

Cambridge International Examinations

Cambridge International General Certificate of Secondary Education

COMBINED SC Paper 3 (Extend	October/I	0653/33 November 2014
CENTRE NUMBER	CANDIDATE NUMBER	
CANDIDATE NAME		

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.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO **NOT** WRITE IN ANY BARCODES.

Answer all questions.

Electronic calculators may be used.

You may lose marks if you do not show your working or if you do not use appropriate units.

A copy of the Periodic Table is printed on page 24.

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.

This document consists of **24** printed pages.



1 hour 15 minutes

- 1 (a) A student performs some experiments to find out what makes iron rust.
 - (i) Fig. 1.1 shows his first experiment.

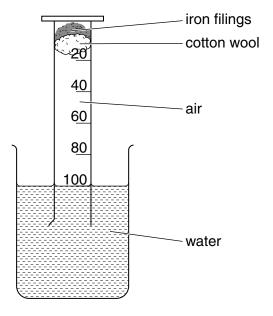


Fig. 1.1

Fig. 1.2 shows the apparatus after one week. The iron has rusted and the water has risen up the cylinder.

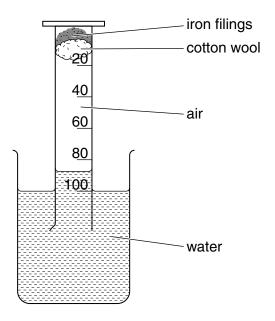


Fig. 1.2

Explain why the water has risen up the cylinder.

(ii) The student repeats the experiment using helium in the cylinder instead of air.

Fig. 1.3 shows the results after one week.

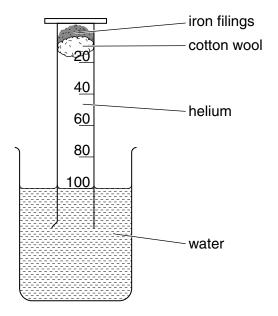


Fig. 1.3

The iron has	not rusted	and the	water ha	s not riser	n up the	cylinder.

Explain why the water has not risen up the cylinder.

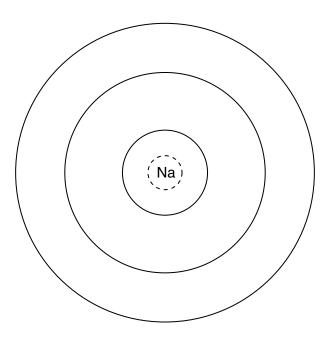
_____[1]

	/L	The			:	h:-		امم	
1	u	, ine	student	writes	ш	HIS	noteb	OOK	١.

"When sodium burns in chlorine it forms ions that are like neon atoms."

(i)	State two similarities in the arrangement of electrons in a sodium ion and a neon atom
	The Periodic Table on page 24 may help you to answer this question.
	1
	2
	[2

(ii) Complete the diagram of the electronic structure of a sodium atom.



(iii)	Describe what happens when a sodium atom becomes a sodium ion.
	[1]
(iv)	Some sodium chloride is dropped into a container filled with chlorine.
	Predict whether or not the sodium ions in sodium chloride would react with chlorine atoms .
	Explain your answer.
	[1]

[1]

(c)	Name a noble gas.
	State and explain a use for this noble gas.
	name

explanation

2 (a) Fig. 2.1 shows a man paddling a canoe across a lake.

The man is paddling hard to gain speed from rest.

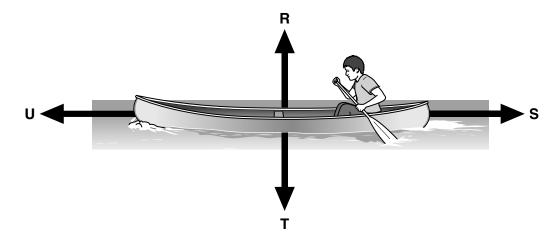


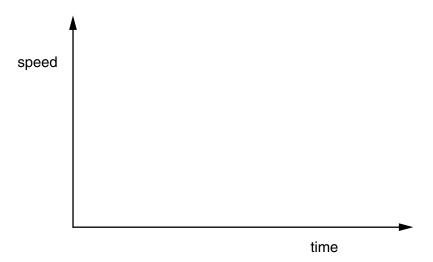
Fig. 2.1

(i)	State two forces from R , S , T and U that are equal and opposite.	
	and	[1]
(ii)	Explain which force from ${\bf R},{\bf S},{\bf T}$ and ${\bf U}$ is the result of a gravitational field acting on combined mass of the canoe and man.	the

(iii) The canoe moves across the lake from rest to maximum speed with decreasing acceleration, then continues across the lake at a constant speed.

.....[2]

Sketch a speed/time graph for this journey.



[3]

(b)	The man's energy is transferred to the canoe as it gains speed.
	The kinetic energy gained by the canoe is less than the energy transferred from the man.
	The principle of energy conservation applies to these energy transfers.
	State what happens to the man's energy that is not transferred into kinetic energy of the canoe.
	[1]
(c)	The man paddles the canoe at a steady speed of 2m/s.
	The canoe and man together have a mass of 250 kg.
	Calculate the kinetic energy of the canoe.
	State the formula you use and show your working.
	formula
	working
	kinetic energy = J [2]

3 (a) Fig. 3.1 shows a diagram of the uterus in a pregnant female.

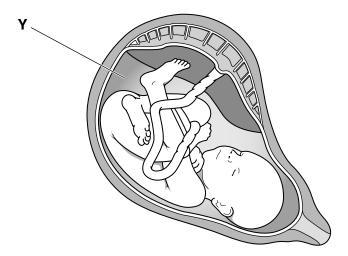


Fig. 3.1

(i)	Using label lines, label the placenta and cervix on Fig. 3.1.	[2]
(ii)	Complete the sentences using words or phrases from the list.	

You may use each word or phrase once, more than once or not at all.

	bacteria	carbon dioxide	cells	glucose	viruses	
	The placenta	allows dissolved nutrie	ents such as		to pass	through
	to the baby. C	Other small molecules	s such as .		are also	able to
	pass through	the placenta.				[2]
(iii)	Name the liqu	uid found at position Y	and state its	s function.		
	name					
	function					
						[2]

- **(b)** Some of the nutrients that pass through the placenta result from the chemical digestion of large food molecules in the digestive system of the mother.
 - (i) Complete Table 3.1 with ticks (\checkmark) and crosses (X) to predict whether the digesting enzymes amylase (starch-digesting enzyme) and protease (protein-digesting enzyme) are active in the parts of the digestive system shown.

Table 3.1

type of enzyme	in the small intestine	in the large intestine		key
amylase				√ = enzyme active
protease				X = enzyme inactive
(ii) Exp	lain your answers to part	(b)(i).		[2]
				[2]
(c) The hum	an immunodeficiency vir	us (HIV) can be transmi	tted through	sexual intercourse.
Describe	how HIV affects the imm	nune system.		

4 Fig. 4.1 shows an electric hairdryer that uses mains electricity.



Fig. 4.1

A heater inside the hairdryer warms the air. A fan blows the warm air out of the hairdryer.

(a) The hairdryer contains a switch, a heater to warm the air and an electric motor to drive the fan. The heater and the motor are connected in parallel.

Fig. 4.2 shows the circuit symbols for a heater and an electric motor.



Fig. 4.2

Complete the circuit diagram for the hairdryer. The circuit has been started for you.

mains electricity supply ---0 \sim 0----

(b)	The flow of warm air dries the wet hair by evaporation.
	Describe in terms of molecules how the flow of warm air speeds up the drying of wet hair.
	[3]

[2]

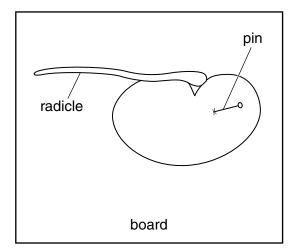
(c)	If th	ne heated air was not blown out s	ideways by a	fan, it would simply move upwards.
	Exp	plain why heated air rises.		
	•••••			[2]
(d)	Fig.	. 4.3 shows information on a labe	I fixed to the	hairdryer.
			220V	
			1100W	
			Fig. 4.3	
	(i)	State the name of the unit whos	se symbol is \	V.
				[1]
	(ii)	Use the formula $P = IV$ to show	that the curr	ent in the hairdryer when in use is 5 A.
		Show your working.		

(e)		plug on the lead of dryer is being used.	the hairdryer is f	itted with a f	use. One day, the	e fuse blows wh	ile the					
	(i)	Give one possible c	ause for the fuse	blowing.								
							[1]					
	(ii)	The fuse has to be r	eplaced.									
	The current through the hairdryer when in use is 5A. Several new fuses volume current ratings are available.											
		2A	5 A	10 A	15 A							
		Explain which of these four fuses should be used.										
		Fuse	because									
							[2]					

5 (a) A student investigates the effect of gravity on the growth of a seedling.

The student germinates a seed. When the radicle is clearly visible, he pins the seedling to a board, as shown in Fig. 5.1 (a). He positions the board on its side so that the radical is horizontal.

The radicle continues to grow and curves downwards, as shown in Fig. 5.1 (b).



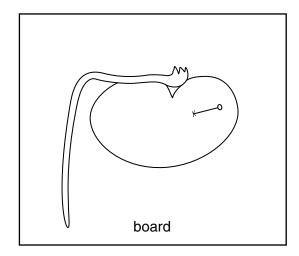


Fig. 5.1 (a)

Fig. 5.1 (b)

(i)	Name the growth response shown by the seedling.
	[1]
(ii)	Explain why this growth response is an advantage to the seedling.
	[2]

(b) Fig. 5.2 shows a diagram of a radicle similar to the one in Fig. 5.1 (a). The shaded area shows the location of hormones that cause the response in (a)(i).

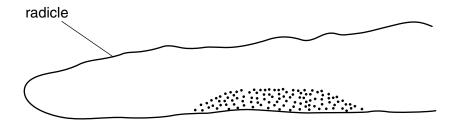


Fig. 5.2

	Des	cribe fully how the hormones act to cause the response shown by the radicle.
		[2]
(c)	Roo	ts usually get their energy from aerobic respiration.
	The	soil around a seedling becomes waterlogged so there are no air spaces.
	(i)	Suggest how this affects the rate of aerobic respiration.
		Explain your answer.
		[1]
	(ii)	Predict and explain the effect this will have on the rate of growth of the seedling.
		[1]

Question 6 begins on page 16

- 6 Dilute hydrochloric acid reacts with calcium carbonate to produce carbon dioxide gas.
 - (a) Complete the word equation for the reaction.

(b) Fig. 6.1 shows the apparatus a student uses to investigate the effect of changing the initial temperature of the acid on the rate of reaction.

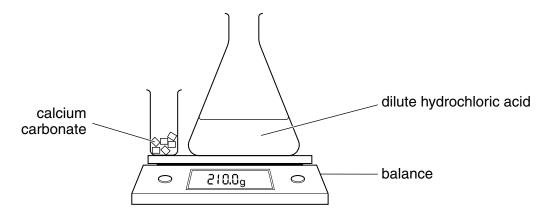


Fig. 6.1

The student adds the calcium carbonate to excess acid at a temperature of 20 °C.

She records the reading of the balance every minute for 7 minutes.

Fig. 6.2 shows the results obtained in the first experiment.

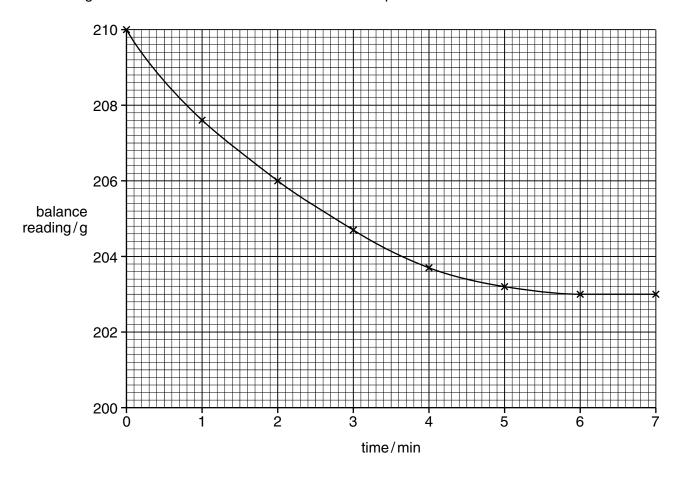


Fig. 6.2

(i)	Explain why the mass of the apparatus decreases during the experiment.	
		[1
(ii)	Describe and explain how the rate of reaction changes during the experiment.	-
		[3

(c)		experiment is repeated with the same mass of calcium carbonate and excess acid at a perature of 30 $^{\circ}\text{C}.$
	(i)	Use the information from Fig. 6.2 to predict the final mass of the apparatus when the acid has an initial temperature of 30 $^{\circ}$ C.
		[1]
	(ii)	The student finds that the rate of reaction increases as the temperature of the acid increases.
		Use the idea of particle collision to explain the effect of temperature on the rate of reaction.
		IOI

0653/33/O/N/14

Astronomers use telescopes to study the electromagnetic radiation that reaches the Earth from

(a) (i)	•	the sentences below, more than once o	•	or phrases fror	n the list. You	may use each								
radio w	aves sound waves ultra-violet visible light water wa													
	People ca	People can see stars with their eyes because the stars emit												
	Astronom	ers need special to	e other types	other types of electromagnetic radiation										
		and												
(ii) We are able to see the Moon, even though the Moon itself does not emit ele														
(ii)	We are able to see the Moon, even though the Moon itself does not emit electromagne radiation.													
	State a c Moon.	State a characteristic behaviour of electromagnetic radiation that enables us to see the Moon.												
						[1]								
(b) Sor	me stars er	mit electromagnetic	radiation with a	very high frequ	ency, such as	X-rays.								
(i)	(i) Fig. 7.1 shows an incomplete diagram of the electromagnetic spectrum.													
gamma radiation					microwaves									
			Fig. 7.1											
	Mark with	an X on Fig. 7.1 th	e part of the spe	ctrum where X	-rays are situa	ated. [1]								
(ii)		consists of two sta ht, while the other e			icular binary,	one star emits								
	The light	and X-rays leave th	is binary at the s	ame time.										
	Tick the I answer.	oox next to the con	rect statement ir	the list below	and give a r	eason for your								
	X-rays wi	ll reach the Earth fir	rst.											
	Light will	reach the Earth firs	t.											
	X-rays an	d light will reach the	e Earth at the sa	me time.										
	reason													
						[2]								

7

the stars.

8 (a) Fig. 8.1 shows an experiment to investigate the effect of changing light intensity on the rate of photosynthesis of a water plant called *Elodea*.

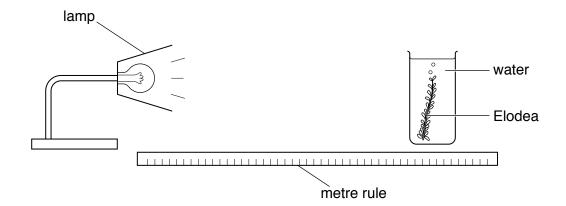


Fig. 8.1

The light intensity is altered by changing the distance between the lamp and the plant.

The number of bubbles of oxygen produced by the plant per minute is used to find the rate of photosynthesis.

The results are shown in Fig. 8.2.

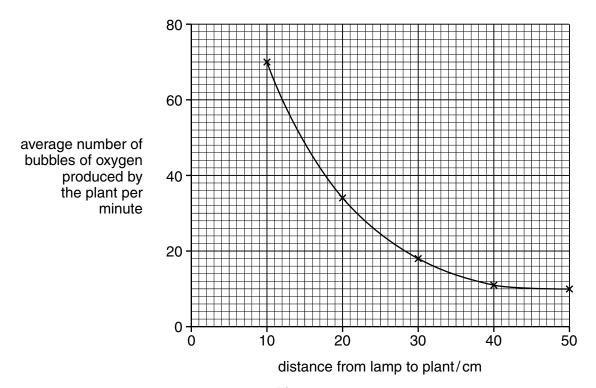


Fig. 8.2

Use Fig. 8.2 to describe how the rate of photosynthesis of the plant changes as the light intensity is varied.

(b) Fig. 8.3 shows some of the living organisms in a pond.

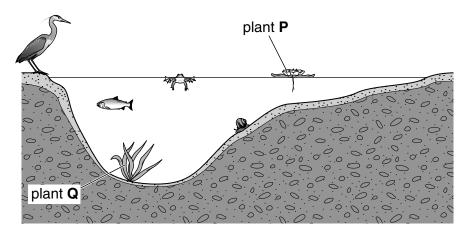


Fig. 8.3

	_	ggest how the rate of photosynthesis of plant P compares with plant Q . Explain yewer.	your
			[2]
(c)	The	e pollution of water by fertilisers can cause eutrophication.	
	(i)	Some fertiliser is added to a pond. Describe the effect this will have on the plants that on the surface of the pond.	live
	(ii)	Use your answer to (b)(i) to predict how eutrophication will affect plant Q in Fig. 8.3.	
			ا

Aluminium is extracted from an ore called bauxite.												
Bauxite is a mixture of aluminium oxide and other compounds.												
The element aluminium is extracted from molten aluminium oxide by electrolysis.												
The element oxygen is also formed during the electrolysis.												
(a) Using examples taken from the sentences above, explain(i) one difference between an element and a compound,												
[1]												
(ii) one difference between a compound and a mixture.												
[1]												
(b) Aluminium oxide consists of Al^{3+} ions and O^{2-} ions.												
Deduce the formula of aluminium oxide. Explain your answer.												
[2]												

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9

(c) In industry aluminium is extracted from aluminium oxide by electrolysis.

Fig. 9.1 shows the apparatus used.

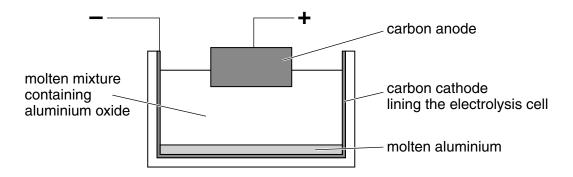


Fig. 9.1

	Explain, in terms of the ions present, how aluminium is formed at one of the electrodes.	
		[3]
(d)	Copper can be extracted from an ore containing copper oxide by heating it with carbon.	
	Explain why aluminium cannot be obtained from aluminium oxide in the same way.	
		[2]

		0	4 Đ	Helium	20	Ne	Neon	40	Ā		84	궃	Krypton	131	Xe	Xenon	222	Ru	Radon				175	Ľ	Lutetium	260	۲	Lawrencium 103				
		NII		N	19	ш	Fluorine 10	35.5	CI	Chlorine 18	80	Ŗ	Bromine 36	127	-	lodine 54	210	At	Astatine 86				173	Λb	Ytterbium L	259	٩	_				
		<i>></i>					Ē 6		_	17 C		_	35 Br			53		_	85 As					_	۶ پټ		_					
		>			16	0	Oxygen 8	32	တ	Sulfur 16	79	Se	Selenium 34	128	<u>e</u>	Tellurium 52	209	Ъ	Polonium 84				169	F	Thulium 69	258	Md	Mendelevium 101				
		>								4	z	Nitrogen 7	31	۵	Phosphorus 15	75	As	Arsenic 33	122	Sp	Antimony 51	209	ā	Bismuth 83				167	ш	Erbium 68	257	Fn
		IV			12	ပ	Carbon 6	28	Si	Silicon 14	73	Ge	Germanium 32	119	Sn	Tin 50	207	Pb	Lead 82				165	운	Holmium 67	252		E				
		=			£	Ω	Boron 5	27	Ν	Aluminium 13	20	Ga	Gallium 31	115	'n	Indium 49	204	11	Thallium 81				162	۵	Dysprosium 66	251	ర	Ę				
ģ											65	Zu	Zinc 30	112	ဦ	Cadmium 48	201	Hg	Mercury 80				159	Д	Terbium 65	247	Æ	ε				
DATA SHEET The Periodic Table of the Elements											64	చె	Copper 29	108	Ag	Silver 47	197	Ρn	Gold 79				157	gg	Gadolinium 64	247	Cm	Curium 96				
DATA SHEET ic Table of the	Group										59	Z	Nickel 28	106	Pd	Palladium 46	195	풉	Platinum 78				152	Eu	Europium 63	243	Am	Ameridium 95				
DATA (Gre										29	ပိ	Cobalt 27	103	絽	Rhodium 45	192	Ä	Iridium 77				150	Sm	Samarium 62	244	Pu	Plutonium 94				
he Perio			- I	Hydrogen 1							26	Fe	Iron 26	101	Bu	Ruthenium 44	190	0s	Osmium 76				147	Pm	Promethium 61	237	Ν	Neptunium 93				
-											55	Mn	Manganese 25		ဥ	Technetium 43	186	Be	Rhenium 75				144	P	Neodymium 60	238	>	Uranium 92				
											52	ပ်	Chromium 24	96	Mo	Molybdenum 42	184	>	Tungsten 74				141	Ą	Praseodymium 59	231	Ра	Protactinium 91				
											51	>	Vanadium 23	93	q	Niobium 41	181	<u>a</u>	Tantalum 73				140	S	Cerium 58	232	두	Thorium 90				
											48	F	Titanium 22	91	Zr	Zirconium 40	178	Ξ	Hafnium 72				,			nic mass	pol	on) number				
								1			45	သွ	Scandium 21	88	>	Yttrium 39	139	Ľ	Lanthanum 57 *	227	Ac	Actinium 89 †	o pri	l corioe	SOLIDS I	a = relative atomic mass	X = atomic symbol	b = atomic (proton) number				
		=			6	Be	Beryllium 4	24	M	Magnesium 12	40	Sa	Calcium 20	88	Š	Strontium 38	137	Ва	Barium 56	226	Ва	Radium 88	* 58_71 20th	+ 90-103 Actionid series		a a:	×					
		_			7	=	Lithium 3	23	Na	Sodium 11	39	¥	Potassium 19	85	Rb	Rubidium 37	133	Cs	Caesium 55	223	Ť.	Francium 87	* 52 71	+ 00 +			Key	Q				

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

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