Centre Number	Candidate Number	Name

CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

SCIENCE **5124/03, 5126/03**

Paper 3 Chemistry

October/November 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 page 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 **11** printed pages.and **1** lined page.

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate
[Turn over

Section A

Answer **all** the questions.

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

1 Give **one** use for each of the substances in Fig. 1.1.

substance	use
calcium carbonate	
chlorine	
hydrogen	
silver salts	
zinc	

Fig. 1.1 [5]

2 Chemical reactions sometimes have names. For example, the complete reaction of an acid with an alkali is called 'neutralisation'.
Fig. 2.1 contains a series of chemical reactions.
Give the names of these reactions.

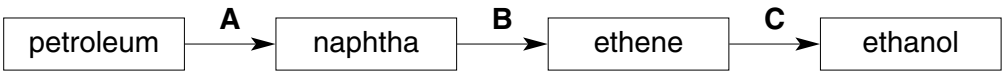

Fig. 2.1

(a) reaction **A** .....

(b) reaction **B** .....

(c) reaction **C** .....

[3]

3 **(a)** Give the number of the Group of the Periodic Table that contains

(i) alkali metals, ...

(ii) halogens. .....

[2]

(b) Group 0 of the Periodic Table contains noble gases. The noble gases are all chemically unreactive.

(i) Complete the table in Fig. 3.1.

name of noble gas	one use of the gas

Fig. 3.1

(ii) Explain why noble gases are chemically unreactive.

.....

.....

[4]

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4 Phosphorus is an element that does not react with water. Phosphorus will react with one of the gases in air, forming an oxide.

A piece of phosphorus is fastened to a copper wire and left for a few days in the apparatus shown in Fig. 4.1. The water slowly rises up the tube.

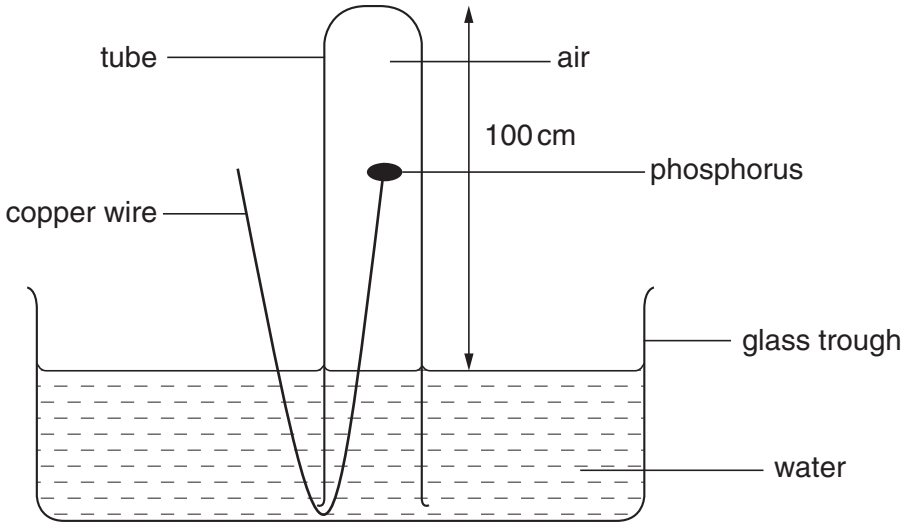


Fig. 4.1

(a) Name the gas, contained in air, that reacts with phosphorus.

..... [1]

(b) Approximately how far up the tube will the water rise?

..... [1]

(c) Name **two** gases that are left in the tube after a few days.

.....

.....[2]

5 Imagine that three metals are transported to Earth by rocket ship from a far distant planet. On the planet the three metals are called beium, ceium and deium.

On Earth the three metals are dropped into water: deium does not react, but beium and ceium do, liberating a gas **T** which 'pops' when lit.

When beium is mixed with dilute sulphuric acid, a solution of beium sulphate is formed.

When ceium is dropped into a solution of beium sulphate, beium is **not** displaced.

(a) (i) Name the gas **T** and the compound formed when it is lit.

name of gas .....

compound formed .....

(ii) Place beium, ceium and deium in order of reactivity, most reactive first.

.....

[3]

(b) Deium could be the same metal as one of Earth's metals.

(i) Name one of Earth's metals that might be the same as deium.

.....

(ii) In the future people on Earth might need to import this metal from the far distant planet. Suggest why this might be necessary.

.....

.....

[2]

6 Three samples of calcium carbonate are placed in flasks for an investigation.
In flask **E** is 5 g of calcium carbonate – large lumps.
In flask **F** is 5 g of calcium carbonate – medium-sized lumps.
In flask **G** is 5 g of calcium carbonate – small lumps.
The same volume, an excess, of dilute hydrochloric acid is added to each flask.
The flasks are placed on three electronic balances.
A datalogger is used to plot the loss of mass of the flasks and their contents against time.
The results are shown in Fig. 6.1.

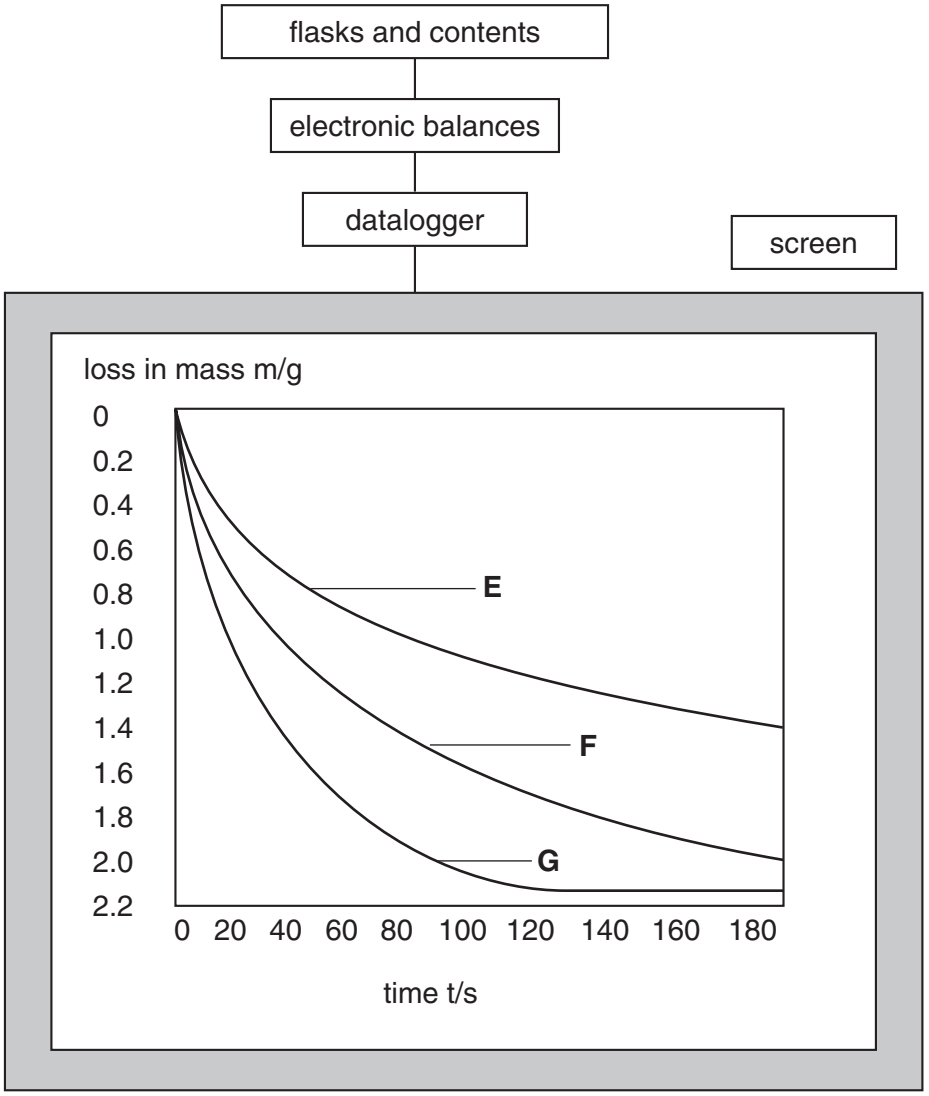


Fig. 6.1

(a) (i) Why do the three flasks and their contents lose mass?

.....

(ii) How do the rates of reaction change with time?

.....

.....

[2]

(b) In which flask is the reaction fastest at time t = 20 s?

..... [1]

(c) **(i)** After how long does the reaction in flask **G** stop?

.....

(ii) Why does this reaction stop?

.....
[2]

(d) Sketch on Fig. 6.1 the curve you would expect if 5 g of powdered calcium carbonate is used instead of 5 g of lumps of calcium carbonate. Label this curve **H**. [2]

(e) What name is given to a reaction in which heat is given out?

..... [1]

7 Some properties of three solids, **I**, **J** and **K** are given in Fig. 7.1. Use this information to complete the last column of the table.

solid	percentage composition by mass	solid conducts electricity	strong heat in oxygen	element or mixture or compound
I	constant	no	decomposes	
J	varies	no	burns	
K	constant	yes	oxidises to one substance	

Fig. 7.1 [3]

8 Fig. 8.1 shows some of the properties of a blue, crystalline solid.

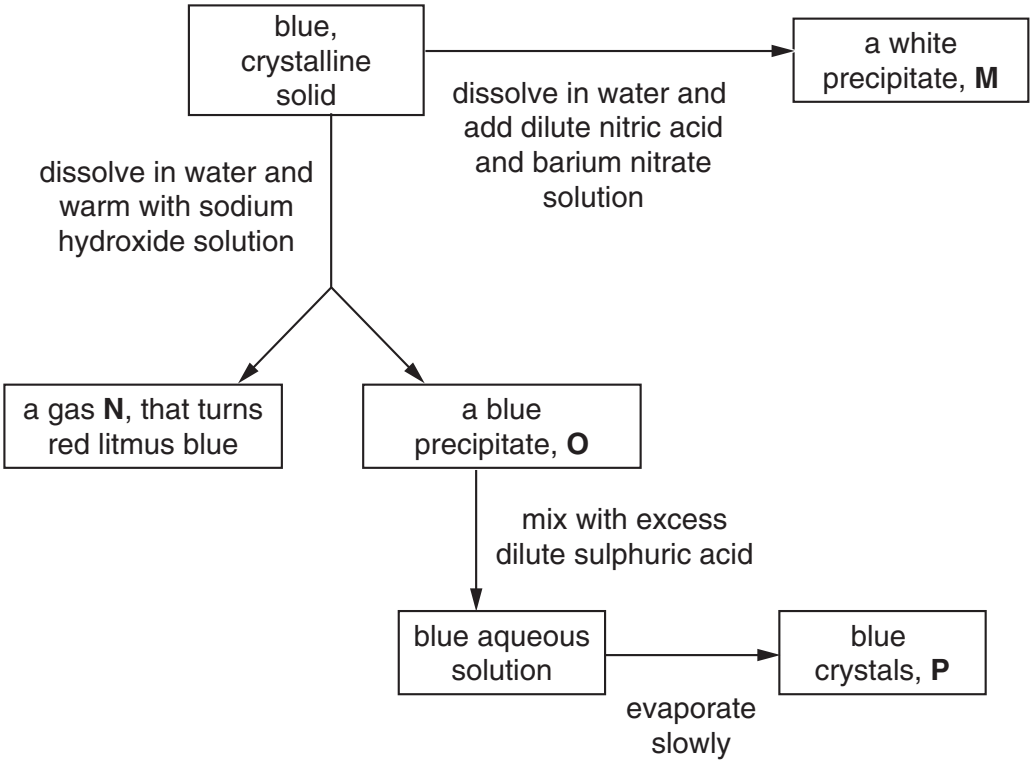


Fig. 8.1

Identify the following.

(a) substance **M** .....

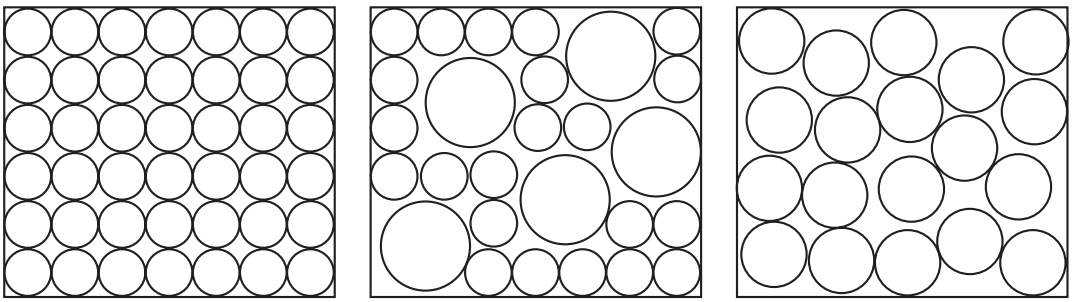
(b) substance **N** .....

(c) substance **O** .....

(d) substance **P** .....

[4]

9 Fig. 9.1 shows the particles in three substances, **Q**, **R** and **S**.



Q **R** **S**

Fig. 9.1

(a) Which of the structures in Fig. 9.1 best represents

(i) solid copper, ...

(ii) brass, ...

(iii) a non-metal? .....

[3]

(b) Use the structures in Fig. 9.1 to help you to suggest why a wire made of an alloy is more difficult to stretch than a wire made of a pure metal.

.....

.....[1]

(c) **(i)** Why do metals conduct heat better than non-metals?

.....

.....

(ii) Give two other differences between metals and non-metals.

.....

.....

[3]

[Turn over

Section B

Answer any **two** questions.

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

10 **(a)** **(i)** Describe how crystalline sugars can be used to produce a solution of ethanol in water. Explain why the temperature must not be allowed to rise above 50 °C.

(ii) Explain why an acid will form in the resulting ethanol solution if it is left open to the air for some time.

[5]

(b) Write the full structural formula for ethanol. Calculate its percentage of carbon by mass. [Relative atomic masses A_r: H,1; C,12; O,16] [5]

11 Sodium hydroxide solution is an alkali and dilute sulphuric acid is an acid.

(a) **(i)** Give **two** properties of all alkalis and **three** properties of all acids.

(ii) What ions cause these properties?

[7]

(b) Sulphuric acid can be neutralised by sodium hydroxide. Write a chemical equation and an ionic equation to represent this neutralisation. [3]

12 **(a)** Define

(i) proton number,

(ii) mass number.

[2]

(b) An element contains atoms of an isotope that has mass number 36 and proton number 16.

(i) Draw diagrams to show the nuclear and electronic structures of an atom of this isotope.

(ii) Identify the element by using the Periodic Table on page 12. Give the element's symbol and the number of the Group in which it appears.

(iii) Decide whether the element is a metal or a non-metal, and explain how you made this decision.

[8]

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											11 B Boron 5	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	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	64 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
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	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
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57 *	178 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	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 †															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

*58-71 Lanthanoid series
†90-103 Actinoid series

Key

a
X
b

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).