

Cambridge International Examinations

Cambridge International General Certificate of Secondary Education

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

COMBINED SCIENCE

0653/32

Paper 3 (Extended)

May/June 2016

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.

You may use an HB 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.



1 Fig. 1.1 shows some parts of the human alimentary canal and its associated organs.

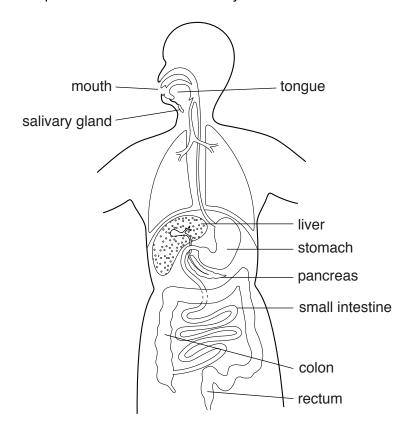


Fig. 1.1

(a) Use the labels in Fig. 1.1 to complete Table 1.1.

Table 1.1

function	name of organ(s)
ingestion	
absorption of digested food	
	stomach and
secrete digestive enzymes	and

[4]

(b) The nutrients that have been absorbed from the digestive system travel in the blood to the body cells.

Fig. 1.2 shows a longitudinal section of a capillary next to some body cells.

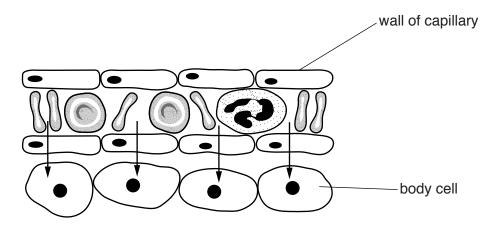


Fig. 1.2

	[2
Describe how the structure of the capillary allows this movement to take place effective	y.
The arrows show the direction of movement of glucose from the blood to the cells of the	body

(c) Fig. 1.3 shows the effect of pH on the activity of an enzyme which is secreted into the food in the stomach. The environment in the stomach has a low pH because of the presence of hydrochloric acid.

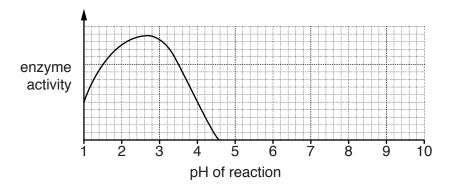


Fig. 1.3

(i)	State the	optimum	рΗ	for	this	enzyme
-----	-----------	---------	----	-----	------	--------

	[1]
(ii)	The stomach contents enter the duodenum. The pH there is approximately 8.
	Explain in detail why the enzyme shows no activity when it enters the duodenum.
	[2]
	• ·

(iii) There are enzymes in the duodenum which digest the food after it has left the stomach.On Fig. 1.3 draw a curve to suggest how the activity of an enzyme secreted into the duodenum varies with pH.[2]

Please turn over for Question 2

2 (a) Lead bromide, $PbBr_2$, can be broken down into its elements using the apparatus shown in Fig. 2.1.

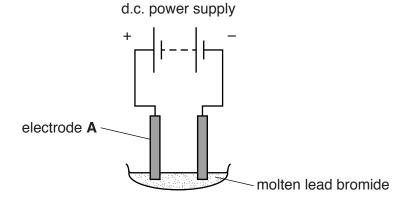


Fig. 2.1

(i)	Name the process shown in Fig. 2.1.	
		[1]
(ii)	Give the symbols of the ions present in molten lead bromide.	
		[1]
(iii)	Name the element produced at electrode A and state the colour of this element.	
	name	
	colour	 [2]
		[~]
	a similar process, aqueous copper chloride solution is broken down into a metal a orine gas.	ınd
(i)	Write the symbol equation for the reaction, including state symbols.	
		[2]
(ii)	Describe the chemical test for chlorine gas.	
	test	
	result	
		 [2]

© UCLES 2016 0653/32/M/J/16

(b)

(c)	(i)	Describe the trend in the boiling points of the elements going down Group VII of the Periodic Table, from chlorine to iodine.
		[1]
((ii)	Fluorine is another element in Group VII.
		Use the Periodic Table to determine the electronic structure of an atom of fluorine.
		[1]
(i	iii)	An atom of fluorine has a nucleon number of 19.
		Calculate the number of neutrons in this atom.
		number of neutrons = [1]

3 Fig. 3.1 shows a gravity racer. A gravity racer is a small cart with four wheels and no engine. It is steered by a driver as it runs down a sloping track.



Fig. 3.1

(a)	The mass of the cart and driver is 100 kg.	

State the name given to the force on this mass due to the effect of gravity.

[1]

(b) Fig. 3.2 shows the track becoming horizontal at the bottom of the slope.

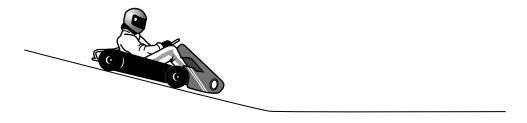


Fig. 3.2

The cart accelerates down the slope and then moves along the horizontal track for a distance before the driver applies the brakes and the cart stops.

Fig. 3.3 shows a speed/time graph for the motion of the cart.

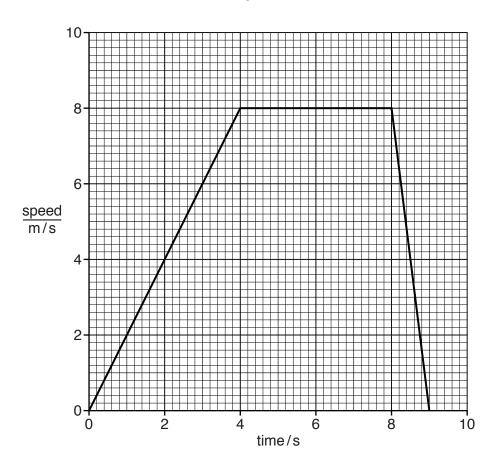


Fig. 3.3

- (i) On Fig. 3.3 write the letter **P** at the point when the brakes are first applied. [1]
- (ii) Use Fig. 3.3 to calculate the distance travelled by the cart
 - 1. while it moves at constant speed.

State any formula you use and show your working.

formula

working

distance = m

2. from the time the brakes are applied until it comes to a stop.

Show your working.

distance = m

(c)	And	nother cart with driver has a mass of 150 kg.							
		This cart travels down the slope through a vertical height of $10\mathrm{m}$ before entering the horizont section of the track.							
	(i)	Complete the energy transfers that take place while the cart is moving.							
	Frompotential energy at the top of the slope								
		to	o						
		o energy as the cart stops. [1]							
	(ii)	Calculate the potential energy lost. (gravitational field strength, $g = 10 \text{N/kg}$).							
		State the formula you use and show your working.							
		formula							
		working							
		potential energy =J	[2]						
	(iii)	Calculate the maximum possible speed of the cart at the bottom of the slope.							
		State the formula you use and show your working.							
		formula							

speed =m/s [3]

© UCLES 2016 0653/32/M/J/16

working

4 Fig. 4.1 shows a germinating seed and a diagram of one of the root hair cells as seen through the microscope.

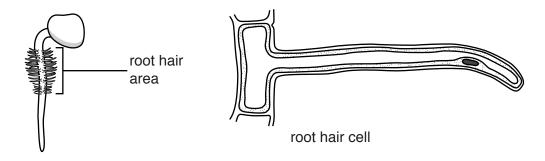


Fig. 4.1

(a) Use the following terms to complete the sentences.

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

	а	mino acids	cell n	nembrane	cell wall	ions	
			nucleus	phloem	xylem		
	The	root hair cell	has a		to control	what enters and	
	leav	es the cell. It	has a large surfa	ace area to absort	water and		
				Water goes fr	om the cell to the		
				to be taken to	the rest of the plant	. [3]	
(b)		ew days late tosynthesise.	-	in Fig. 4.1 devel	ops leaves above	ground and starts to	
	(i)	(i) Write the symbol equation for photosynthesis.					
				light	\rightarrow		
				chlorophy	/II	[2]	
	(ii)	Describe the	e role of chloroph	nyll in photosynthe	sis.		
						[2]	

5 Fig. 5.1 shows the fractional distillation of petroleum.

Four of the fractions are labelled P, Q, R and S.

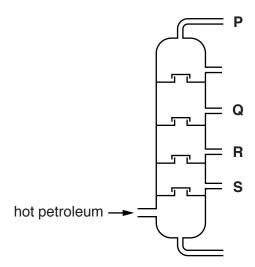
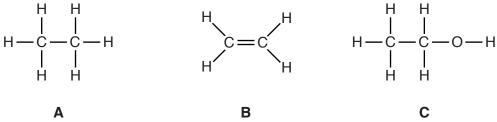


Fig. 5.1

(a)	State whic	h fraction from Fig. 5.1 has	
	the lowest	boiling point range,	
	the greates	st molecular size.	
			ro1
			[2]
(b)	Alkanes ar	nd alkenes are two types of hydrocarbon.	
	(i) Name	the process used in the manufacture of alkenes from alkanes.	
			[1]

(ii) Fig. 5.2 shows three molecules.

(iii)



Α	В	С	
	Fig. 5.2		
State which molecule is	an alkene and give a rea	ason for your answer.	
molecule			
reason			
			[1]
Alkanes and alkenes ca	n be distinguished by a	chemical test.	
Name the chemical use propene.	ed in this test and state	e the observations for	propane and for
chemical name			
propane observation			
propene observation			

[3]

Warmir	na of the water	•	It. This cause		rise for a diffe	rent reason.
		iii uio oodaii		000 10101 10	1100 101 & dimo	em reason.
Global	warming happ	ens when mo	ore of the infra			-
(i) Ta	ble 6.1 shows	part of the el	ectromagneti	c spectrum.		
			Table 6.1			
amma rays	X-rays					radio waves
	•	ace infra-red	radiation in	the correct	position in the	ne electromagnetion [1]
		he thought ir	nfra-red radia	tion travels	from the Sun	more slowly than
Ex	plain why the	student is no	t correct.			
						[1]
molecu	les in the sea					
		ation causes	a decrease	in temperatu	ıre in terms o	f the movement of
						[2]
		ning on the E	arth's surface			[2] and increases more
quickly	he Sun is shir	ning on the Ea erature of the	arth's surface e sea.			
	Explain	Explain this reason. Global warming happ in the Earth's surface (i) Table 6.1 shows In Table 6.1, pla spectrum. (ii) A student said sunlight. Explain why the Global warming caus molecules in the sea to decrease slightly. Suggest why evapor water molecules.	Global warming happens when moin the Earth's surface and atmosple (i) Table 6.1 shows part of the elementarys In Table 6.1, place infra-red spectrum. (ii) A student said he thought in sunlight. Explain why the student is not more wat molecules in the sea increases. The decrease slightly. Suggest why evaporation causes water molecules.	Global warming happens when more of the infra in the Earth's surface and atmosphere. (i) Table 6.1 shows part of the electromagnetic Table 6.1 amma rays In Table 6.1, place infra-red radiation in spectrum. (ii) A student said he thought infra-red radia sunlight. Explain why the student is not correct. Global warming causes more water to evapora molecules in the sea increases. This causes the to decrease slightly. Suggest why evaporation causes a decrease water molecules.	Explain this reason. Global warming happens when more of the infra-red radiatio in the Earth's surface and atmosphere. (i) Table 6.1 shows part of the electromagnetic spectrum. Table 6.1 amma rays X-rays In Table 6.1, place infra-red radiation in the correct spectrum. (ii) A student said he thought infra-red radiation travels sunlight. Explain why the student is not correct. Global warming causes more water to evaporate from the smolecules in the sea increases. This causes the temperature to decrease slightly. Suggest why evaporation causes a decrease in temperature water molecules.	Global warming happens when more of the infra-red radiation coming from in the Earth's surface and atmosphere. (i) Table 6.1 shows part of the electromagnetic spectrum. Table 6.1 amma rays X-rays In Table 6.1, place infra-red radiation in the correct position in the spectrum. (ii) A student said he thought infra-red radiation travels from the Sun sunlight. Explain why the student is not correct. Global warming causes more water to evaporate from the sea, as the awmolecules in the sea increases. This causes the temperature of the water to decrease slightly. Suggest why evaporation causes a decrease in temperature in terms of

7 Fig. 7.1 shows the energy flow in an ecosystem on an island. The unit for each flow is kJ/m²/year.

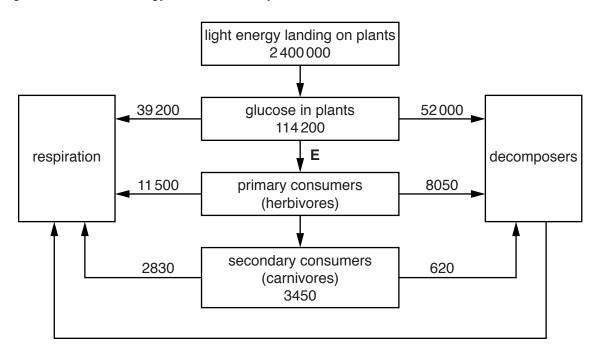


Fig. 7.1

(a)	(i)	Calculate the efficiency	with v	which lig	ht energy	landing	on the	plants is	s converted	l to
		glucose.								

Show your working.

(ii) Calculate E, the amount of energy passed on to the primary consumers.

Show your working

$$E = \dots kJ/m^2/year$$
 [1]

(iii) Explain why there are not many trophic levels in this ecosystem.

(iv) Describe **one** way in which the plants use the energy released by respiration.

.....[1]

(b)		rain can affect ecosystems. The island is affected by acid rain that is carried by the wind a factory on a different island.
	(i)	Describe how the factory could cause this acid rain.
		[2]
	(ii)	The acid rain reduces the growth of the plants on the island.
		Suggest and explain how this affects the number of carnivores in the ecosystem in Fig. 7.1.
		[2]

8 Fig. 8.1 shows a piece of calcium reacting with dilute hydrochloric acid.

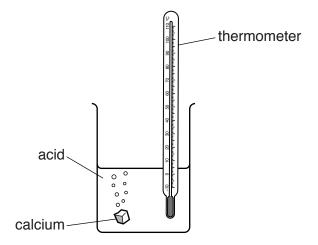


Fig. 8.1

(a)	Cor	nplete the sentences about this reaction.	
	In th	nis reaction the temperature increases. This shows that this is an	
	read	ction. The temperature rises because energy is converted i	nto
		energy.	[3]
(b)		scribe and explain, in terms of colliding particles, any effect on the speed of the react sed by reducing the temperature of the acid.	tion
	effe	ct	
	exp	lanation	
			[2]
(c)	(i)	Describe and explain any effect on the speed of the reaction in Fig. 8.1 caused replacing the piece of calcium by a piece of copper.	by
		effect	
		explanation	
	(ii)	Describe the method of extraction of copper from copper oxide.	[2]
			111

9 A student wants to investigate the current through an electric buzzer. He designs the circuit in Fig. 9.1 to use in his investigation.

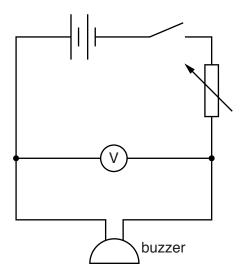
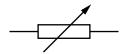


Fig. 9.1

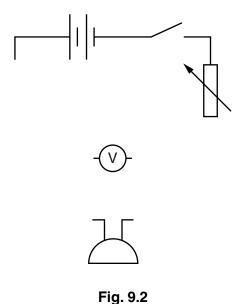
(a) (i) Name the component represented by this symbol.



	[1]
(ii)	State and explain why the student includes this component in his circuit.
	ાલ્ય

(iii) The student has left out an important component from his circuit that is needed to measure the current.

On Fig. 9.2 complete the circuit diagram and include the symbol for this missing component in its correct place.



[2]

(b) The student uses the correct circuit for his experiment. Fig. 9.3 shows his results plotted as a graph.

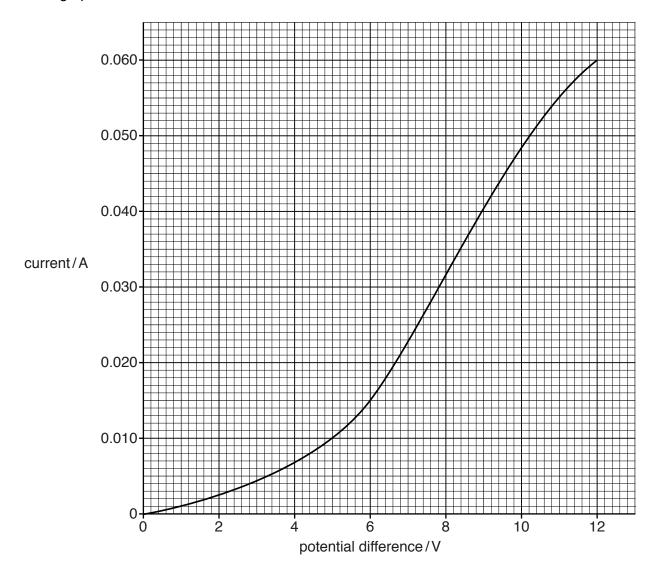


Fig. 9.3

The resistance of the buzzer is given by the formula

resistance =
$$\frac{\text{potential difference (p.d.)}}{\text{current}}$$

The student says that the resistance of the buzzer is lower when the p.d. is 12V than when the p.d. is 6V. The resistance at 12V is $200\,\Omega$.

Use information from the graph in Fig. 9.3 to calculate the resistance at 6V to show that he was correct.

resistance at $6V = \dots \Omega$ [2]

	21
(c)	The buzzer emits a very loud sound at 3000 Hz with a wavelength of 0.11m. A student 1km away from the buzzer hears the sound after a short time.
	Calculate the time taken by the sound to reach the student.
	State any formula you use and show your working.
	formula
	working
	time =s [3]

BLANK PAGE

BLANK PAGE

The Periodic Table of Elements

	III/	2	운	helium 4	10	Ne	neon 20	18	Ā	argon 40	36	궃	krypton 84	22	Xe	xenon 131	98	몬	radon			
	IIΛ				6	ட	fluorine 19	17	Cl	chlorine 35.5	35	B	bromine 80	53	н	iodine 127	85	¥	astatine -			
	IN				8	0	oxygen 16	16	S	sulfur 32	34	Se	selenium 79	52	Те	tellurium 128	84	Ро	polonium –	116	_	livermorium -
	Λ				7	Z	nitrogen 14	15	凸	phosphorus 31	33	As	arsenic 75	51	Sb	antimony 122	83	Ξ	bismuth 209			
	<u> </u>				9	ပ	carbon 12	14	S	silicon 28	32	Ge	germanium 73	20	S	tin 119	82	Ъ	lead 207	114	lΗ	flerovium -
	III				2	В	boron 11	13	Ν	aluminium 27	31	Ga	gallium 70	49	In	indium 115	81	11	thallium 204			
											30	Zu	zinc 65	48	g	cadmium 112	80	БĤ	mercury 201	112	ပ်	copernicium
											29	D.	copper 64	47	Ag	silver 108	62	Αn	gold 197	111	Rg	roentgenium -
Group											28	z	nickel 59	46	Pd	palladium 106	78	귙	platinum 195	110	Ds	darmstadtium -
Gro											27	ပိ	cobalt 59	45	牊	rhodium 103	77	ŀ	iridium 192	109	Μ̈́	meitnerium -
		-	I	hydrogen 1							26	Ьe	iron 56	44	Ru	ruthenium 101	9/	Os	osmium 190	108	Hs	hassium
											25	Mn	manganese 55	43	ည	technetium -	75	Re	rhenium 186	107	В	bohrium
						pol	ass				24	ပ်	chromium 52	42	Mo	molybdenum 96	74	≥	tungsten 184	106	Sg	seaborgium -
				Key	atomic number	atomic symbo	name relative atomic mass				23	>	vanadium 51	41	qN	niobium 93	73	Та	tantalum 181	105	ОР	dubnium –
						ato	rels				22	F	titanium 48	40	Zr	zirconium 91	72	Ξ	hafnium 178	104	¥	rutherfordium -
											21	လွ	scandium 45	39	>	yttrium 89	57-71	lanthanoids		89-103	actinoids	
	=				4	Be	beryllium 9	12	Mg	magnesium 24	20	Ca	calcium 40	38	Š	strontium 88	56	Ва	barium 137	88	Ra	radium _
	_				3	:=	lithium 7	11	Na	sodium 23	19	¥	potassium 39	37	SP SP	rubidium 85	55	Cs	caesium 133	87	ᅩ	francium -

7.1	ŋ	lutetium 175	103	۲	lawrencium	ı
20	Υp	ytterbium 173	102	Š	nobelium	I
69	Ш	thulium 169	101	Md	mendelevium	1
89	ш	erbium 167	100	Fm	fermium	I
29	운	holmium 165	66	Es	einsteinium	1
99	ò	dysprosium 163	86	ŭ	californium	1
65	Q L	terbium 159	97	益	berkelium	1
64	В	gadolinium 157	96	Cm	curium	1
63	П	europium 152	95	Am	americium	1
62	Sm	samarium 150	94	Pn	plutonium	1
61	Рш	promethium	93	δ	neptunium	1
09	PZ	neodymium 144	92	\supset	uranium	238
59	ď	praseodymium 141	16	Ра	protactinium	231
28	Ce	cerium 140	06	T	thorium	232
22	Ľ	lanthanum 139	68	Ac	actinium	I

lanthanoids

actinoids

The volume of one mole of any gas is $24\,\mathrm{dm}^3$ at room temperature and pressure (r.t.p.)

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.