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	Give the number of the Group of the Periodic Table that contains								
		(i)	) alkali metals,								
		(ii)	i) halogens								
	(b)		up 0 of the Periodic Table active.	contains noble gases. The noble gases are all chemically							
		(i)	(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.

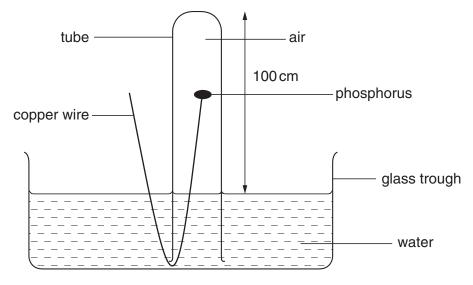


Fig. 4.1

(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 <b>two</b> gases that are left in the tube after a few days.	
		[2]

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 <b>T</b> 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					
		į s	וי				
(b)	Dei	um 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 distarplanet. Suggest why this might be necessary.	nt				

[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.

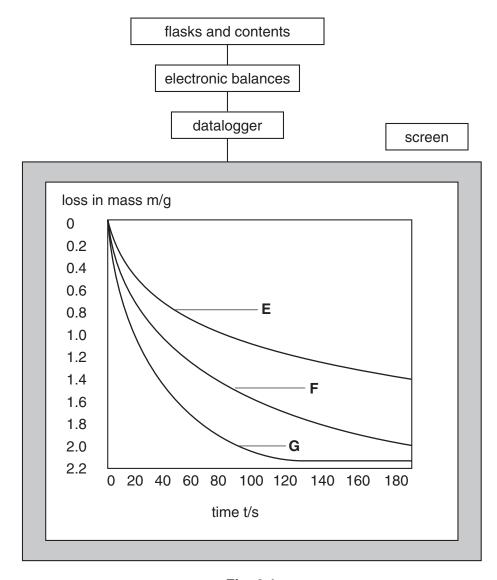


Fig. 6.1

(a)	(a) (i)	Why do the three flasks and their contents lose mass?	
	<b></b>		
	(ii)	How do the rates of reaction change with time?	
			[2]

(b)	In w	which flask is the reaction fastest at time t = 20 s?	
			[1]
(c)	(i)	After how long does the reaction in flask <b>G</b> stop?	
	(ii)	Why does this reaction stop?	
			 [2]
			[4]
(d)		etch on Fig. 6.1 the curve you would expect if 5 g of powdered calcium carbonated dinstead of 5 g of lumps of calcium carbonate. Label this curve <b>H</b> .	is [2]
(e)	Wh	at 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
ı	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.

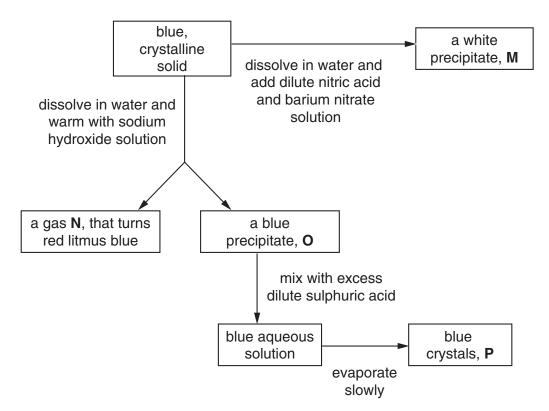


Fig. 8.1

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.

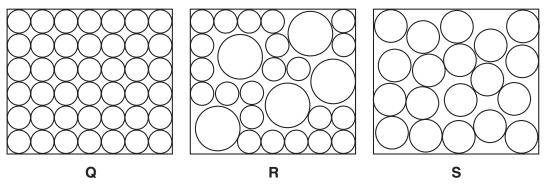


Fig. 9.1

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

(i)	solid copper.	

(ii) brass, .....

(iii) a non-me	al?
----------------	-----

[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.

[4]
 [1]

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

• • • •	 	 	• • • • • • • • • • • • • • • • • • • •	 •	

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

#### 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]

[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]
- 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

		0	4 <b>H</b>	Helium 2	20	Ne	Neon 10	40	Ar	Argon 18	84	ž	Krypton 36	131	Xe	Xenon 54		R	Radon 86				
		IIA			19	ш	Fluorine 9		C	1	80	Ā	Bromine 35		Ι	lodine 53		Αt	Astatine 85				
		IN			16	0	Oxygen 8	32	S	Sulphur 16	79	Se	Selenium 34	128	<u>e</u>	Tellurium 52		Ъ	Polonium 84				
		>			14	z	Nitrogen 7			Phosphorus 15		As	Arsenic 33	122	Sb	Antimony 51	509	Ξ	Bismuth 83				
		>			12	ပ	Carbon 6		Si	Silicon 14		ge Ge	Germanium 32	119	Sn	Tin 50	207	Pb	Lead 82				
		=			Ξ	Δ	Boron 5	27	Ν	Aluminium 13	70		Gallium 31	115	In	Indium 49	204	11	Thallium 81				
S												Zu	Zinc 30	112	ဦ	Cadmium 48	201	Hg	Mercury 80				
The Periodic Table of the Elements											64	J O	Copper 29	108	Ag	Silver 47	197	Αn	Gold 79				
e or the	dn										59	Z	Nickel 28	106	Pd	Palladium 46	195	풉	Platinum 78				
aic i abi	Group										69	ပိ	Cobalt 27	103	몺	Rhodium 45	192	ŀ	Iridium 77				
le Perio			- <b>I</b>	Hydrogen 1							56	Бe	Iron 26	101	Bu	Ruthenium 44	190	Os	Osmium 76				
-					J						55	Mn	Manganese 25		ဥ	Technetium 43	186	Be	Rhenium 75				
											25	ဝံ	Chromium 24	96	Mo	Molybdenum 42	184	>	Tungsten 74				
											51	>	Vanadium 23	93	Q N	Niobium 41	181	Та	Tantalum 73				
											48	F	Titanium 22	91	Ż	Zirconium 40	178	Ξ	Hafnium 72				
											45	Sc	Scandium 21	89	>	Yttrium 39	139	Гa	Lanthanum 57 *	227	Ac	Actinium 89 †	
		=			6	Be	Beryllium 4	24	Mg	Magnesium 12	40	Ca	Calcium 20	88	Š	Strontium 38	137	Ва	Barium 56	226	Ва	Radium 88	
		_			7	=	Lithium 3	23	Na	_	39	¥	Potassium 19	85	ВВ	Rubidium 37	133	Cs	Caesium 55		ř	Francium 87	
ı					-							5	5124/0	3/0/1	N/03								-

87	88	4 68												
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100+	30-7 I Laminandiu sene. FOO 102 Antinoid corioc	iold series	ဝီ	Ā	PZ	Pm	Sm	Eu	gg		D	운	ш	T
-08	OS ACIIIIC	id selles		Praseodymium 59	Œ	Promethium 61	Samarium 62	Europium 63	Gadolinium 64	Terbium 65	Dysprosium 66	67	Erbium 68	Thulium 69
	В	a = relative atomic mass	232	3	238		}	3			3		3	3
Key	×	X = atomic symbol	드	Ра	⊃	Np	Pu	Am	Cm		ర	Es		Md
	Q	b = proton (atomic) number	Thorium 90	Protactinium 91	Uranium 92	Neptunium 93	Plutonium 94	Americium 95	Curium 96	Berkelium 97	Californium 98	Einsteinium 99	Fermium 100	Mendeleviu 101

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

Lr Lawrencium 103

175 **Lu** Lutetium