Name

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CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

COMBINED SCIENCE

0653/03

Paper 3

October/November 2003

1 hour 15 minutes

Candidates answer on the Question Paper. No Additional Materials are required.

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 in the spaces provided on the Question Paper. You may use a soft pencil for any diagrams, graphs or rough working. Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer all questions.

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 16.

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 Exam	iner's Use
1	
2	
3	
4	
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6	
7	
8	
9	
10	
TOTAL	

(a) Fig. 1.1 shows some information about three enzymes which act in the human and system.

Fig. 1.1 shows so system.	ome information about tl	2 nree enzymes which ad	et in the human di	For Examiner's Use
enzyme	substance which the enzyme digests	substance which is produced	place where the enzyme works	Se. COM
	starch	sugar (maltose)	mouth and small intestine	
lipase		fatty acids and glycerol	small intestine	
protease	proteins			

Fig. 1.1

Complete the table by writing the appropriate word or words in each of the four spaces.

(b) Seeds and fruits are important sources of nutrients for many animals, including humans. Many seeds and fruits contain sugar, starch and protein. Explain how the presence of these nutrients can help the seeds or fruits to be dispersed to new areas.[2] (ii) Describe how you would test a seed for the presence of protein, and state what you would see if the test was positive.

- 2 (a) Fig. 2.1 shows an observer's eye looking at a lamp in a mirrror.
- www.PapaCambridge.com (i) On Fig. 2.1, draw a ray of light to show how the observer is able to see the lamp the mirror.

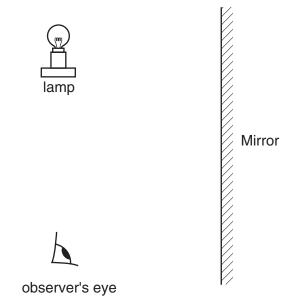


Fig. 2.1

On Fig. 2.1 show the position of the image.

[2]

[3]

- (b) Light waves and radio waves are both parts of the electromagnetic spectrum.
 - State **one** property that is the same for both of these waves. (i)

(ii) State **one** property that is different for each of these waves.

www.PapaCambridge.com Fig. 3.1 shows a blast furnace which is used to extract iron from iron ore. Iron ore 3 containing iron(III) oxide.

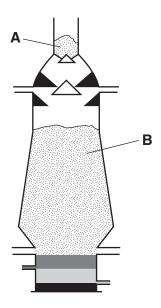


Fig. 3.1

(a) (i)	Iron ore and coke are added to the furnace at ${\bf A}$. Name the other raw material that is added at ${\bf A}$.
	[1]
(ii)	Iron(III) oxide is reduced to iron at B .
	Write a word equation for the reaction at B .
	[2]
(iii)	Explain why iron(III) oxide is said to be <i>reduced</i> in this reaction.
	[1]
(b) (i)	The chemical formula of iron(III) oxide is Fe_2O_3 . The formula of the oxide ion is O^{2-} . Deduce the formula of the iron ion. Show how you obtained your answer.
	[2]

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(ii) Calculate the relative formula mass of iron(III) oxide. Show your working.

.....[2]

A student investigated the effect of temperature on the transpiration rate of potted pla

www.papaCambridge.com She took three similar plants growing in pots, and added the same volume of water to soil in each pot. Then she fastened a transparent polythene bag around each one. For plants A and B, the bag covered the pot only. For plant C, the bag covered the pot and also the plant, as shown in Fig. 4.1.

Plants **A** and **C** were left in a room kept at 20°C. Plant **B** was left in a room kept at 10°C.

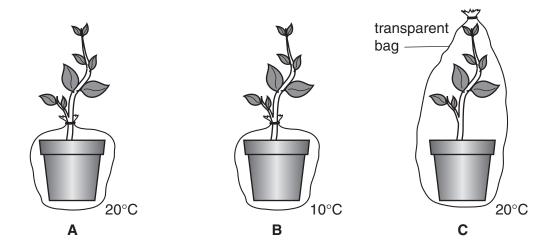
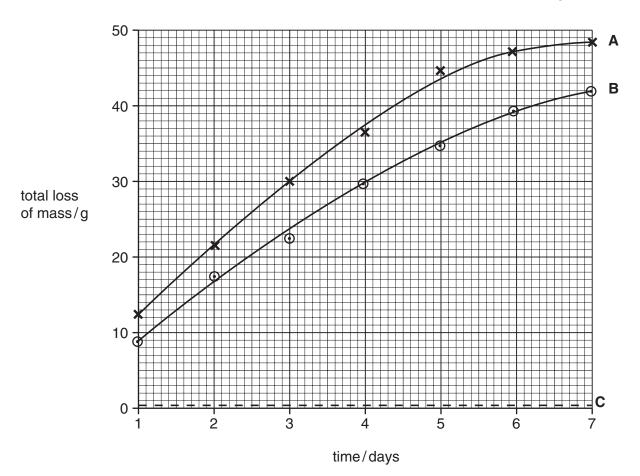


Fig. 4.1

Each plant was placed on a balance and its mass was recorded at the same time each day for one week. The loss of mass was then calculated. The results are shown in Fig. 4.2.



(a)	(i)	Suggest one factor which should have been the same in the two rooms, is sure that the student's results were valid. [1] Explain why the polythene bags needed to be transparent.	1
	(ii)	Explain why the polythene bags needed to be transparent.	COL
		[2]	
(b)	(i)	Explain why plants A and B lost mass, but plant C did not.	
	(ii)	Explain why plant A lost more mass than plant B .	
		[3]	
	(iii)	The conditions in the two rooms were kept constant throughout the experiment. Suggest why plant A lost mass more slowly towards the end of the week.	
		[2]	

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5 Liquid water may freeze into solid ice on a cold night but may evaporate into water val a hot day.

Explain in terms of particles how water can be found as ice, liquid water or water vapour under these different conditions.

You may wish to use diagrams in your answer. Your answer must refer to

- the motion of the particles,
- the separation of the particles,
- the forces between the particles.

[5]
[৩]

Most of the compounds in petroleum (crude oil) are hydrocarbons but some 6 compounds are also present.

www.PapaCambridge.com (a) (i) Write a word equation for the complete combustion of the hydrocarbon, methane.

		[2]
	(ii)	Explain how sulphur compounds may cause damage to the environment if they are not removed from petroleum.
		[3]
(b)		ne hydrocarbons are cracked to form smaller molecules such as ethene which tains a double bond.
	Des	scribe how a hydrocarbon is tested to find out whether it contains a double bond.
		[2]
(c)	Fig.	6.1 shows the displayed formula of a small part of a molecule of poly(ethene).
		H H H H H H H H H H H H H H H H H H H

Fig. 6.1

(1)	poly(ethene) molecule.
	[1]
(ii)	Explain your answer to (i).

7 Fig. 7.1 shows two beakers **A** and **B**, both full of water.

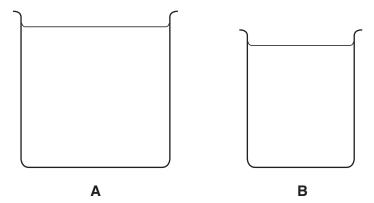


Fig. 7.1

(a) (i) When both beakers are full of water, beaker A has twice the weight of beaker B. What can be said about the masses of the two beakers when they are full of water?

Explain your answer.	
	[2]

(ii) Fig. 7.2 shows the two beakers balanced on a thin beam.

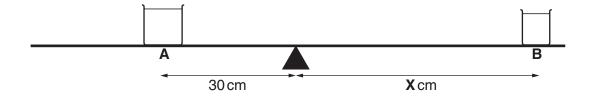


Fig. 7.2

What is the value of X?	
Explain your answer.	
	•••
	2

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(b) Fig. 7.3 shows a conical flask and a drinking glass, both full of water.

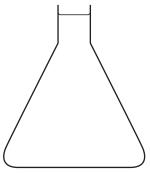




Fig. 7.3

- (i) Label each container with a **C** to show the approximate centre of mass in each one.
- (ii) Explain why it is more difficult to tip over the conical flask than the drinking glass. You may draw diagrams if it helps your answer.

••••••	 	
	 	 [2

8

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	on bulb is cut open, it can be seen to be made of several different layers. Early thin 'skin' covering its inner surface. This skin is called an <i>epidermal tissue</i> . at is the term that is used to describe a structure such as an onion bulb, which is de of several tissues grouped together?
The	outline shows the shape of a plant cell in the epidermal tissue of an onion bulb.
(i)	In the space below, draw a diagram to show how at least six of these cells are grouped together to form the epidermal tissue.
	[3]
(ii)	State one way in which a cell in onion epidermal tissue differs from a cell in the palisade mesophyll of a leaf. Explain the reason for this difference.
	difference
	reason for this difference

9	The	pH v	alues o	of thre	e acidio	solu	tions	are sho	own bel	OW.					oca,
			gar on juice ery acid		4 3 1										acambi.
	(a)	The	formula	a of th	ne ion p	resen	t in al	l acids	is H ⁺ .						
		(i)	Which	of the					contains						
		(ii)	Write a	an ion	ic equa	tion w	/hich	describ	oes the i	neutra	lisatior	n of an	y acid b	y any a	lkali.
	(b)				arbona	te is	adde	ed to c	dilute hy	/droch	loric a	acid, th			
					ord equa				nd a gas	s is giv	en oπ.				
hy	drocl aci	hloric d	+		odium bonate	_	-			+			+		·
			_												[3]
	(c)	Сор	per(II)	oxide	is an in	solub	le bas	se.							
			cribe h e sulph			f cop	per(II) sulph	nate cou	ld be	made	from c	opper(II	() oxide	and
				•••••								•••••	•••••		
				•••••											
															[4]

10	Rac	lon is a gas that emits alpha radiation.	Use
	(a)	Explain why alpha radiation is dangerous to human beings.	Use
			SE.COM
		[2]	
	(b)	Explain why alpha radiation is affected by an electric field.	
		[2]	
	(c)	Describe the differences in the structure of the nucleus of a radon-220 atom before and after the emission of an alpha particle.	

.....[2]

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	Elements
DATA SHEET	The Periodic Table of the

						<u> </u>	he Perio	dic lab	The Periodic Table of the Elements	Elemen	ts						
								Gre	Group								
_	=											=	≥	>	>	IIA	0
							-:										4
							Hydrogen										Helium
7	6											£	12	14	16	19	20
=	Be											ш	ပ	z	0	ш	Ne
Lithium 3	Beryllium 4											Boron 5	Carbon 6	Nitrogen 7	Oxygen 8	Fluorine 9	Neon 10
23	24											27	28	31	32		40
Na	Mg											Αl		۵	တ	10	Αľ
Sodium 11	Magnesium 12											Aluminium 13	Silicon 14	Phosphorus 15	Sulphur 16	Chlorine 17	Argon 18
39	40	45	48	51	52	55	56	29		64		70	73	75	62	88	84
¥	Ca	Sc	F	>	င်	Mn	Рe	ပိ		చె	Zu	Са	Ge	As	Se		ž
Potassium 19	Calcium 20	Scandium 21	Titanium 22	Vanadium 23	Chromium 24	Manganese 25		Cobalt 27	Nickel 28	Copper 29	Zinc 30	Gallium 31	Germanium 32	Arsenic 33	Selenium 34	Bromine 35	Krypton 36
85	88	88	91	86	96			103	106	108	112	115	119	122	128		131
	Š		Zr	Q N	Mo	ည		絽	Pd	Ag	ප	٦	Sn		Тe	Ι	Xe
Rubidium 37	Strontium 38	Yttrium 39	Zirconium 40	Niobium 41	Molybdenum 42	Technetium 43	n Ruthenium 44	Rhodium 45	Palladium 46	Silver 47	Cadmium 48	Indium 49	Tin 50	Antimony 51	Tellurium 52		Xenon 54
133	137	139	178	181	184	186		192	195	197	201	204	207	209			
Cs	Ва	Ľ	Ξ	ц	>	Re	SO.	Ļ	풉	Αn	Нg	11	Pb	Ξ	Ъ		R
Caesium 55	Barium 56	Lanthanum 57 *	Hafnium 72	Tantalum 73	Tungsten 74	Rhenium 75	Osmium 76	Iridium 77	Platinum 78	79	Mercury 80	Thallium 81		Bismuth 83	Polonium 84	Astatine 85	Radon 86
	226	227															
Ľ,	Ba	Ac															
Francium 87	Radium 88	Actinium 89 †															
*58-71	*58-71 Lanthanoid series	Series		140	141			150	152	157	159	162	165	167	169	173	175
+90-103	+90-103 Actinoid series	oci ico		ပီ	ቯ	Š	Pm	Sm		В	Q L	Dy	운	ш	Ę		Γn
201-00	מ מונים מינים	0 0		Cerium 58	Praseodymium 59	Neodymium 60	Promethium 61	Samarium 62	Europium 63	Gadolinium 64	Terbium 65	Dysprosium 66	Holmium 67	Erbium 68		_	Lutetium 71
									Т			1					

Pr Nd	1			20		162		167	169	173	175
	E	Sm	Eu	Gd	Q L	D	운	ш	T	Λ	ב
Praseodymium Neodymium 60	Promethium 61	Samarium 62	Europium 63	Gadolinium 64	Terbium 65	Dysprosium 66	, ,	Erbium 68	Thulium 69	Ytterbium 70	Lutetium 71
238											
Pa	Š	Pa	Am	E O	益	ర		Fa	Š	2	تـ
Jranium	eptrunium	Plutonium 94	Americium 95	Curium 96	Berkelium 97	Californium 98	Einsteinium 99	Fermium 100	Mendel 101	Nobelium 102	Lawrencium 103
o co		94	95	96	97	98		100	101	102	9 2
nium	U	Neptunium	U Np Pu Jranium Neptunium Plutonium 93 94	U Np Pu Jranium Neptunium Plutonium 93 94	U Np Pu Am Jranium Neptunium Plutonium Americium	U Np Pu Am Cm Jranium Neptunium Plutonium Americium Curium 93 94 95 96	U Np Pu Am Cm Bk Jranium Neptunium Plutonium Americium Curium Berkelium 93 94 95 96 97	U Np Put Am Cm Bk Cf Es Jranium Neptunium Plutonium Americium Curium Berkelium Catifornium Einsteinium 93 94 95 96 97 98 99	U Np Put Am Cm BK Cf ES Fm Jranium Neptunium Plutonium Americium Curium Berkelium Californium Ensteinium Fermium 93 94 95 96 97 98 99 100	U Np Put Am Cm BK Cf Es Fm Mn Jranium Neptunium Plutonium Americium Curium Berkelium Californium Einsteinium Fermium Mendeli 93 94 95 96 97 98 100 101	U Np Pu Am Cm BK Cf Es Fm Jranium Neptunium Plutonium Americium Curium Berkelium Catfornium Finsteinium Fermium 93 94 95 96 97 98 99 100

Key

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