ethane and ethene. Show **all** the bonds.

ethane

ethene

(4)

(*d*) Methane is the simplest alkane.
Draw a dot and cross diagram to show how outer electrons are used to form bonds in a molecule of methane, CH_4.

(3)

(Total 13 marks)

QUESTION 5

TURN OVER FOR QUESTION 6

6. There are four main steps in the manufacture of the fertiliser ammonium nitrate.

Leave blank

1. The reaction of methane with steam to produce hydrogen.
2. The reaction of hydrogen and nitrogen to produce ammonia.
3. The oxidation of ammonia to produce nitric acid.
4. The reaction of ammonia with nitric acid to produce ammonium nitrate.

(*a*) Balance the equation for the reaction of methane with steam.

$$\ldots\ldots CH_4 + \ldots\ldots H_2O \longrightarrow \ldots\ldots H_2 + \ldots\ldots CO_2$$

(1)

(*b*) (i) Suggest the source of nitrogen for step 2.

. . . . . .

(1)

(ii) Write the balanced equation, including state symbols, for the reaction in step 2.

. . . . . .

(3)

(*c*) (i) What type of reaction is taking place in step 4?

. . . . . .

(1)

(ii) What is the formula of ammonium nitrate?

. . . . . .

(1)

(*d*) The fertiliser ammonium nitrate is very soluble in water.
Describe the advantages and disadvantages of this.

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

(4)

(Total 11 marks)

QUESTION 6

Leave blank

7. (*a*) Magnesium is a reactive metal.

(i) State TWO metals which can be displaced from solutions of their salts by magnesium.

. . . . . and . . . . . .

(2)

(ii) State ONE metal which CANNOT be displaced from solutions of its salts by magnesium.

. . . . . .

(1)

(*b*) Magnesium is obtained industrially by electrolysing molten magnesium chloride. Magnesium is formed at the cathode and chlorine at the anode.

(i) The half equation for the formation of chlorine at the anode is

$$2\,Cl^- \longrightarrow Cl_2 + 2e^-$$

Explain why this reaction is classified as oxidation.

. . . . . .

. . . . . .

(1)

(ii) Write the half equation for the formation of magnesium at the cathode.

. . . . . .

(2)

(Total 6 marks)

QUESTION 7

TURN OVER FOR QUESTION 8

Leave blank

8. Iodine is a grey solid which sublimes to a purple gas above 110 °C.
Hydrogen iodide is a colourless gas at room temperature.

Hydrogen iodide can be converted into iodine by two methods.

(*a*) **Method 1** Dissolve the hydrogen iodide gas in water and bubble chlorine gas through the solution.
Hydrogen iodide solution contains iodide ions.

Write a balanced equation for the reaction of chlorine molecules with iodide ions.

. . . . . .

(3)

(*b*) **Method 2** Heat the hydrogen iodide gas in a sealed tube.
Hydrogen iodide decomposes in an endothermic reaction.

$$2\,HI(g) \rightleftharpoons H_2(g) + I_2(g)$$

The reaction is reversible.
At a temperature of 440 °C, an equilibrium is reached in which 22% of the hydrogen iodide has decomposed.

(i) What would you SEE if hydrogen iodide was heated to 440 °C and allowed to reach equilibrium?

. . . . . .

(1)

(ii) What effect, if any, would heating to a higher temperature have on the colour in the tube? Explain your answer.

. . . . . .

. . . . . .

. . . . . .

(3)

(iii) What effect, if any, would increasing the pressure have on the composition of the mixture at equilibrium?

. . . . . .

. . . . . .

(1)

Leave blank

(iv) Calculate the maximum mass of iodine which can be formed by complete decomposition of 6.40 g of hydrogen iodide.
Give your answer to 3 significant figures.
(Relative atomic masses: H = 1; I = 127)

. . . . . .

. . . . . .

. . . . . .

. . . . . .

(2)

(Total 10 marks)

QUESTION 8

TURN OVER FOR QUESTION 9

Leave blank

9. The table shows some properties of diamond and graphite.

Diamond	Graphite
colourless, transparent crystals	black shiny solid
hardest natural substance known	flakes easily
non-conductor of electricity	conductor of electricity

(*a*) Why might you expect diamond and graphite to have the same properties?

. . . . . .

(1)

(*b*) Explain why diamond and graphite do **not** have the same properties.

. . . . . .

. . . . . .

. . . . . .

. . . . . .

(2)

(*c*) Explain why diamond does **not** conduct electricity but graphite does.

. . . . . .

. . . . . .

. . . . . .

. . . . . .

(2)

(*d*) Write a balanced equation, including state symbols, for the reaction which occurs when graphite burns in excess air.

. . . . . .

(3)

(Total 8 marks)

TOTAL MARKS 90

QUESTION 9

END