

Centre Number	Candidate Number	Name
---------------	------------------	------

CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

SCIENCE

5124/03, 5126/03

Paper 3 Chemistry

May/June 2003

1 hour 15 minutes

Additional Materials: Answer paper.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B

Answer any **two** questions.
Write your answers on the lined paper provided and, if necessary, continue on separate answer paper.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [] at the end of each question or part question.
A copy of the Periodic Table is printed on page 12.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

For Examiner's Use	
Section A	
Section B	/
TOTAL	

This document consists of **9** printed pages and **3** lined pages.



Section A

Answer **all** the questions.

Write your answers in the spaces provided on the question paper.

- 1 Complete the table in Fig. 1.1

substance	symbol or formula	one use of the substance
aluminium		
ethanol		
haematite	Fe_2O_3	
helium	He	

[6]

Fig. 1.1

- 2 Read the information about **A**, **B**, **C** and **D**.

Solid A

A has a constant composition and decomposes into two elements when heated.

Solid B

B is coloured grey and attracted to a magnet. It cannot be decomposed into anything simpler.

Solid C

C is speckled black and white. The white particles dissolve in water but the black particles do not.

Solid D

D is black. It is formed by strongly heating copper in oxygen.

Complete Fig. 2.1 by placing a tick (✓) in **one** box in each line.

substance	element	compound	mixture
A			
B			
C			
D			

[4]

Fig. 2.1

3 (a) **E** is a hydrocarbon with the formula C_2H_6 . **F** is a hydrocarbon with the formula C_2H_4 .

(i) Give the full structural formula of **E** and of **F**.

(ii) How would you distinguish in the laboratory between **E** and **F**?

chemical test

result with **E**

result with **F**

(iii) Calculate the relative molecular mass of **E**.

[Relative atomic masses A_r : H, 1; C, 12]

[5]

(b) (i) Explain why **F** can be polymerised but **E** cannot.

.....

.....

(ii) Give the chemical structure of the polymer formed from **F**.

(iii) Explain why pollution is caused by

1. dumping polymers,

.....

2. burning polymers.

.....[4]

- 4 Fig. 4.1 describes some properties of gas **H** and its industrial preparation. The letters are not the chemical symbols of the substances.

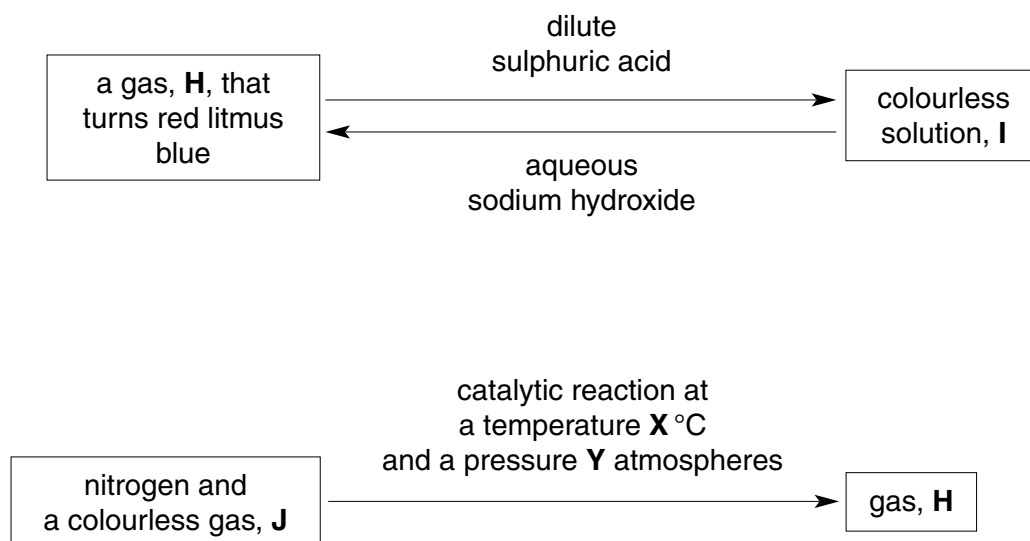


Fig. 4.1

(a) Name

(i) gas, **H**,

(ii) colourless solution, **I**,

(iii) colourless gas, **J**.[3]

(b) Give

(i) the temperature, **X**,

(ii) the pressure, **Y**.[2]

- 5 Fig. 5.1 shows properties of four compounds **K**, **L**, **M** and **N**.

compound	state at 20 °C	approximate boiling point / °C	electrical conductivity of molten compound
K	gas	-25	poor conductor
L	solid	5000	poor conductor
M	solid	1500	good conductor
N	liquid	25	poor conductor

Fig. 5.1

- (a) Particles of solids behave differently from particles of gases.
Give three differences in behaviour.

1.
2.
3.[3]

- (b) Write the letters of **two** compounds in Fig. 5.1 that

(i) are gases at a temperature of 30 °C,
..... and

(ii) consist of simple molecules.
..... and[2]

- (c) (i) Suggest how the atoms are bonded in compound **M** and compound **N**.

M

N [2]

- (ii) Suggest why compound **M** has a higher boiling point than compound **N**.

.....
.....[3]

- 6 (a) Copper(II) sulphate solution acts as a catalyst in the reaction of zinc and dilute sulphuric acid. A gas is produced by the reaction.

(i) What gas is produced?

- (ii) What is meant by a *catalyst*?

.....
.....

- (iii) How will the presence of a catalyst affect the time it takes for the reaction to stop?

.....

- (iv) Give a reason for your answer to **a(iii)** above.

.....[5]

- (b) The apparatus in Fig. 6.1 is used to investigate how changes in temperature affect the activity of the catalyst in the above reaction.

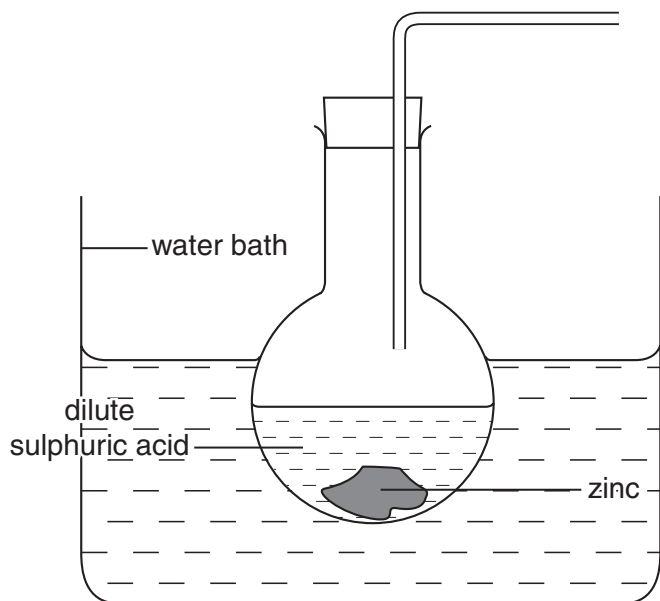


Fig. 6.1

Complete Fig. 6.1 to show how to

- (i) add a solution of the catalyst to the flask,
 (ii) collect the gas being produced and measure its volume. [2]

(c) Why is a water bath needed?

.....[1]

(d) List **three** measurements you would take.

.....

[3]

Section B

Answer any **two** questions.

Write your answers on the lined pages provided and, if necessary, continue on separate answer paper.

- 7** Caesium, lithium, potassium and sodium are all in Group I of the Periodic Table.
- (a) Place these metals in order of reactivity with water, most reactive metal first. [1]
- (b) Name the chemical products of the reactions between lithium and water and between sodium and water. [3]
- (c) (i) What would you expect to **see** if small pieces of caesium were dropped onto water? How would the pH of the resulting solution be different from the pH of water?
- (ii) Write the full chemical equation for the reaction of caesium with water. Include state symbols. [6]
- 8** Magnesium has a proton number of 12 and chlorine has a proton number of 17.
- (a) Explain how and why a magnesium atom forms a magnesium ion and give the symbol for this ion. [6]
- (b) Draw the electronic structure of the compound that results from magnesium combining with chlorine. All electron shells must be shown. [4]

9 (a) Lime is an alkaline substance. Give **two** uses of lime that depend on this property. One of the uses must be in farming. [2]

(b) Fig. 9.1 shows some of the properties of a calcium compound, **O**. The letters are not the chemical symbols of the substances.

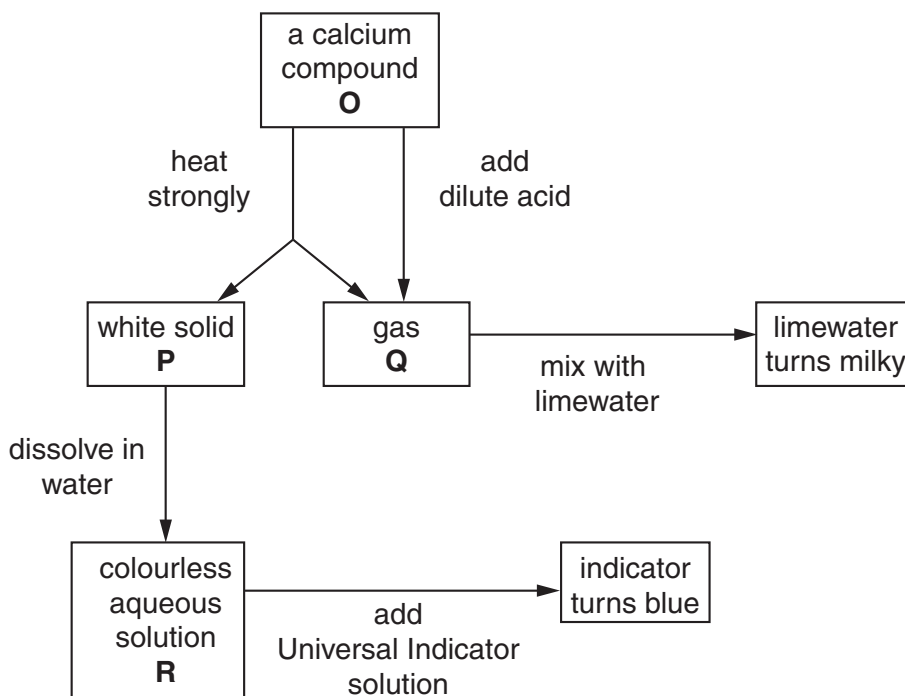


Fig. 9.1

- (i) Suggest the identity of **O**, **P**, **Q** and **R**.
- (ii) Name an acid that could be used to liberate gas **Q** from solid **O**.
- (iii) Write an equation, including state symbols, for any one of the reactions shown in Fig. 9.1. [8]

Ruled writing area with horizontal dashed lines.

A series of 35 horizontal dotted lines spanning the width of the page, intended for writing or calculations.

DATA SHEET
The Periodic Table of the Elements

		Group																						
I	II	III	IV	V	VI	VII	0																	
		1 H Hydrogen 1										4 He Helium 2												
7 Li Lithium 3	9 Be Beryllium 4		12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10																	
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																	
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	51 V Vanadium 23	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	84 Kr Krypton 36												
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	101 Ru Ruthenium 44	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	131 Xe Xenon 54												
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	181 Ta Tantalum 73	190 Os Osmium 76	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	222 Rn Radon 86												
226 Ra Radium 88	227 Ac Actinium 89																							
*58-71 Lanthanoid series																								
†90-103 Actinoid series																								
<table border="1"> <tr> <td>a</td> <td>X</td> <td>b</td> </tr> <tr> <td></td> <td>a = relative atomic mass</td> <td></td> </tr> <tr> <td></td> <td>X = atomic symbol</td> <td></td> </tr> <tr> <td></td> <td>b = proton (atomic) number</td> <td></td> </tr> </table>													a	X	b		a = relative atomic mass			X = atomic symbol			b = proton (atomic) number	
a	X	b																						
	a = relative atomic mass																							
	X = atomic symbol																							
	b = proton (atomic) number																							
140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71													
232 Th Thorium 90	238 Pa Protactinium 91	238 U Uranium 92	238 Pu Plutonium 94	238 Np Neptunium 93	238 Am Americium 95	238 Cm Curium 96	238 Bk Berkelium 97	238 Cf Californium 98	238 Es Einsteinium 99	238 Fm Fermium 100	238 Md Mendelevium 101	238 No Nobelium 102	238 Lr Lawrencium 103											

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).