

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.



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]

- 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.

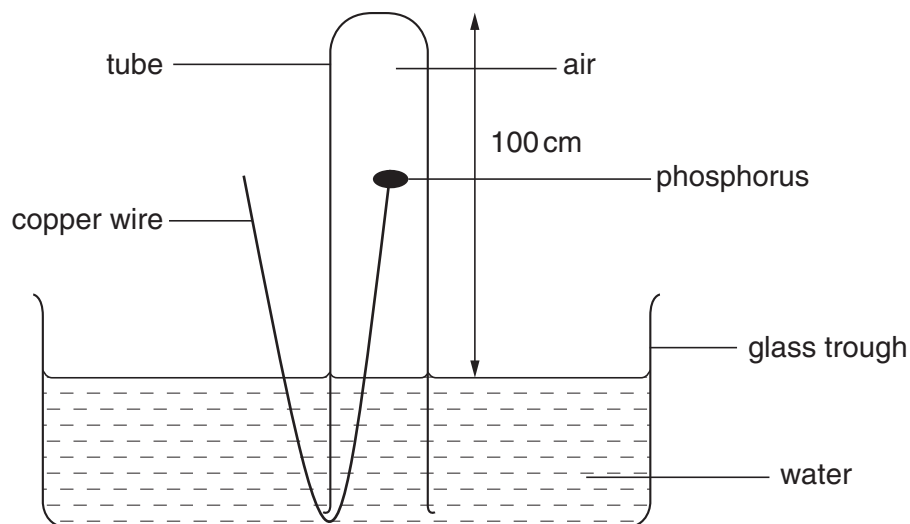


Fig. 4.1

- (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.

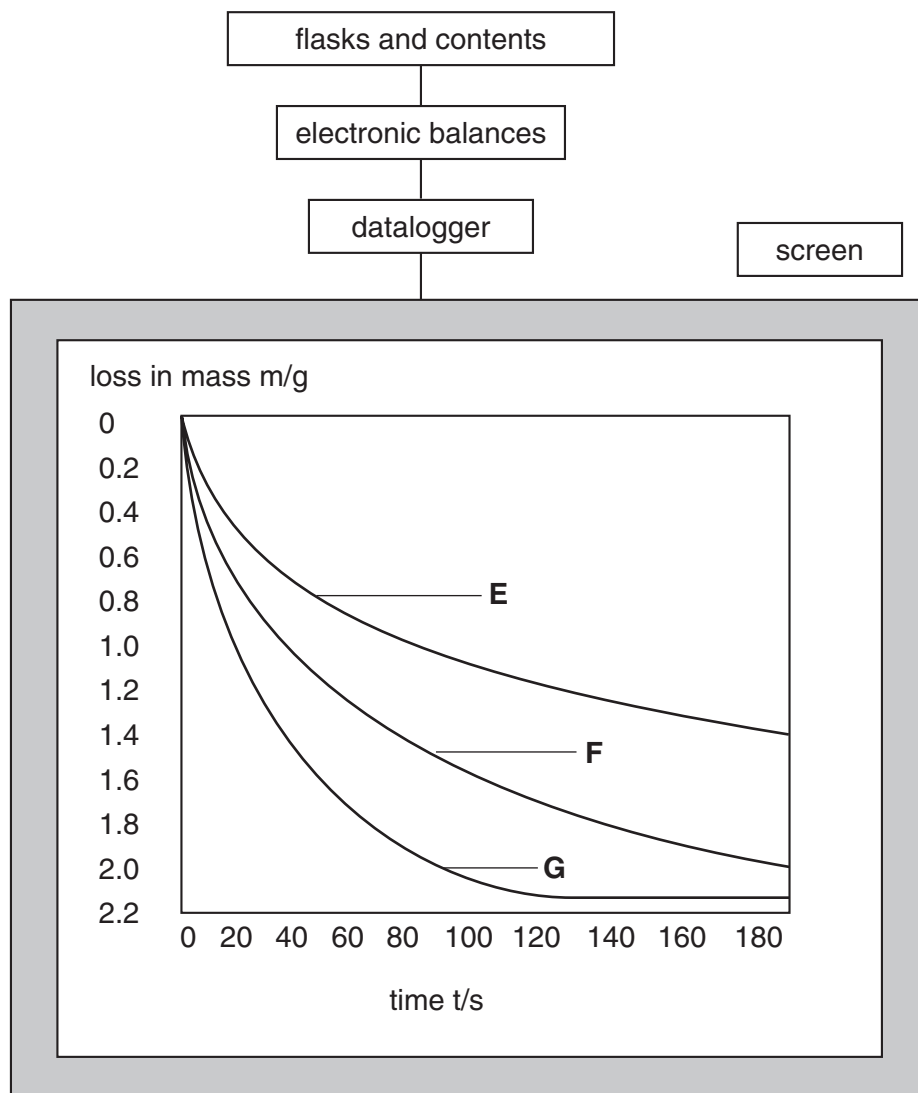


Fig. 6.1

- (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.

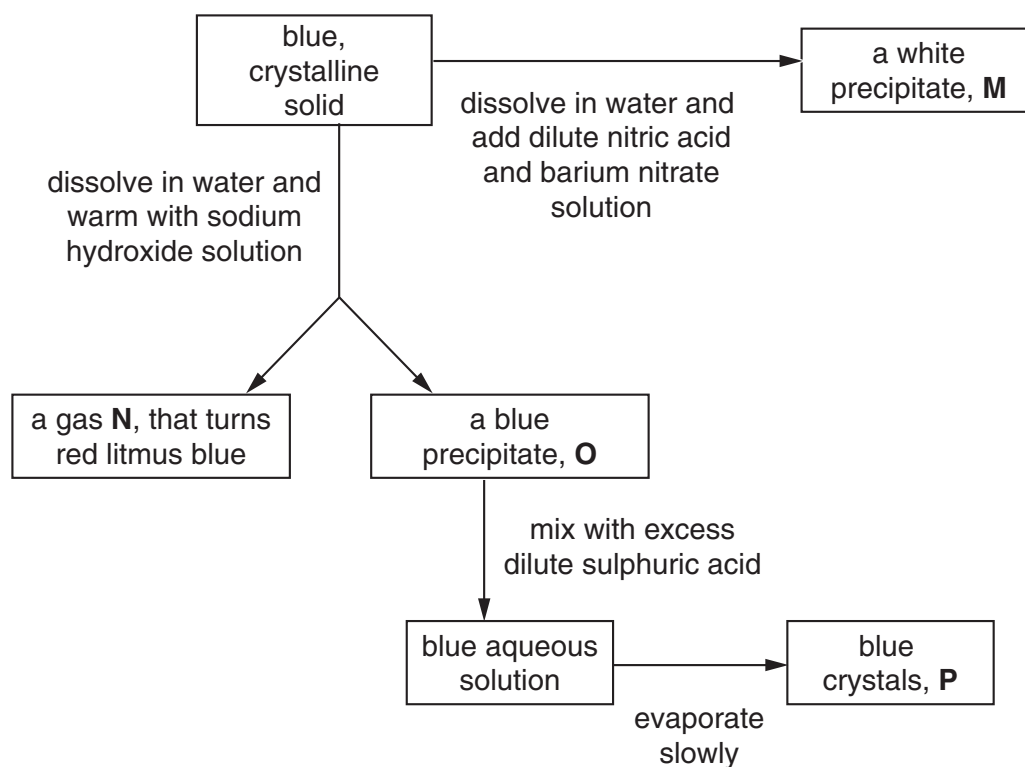


Fig. 8.1

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**.

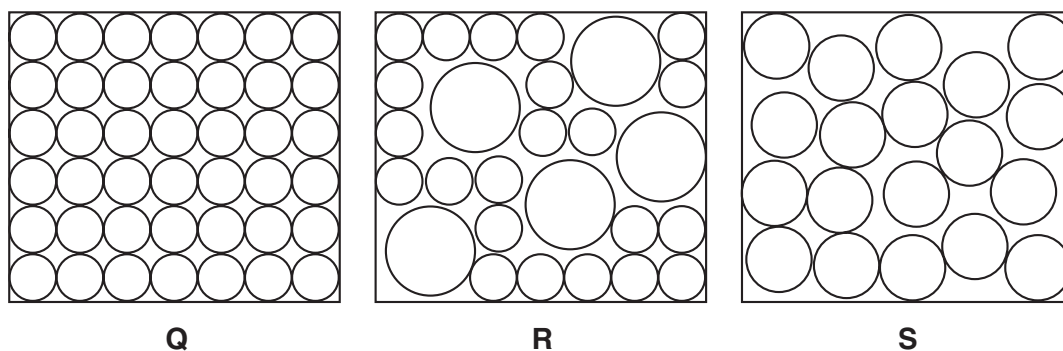


Fig. 9.1

- (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]

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]

5124/03/O/N/03

DATA SHEET

Group

I	II											III	IV	V	VI	VII	O	
		1 H Hydrogen																4 He Helium
7 Li Lithium	9 Be Beryllium																	20 Ne Neon
3	4																	10
23 Na Sodium	24 Mg Magnesium																	18
11	12																	17
39 K Potassium	40 Ca Calcium	45 Sc Scandium	48 Ti Titanium	51 V Vanadium	52 Cr Chromium	55 Mn Manganese	56 Fe Iron	59 Co Cobalt	59 Ni Nickel	64 Cu Copper	65 Zn Zinc	70 Ga Gallium	73 Ge Germanium	75 As Arsenic	79 Se Selenium	80 Br Bromine	84 Kr Krypton	
19	20	21 Y Yttrium	22 Zr Zirconium	23 Nb Niobium	24 Mo Molybdenum	25 Tc Technetium	26 Ru Ruthenium	27 Rh Rhodium	28 Pd Palladium	29 Ag Silver	30 Cd Cadmium	31 In Indium	32 Sn Tin	33 Sb Antimony	34 Te Tellurium	35 I Iodine	36 Xe Xenon	
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
85 Rb Rubidium	88 Sr Strontium	89 Y Yttrium	91 Zr Zirconium	93 Nb Niobium	96 Mo Molybdenum	101 Ru Ruthenium	103 Rh Rhodium	106 Pd Palladium	108 Ag Silver	112 Cd Cadmium	115 In Indium	119 Sn Tin	122 Sb Antimony	127 I Iodine	131 Xe Xenon	136 Kr Krypton	137 Xe Xenon	
55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	
133 Cs Caesium	137 Ba Barium	139 La Lanthanum	178 Hf Hafnium	181 Ta Tantalum	184 W Tungsten	186 Re Rhenium	190 Os Osmium	192 Ir Iridium	195 Pt Platinum	197 Au Gold	201 Hg Mercury	204 Tl Thallium	207 Pb Lead	209 Bi Bismuth	210 Po Polonium	210 At Astatine	222 Rn Radon	

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

232	Th Thorium	238	U Uranium	92	Pa Protactinium	91	Th Thorium	90
94	Pu Plutonium	93	Np Neptunium	94	Pu Plutonium	95	Am Americium	96
97	Bk Berkelium	96	Cm Curium	97	Bk Berkelium	98	Cf Californium	99
100	Fm Fermium	101	Md Mendelevium	102	No Nobelium	103	Lr Lawrencium	104

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