

Centre No.				
Candidate No.				

Paper Reference (complete below)					

Surname	Initial(s)
Signature	

Paper Reference(s)

1522/5H 1530/3H

Edexcel GCSE

**Science: Double Award A
[1522]**

Paper 5H

Chemistry A

[1530]

Paper 3H

Higher Tier

Monday 9 June 2003 – Morning

Time: 1 hour 30 minutes

Materials required for examination

Nil

Items included with question papers

Nil

Examiner's use only

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Team Leader's use only

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Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
Total	

Instructions to Candidates

In the boxes above, write your centre number, candidate number, the paper reference, your surname, initials and signature.

The paper reference is shown above. If more than one paper reference is shown, you should write 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 eight questions. There is one blank page.

Advice to Candidates



This symbol shows where the quality of your written answer will also be assessed.

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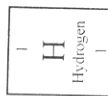
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THE PERIODIC TABLE

1 2 3 4 5 6 7 0

Group

Period



7	Li Lithium	9											4	He Helium								
	3	4											2	20								
2	Be Beryllium											19	F Fluorine	16	O Oxygen	14	N Nitrogen	12	C Carbon	11	B Boron	
	23	24											35.5	32	31	28	27					
3	Na Sodium	Mg Magnesium											Cl Chlorine	S Sulphur	P Phosphorus	Si Silicon	Al Aluminium	10	Ne Neon	40	Ar Argon	
	39	40											17	16	15	14	13	10	18			
4	K Potassium	Ca Calcium											Br Bromine	Se Selenium	As Arsenic	Ge Germanium	Ga Gallium	73	75	79	84	Kr Krypton
	85	88											80	78	75	73	70	84	84			
5	Rb Rubidium	Sr Strontium											I Iodine	Te Tellurium	Sb Antimony	Sn Tin	In Indium	119	122	128	131	Xe Xenon
	37	38											127	128	127	119	115	127	131	131		
6	Cs Caesium	Ba Barium											Xe	Po Polonium	Bi Bismuth	Pb Lead	Tl Thallium	207	209	210	210	222
	55	56											53	52	51	50	49	207	209	210	210	222
7	Fr Francium	Ra Radium											At Astatine	Po Polonium	Bi Bismuth	Pb Lead	Tl Thallium	81	83	84	85	86
	87	88											85	84	83	82	81	82	83	84	85	86

Key

Relative atomic mass
Symbol
Name
Atomic number

Leave blank

1. Before electronic flash units, photographers had to use flash bulbs to take photographs in dark conditions. The flash was produced by the reaction of very thin magnesium wires with oxygen to form the compound magnesium oxide.

(a) Write the balanced equation for the reaction.

.....
(3)

(b) Explain why magnesium oxide is called a compound.



.....
.....
.....
.....
(3)

(c) Magnesium oxide is an ionic compound containing magnesium ions, Mg^{2+} , and oxide ions, O^{2-} .

(i) The atomic number of magnesium is 12. Its mass number is 24.

Complete the table.

	number of protons	number of neutrons	number of electrons
Mg			
Mg^{2+}			

(4)

(ii) Suggest how the oxide ions, O^{2-} , were formed when the magnesium burned in oxygen.

.....
.....
.....
(2)

Q1

(Total 12 marks)

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2. (a) Three gases make up nearly 100% of dry air.

Complete the table with the names of these three gases.

gas	percentage in dry air (%)
	78
	21
	1

(3)

(b) Billions of years ago the Earth's atmosphere contained more carbon dioxide than today.

(i) Where was this carbon dioxide produced?

.....

(1)

(ii) Some of this carbon dioxide has been incorporated into rocks containing carbonate ions.

Name a common rock containing carbonate ions.

.....

(1)

(iii) Rocks containing carbonate ions may be sedimentary.

State **two** pieces of evidence which show that a rock is sedimentary.

1.....

2.....

(2)

(c) Some rocks contain large quantities of metal compounds. Metal can be extracted from these rocks.

Leave blank

(i) What is the name of this type of rock?

.....
(1)

(ii) Copper can be extracted from the rock malachite.

Name rocks from which each of the following metals are extracted.

iron

aluminium
(2)

(d) Write the equation to show iron oxide (Fe_2O_3) being reduced to iron by carbon monoxide (CO).

.....
(2)

Q2

(Total 12 marks)

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TURN OVER FOR QUESTION 3

3. The table gives some information about the group 1 metals.

metal	atomic symbol	atomic number	melting point (°C)
lithium	Li	3	181
sodium	Na	11	98
potassium	K	19	63
rubidium	Rb	37	39
caesium	Cs	55	29

(a) What name is given to the group 1 metals?

.....
(1)

(b) Use the information given in the table to give the electronic structure of a sodium atom.

.....
(2)

(c) When small pieces of sodium and potassium react with water, they melt on the surface of the water. Only potassium produces a flame.

(i) Why do the metals melt?

.....
.....
(1)

(ii) Suggest why only potassium produces a flame.

.....
.....
(1)

(d) In 1807 Humphrey Davy discovered potassium by electrolysis of molten potassium hydroxide (potash). He found that a shiny substance collected around the cathode. From the evidence he collected in experiments carried out on this substance and his knowledge of chemistry, Davy decided that it was a metal. When he shared his ideas, some chemists were uncertain that the substance was a metal as it had a much lower density than metals like iron. As more was discovered about the shiny substance, most agreed that potassium was a metal.

Leave blank

(i) Suggest **two** items of experimental evidence that Davy could have used to show that the shiny substance was a metal.

1.....

2.....

(2)

(ii) Potassium has a much lower density than most metals.
Give another property of potassium that is different from most other metals.

.....

(1)

(iii) What ideas about the electronic structure of atoms could be used to place potassium in the same group of metals as sodium and lithium?

.....

.....

(2)

(Total 10 marks)

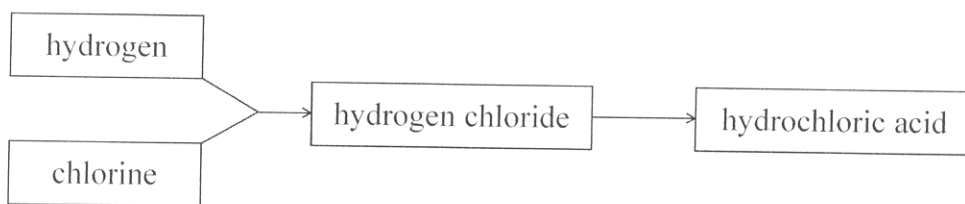
Q3

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TURN OVER FOR QUESTION 4

Leave
blank

4. The flow diagram shows how hydrochloric acid can be formed.



- (a) Hydrogen and chlorine combine to form hydrogen chloride.

Write the balanced equation for the reaction.

..... (3)

- (b) Draw the dot and cross diagram for a molecule of hydrogen chloride, showing the outer electrons only.

(2)

- (c) How can hydrogen chloride be converted into hydrochloric acid?

..... (1)

Q4

(Total 6 marks)

5. Methane, CH₄, is a hydrocarbon.

Leave blank

(a) During complete combustion, methane burns in air to form carbon dioxide as one of the products.

(i) Write the balanced equation, including state symbols, for the reaction.

.....
(3)

(ii) The reaction is exothermic.

Use the equation to explain this in terms of bonds broken and bonds formed.

.....
.....
.....
(2)

(b) A central heating boiler burns methane at a rate of 1000 g per hour.

Calculate the maximum mass of carbon dioxide produced by the boiler in five hours.

(Relative atomic masses : H=1.0; C=12; O=16)

.....
.....
.....
.....
.....
(4)

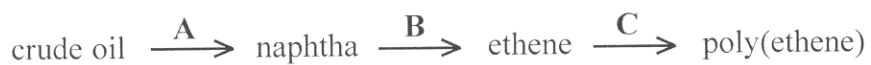
Q5

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(Total 9 marks)

TURN OVER FOR QUESTION 6

6. Poly(ethene) can be obtained from crude oil in three stages **A**, **B** and **C**.



(a) Describe how naphtha is produced from crude oil in stage **A**.

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

(3)

(b) Naphtha contains molecules of decane, $\text{C}_{10}\text{H}_{22}$.

Write the balanced equation for stage **B**, in which one molecule of ethene and one molecule of another product are produced from one molecule of decane.

.....

(2)

(c) (i) Draw the structure of a molecule of ethene, showing all bonds.

*Leave
blank*

(2)

(ii) Describe a test to show that ethene, an alkene, is present in the mixture produced from the cracking of naphtha in stage **B**.

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

(3)

(iii) Draw the repeating unit of a poly(ethene) molecule, showing all bonds.

(2)

(iv) Explain how molecules of ethene combine to form a poly(ethene) molecule.

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

(2)

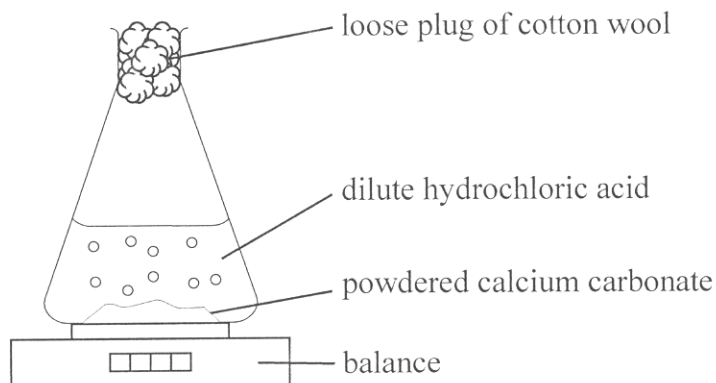
Q6

(Total 14 marks)

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TURN OVER FOR QUESTION 7

7. A student carried out an experiment to investigate the rate of reaction between powdered calcium carbonate and excess dilute hydrochloric acid, using the following apparatus.



- (a) Write the balanced equation, including the state symbols, for the reaction.

..... (3)

- (b) The student measured the mass of the flask and contents every 30 seconds and calculated the loss in mass.

time (min)	loss of mass (g)
0.0	0.00
0.5	0.60
1.0	1.05
1.5	1.45
2.0	1.75
2.5	1.95
3.0	2.10
3.5	2.20
4.0	2.25
4.5	2.30
5.0	2.30

- (i) Explain why there is a loss in mass.

.....

 (2)

(ii) Suggest why the student used a loose plug of cotton wool in the neck of the flask.

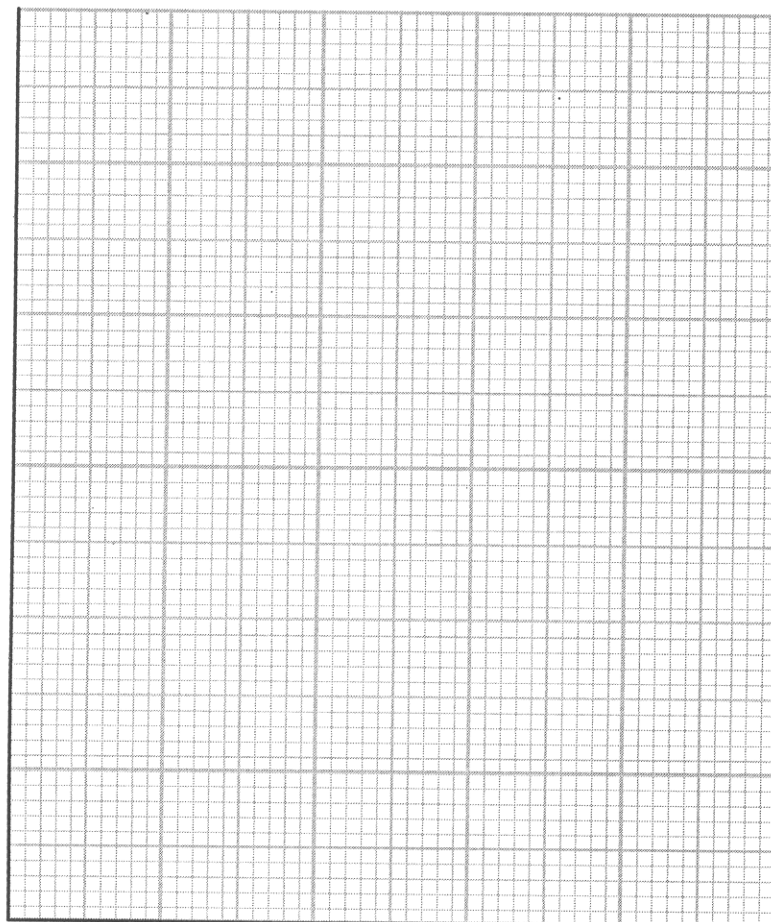
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.....
.....

(2)

(c) Draw a graph of these results on the grid.

Loss in mass
in g



Time in minutes

(4)

(d) State what happens to the rate of reaction during the experiment. Explain your answer in terms of particles.



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

(4)

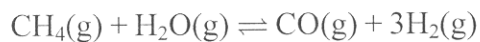
Q7

(Total 15 marks)

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8. Hydrogen is produced commercially by the reaction between methane and steam.

The process is known as 'steam reforming'.



The reaction is endothermic.

A dynamic equilibrium is obtained when methane and steam are passed over a nickel oxide catalyst at 730 °C and at a pressure of 30 atmospheres. A 90% conversion of the methane is achieved at equilibrium.

(a) What is meant by the term **dynamic equilibrium**?

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

(2)

(b) What would happen to the yield of hydrogen if a higher pressure was used?

Explain your answer.

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

(3)

(c) What would happen to the yield of hydrogen if a lower temperature was used?

Explain your answer.

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

(3)

(d) What would happen to the yield of hydrogen if a different catalyst was used?

*Leave
blank*

Explain your answer.



.....

.....

.....

.....

.....

(4)

Q8

(Total 12 marks)

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TOTAL FOR PAPER: 90 MARKS

END