

Cambridge International Examinations

Cambridge International General Certificate of Secondary Education

CANDIDATE NUMBER	

COMBINED SCIENCE

0653/23

Paper 2 (Core)

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 20.

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.

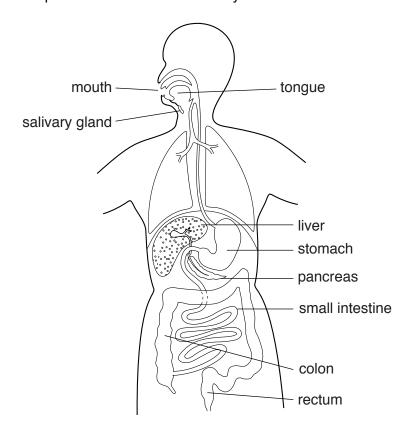


Fig. 1.1

(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	
secrete digestive enzymes	stomach and
Social algorito only mod	and

[4]

(b) After the absorption of digested food, the blood takes the nutrients to the body cells.
State the part of the blood that transports dissolved nutrients.

(c) Fig. 1.2 shows a section of a capillary next to some body cells.

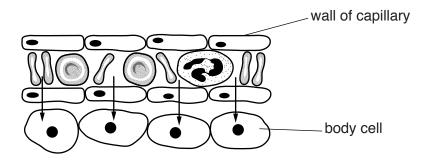


Fig. 1.2

	[2
	••••
Describe the process by which glucose moves in the direction shown by the arrows.	

(d) 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.

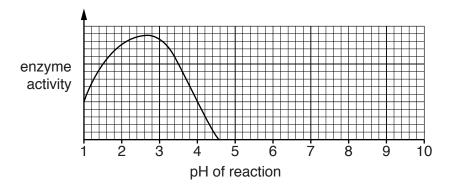


Fig. 1.3

(i)	State the optimum pH for this enzyme[1]
	[1]
(ii)	The stomach contents enter the duodenum. The pH in the duodenum is approximately 8.
	Suggest what happens to the activity of the enzyme when it enters the duodenum. Explain your answer.

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

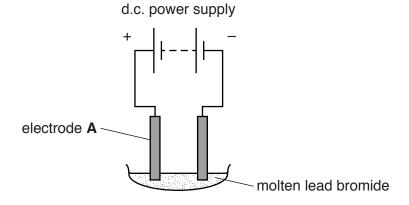


Fig. 2.1

	(i)	Name the process shown in Fig. 2.1.	[4]
	(ii)	Name the element produced at electrode A and state the colour of this element. name	
		colour	
(b)		similar process, copper chloride is broken down into a metal and chlorine.	
			[1]
(c)	(i)	Describe the trend in the boiling points of the elements going down Group VII of Periodic Table, from chlorine to iodine.	the

(ii) Fluorine is another element in Group VII. Fig. 2.2 shows an atom of fluorine.

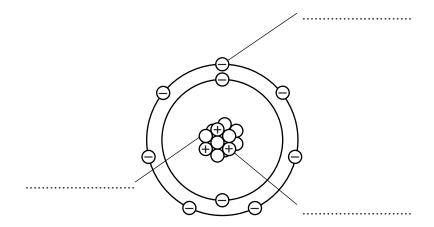


Fig. 2.2

Not all of the particles present in the atom of fluorine are shown.

	Label the particles shown in Fig. 2.2.	[3]
(iii)	State what is meant by the term <i>nucleon number</i> .	
		. [1]

3 Fig. 3.1 shows a small cart on 4 wheels with no engine. The cart runs down a sloping track steered by a driver.



Fig. 3.1

(a)	Nar	me the force that causes the cart to move down the slope.
		[1]
(b)	Fig.	3.2 shows the track becoming horizontal at the bottom of the slope.
		Fig. 3.2
	(i)	The force in part (a) may change the motion of the cart along the horizontal track.
		Tick the box alongside the statement that describes the effect of this force.
		Give a reason for your choice.
		It increases the speed of the cart.
		It does not affect the speed of the cart.
		It decreases the speed of the cart.

		1
	(ii)	The cart moves along the horizontal track at an average speed of 8 m/s for a distance of 20 m before the driver applies the brakes.
		Calculate the time taken to travel this distance.
		State the formula you use, and show your working.
		formula
		working
		time =s [2
	(iii)	After applying the brakes, the cart comes to a stop in 10 m.
		On the axes in Fig. 3.3, sketch the speed/time graph for the journey of the cart from the start of the horizontal track until it stops. (Scales and numbers are NOT required).
		speed
		time
		Fig. 3.3 [2
(c)	Cor	nplete the energy transfers that take place while the cart is moving.
	Froi	m energy at the top of the slope
	to	kínetíc energy on the track

[2]

to energy as the cart stops.

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

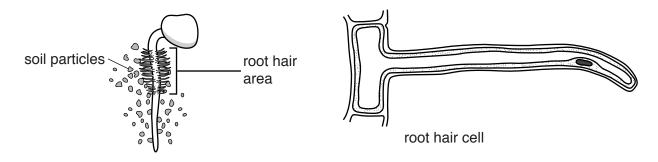


Fig. 4.1

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

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

	ami	no acids	cell membrane	cell wall	ions	nucleus	
	phlo	oem	photosynthesis	respiration	transpiratio	on xylem	
	The	root hair o	ell has a		to control w	hat enters and	
	leav	es the cell	. The main function of the	his cell is to absorb	water and		
			\	Nater goes from the	e root hair cell	to the	
			to	be taken to the res	st of the plant. \	Nater	
	eva	porates fro	m the plant by				[4]
(b)		gest why t	ninating seed in Fig. 4.1	antly have to be rep			
(c)		w days late tosynthesis	er the germinated seed se.	l in Fig. 4.1 develop	os leaves above	e ground and star	ts to
	(i)		word equation for photo	•			[0]
	(ii)		conditions needed for ph				[2]
		1					
		2					[2]

5 Petroleum is a mixture of hydrocarbons. Fig. 5.1 shows how it is separated into useful products.

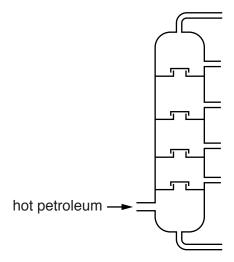


Fig. 5.1

(a)	(i)	Name the process shown in Fig. 5.1.	
]
	(ii)	State what is meant by a <i>hydrocarbon</i> .	
		[2	2]
(b)	Nati	ural gas is often found with petroleum when it is extracted from the Earth's crust. It burn ir.	s
	(i)	Name the main constituent of natural gas.	
		[1]
	(ii)	Name the gas in air that reacts with natural gas when it burns.	
		r-	

(c)	Ethanol,	C ₂ H ₅ OH,	is a	compound	made	from	petrole	um
-----	----------	-----------------------------------	------	----------	------	------	---------	----

(i) Complete the diagram to show the structure of one molecule of ethanol.



[2]

[2]

(ii) Ethanol and hydrocarbons burn to form the same products.

Name	the two	o substances	formed	during	the o	complete	combustion	of	ethano	ĺ.
141110		o cascianico	IOIIIIOG	aaiiig		Joinpioto	COLLIDACTION	٠.	ou lai lo	٠.

1.	
2	

6

Glo	bal w	arming causes ic	e caps to mel	t. This causes	a rise in sea	level.	
(a)	Wa	rming of the water	in the ocean	s causes the	sea level to ri	se for a differe	nt reason.
	Ехр	lain this reason.					
							[1]
(b)	Glo	bal warming caus	es more wate	r from the sea	to move into	the atmosphe	ere.
	(i)	Name the proces	ss that causes	s this moveme	ent.		
							[1]
	(ii)	In the process r surface of the se		(i), the more	energetic wa	ter molecules	escape from the
		Suggest the effe	ct this will hav	e on			
		1. the energy of	the molecules	s remaining in	the sea wate	er.	
		2. the temperatu	re of the sea	water.			
		·					
							[2]
(c)	Ear	bal warming happ th's surface and a	tmosphere.				is trapped in the
	(i)	State the form of	energy trans	fer between th	ne Sun and th	ne Earth.	
							[1]
	(ii)	Table 6.1 shows	part of the ele	ectromagnetic	spectrum.		
				Table 6.1			
g	amm rays	⊢ x-ravs					radio waves

In Table 6.1, write in the correct boxes

- 1. the name of the part of the spectrum often involved in thermal energy transfer. Circle your answer.
- 2. the name of the part of the spectrum that enables you to read this question. **Do not** circle your answer.

[4]

7 Fig. 7.1 shows the members of a food chain in a habitat.

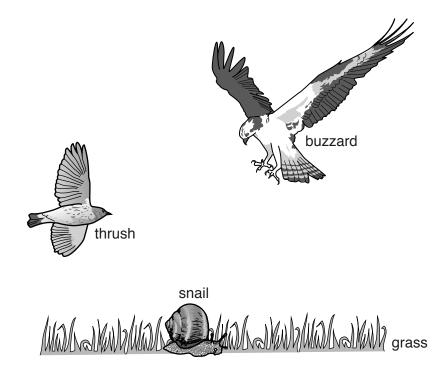


Fig. 7.1

The buzzard eats the thrush. The snail eats grass and the thrush is the snail's predator.

(a) (i) Complete each row of Table 7.1 by ticking the boxes that apply to each organism. One has been done for you.

Table 7.1

organism	producer	consumer	herbivore	carnivore
buzzard				
grass				
snail				
thrush		✓		✓

[3]

(ii) Construct a food chain showing all of the organisms in Fig. 7.1.

[2]

(b)	The	activities of humans can cause air pollution by gases such as methane.	
	(i)	State one large-scale activity of humans that adds methane to the atmosphere.	
	(ii)	Explain why large amounts of methane in the atmosphere are harmful.	. [.

8 Four metals are added to a dilute acid. Fig. 8.1 shows the pieces of metal before they are added to the acid.

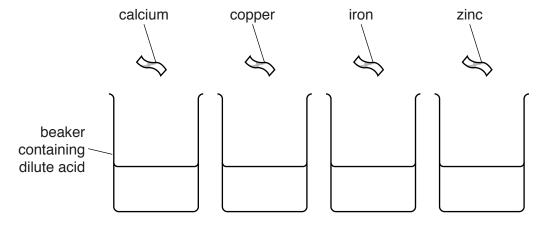


			Fig. 8.1	
(a)	(i)	Place the four	r metals named in Fig. 8.1 in order of reactivity.	
		most reactive		
		least reactive		[1]
	(ii)	The pieces of	metal are added to the acid in the beakers.	
		Describe wha	at is seen in the beakers where a reaction takes place.	
			[[1]
(b)		e student thinks orm iron(III) io	s that iron reacts to form iron(Π) ions. Another student thinks that iron reachs.	ts
	Sug	gest a test for	iron(II) ions and $iron(III)$ ions, and state the observations for each.	
	test			
	iron	(II) ions		
	iron	(III) ions		 [3]

(c) Fig. 8.2 shows a piece of sodium added to water in a beaker.

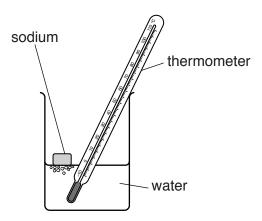


Fig. 8.2

The thermometer is used to measure the temperature of the water before and during the reaction.

The temperature of the water increases.

The equation for the reaction is

) State the type of chemical reaction that causes an increase in temperature.

sodium + water → sodium hydroxide + hydrogen.

.....[1]

(ii) In this reaction sodium atoms turn into sodium ions.

State the charge of a sodium ion.

.....[1]

(iii) Describe how sodium ions are formed from sodium atoms.

.....

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

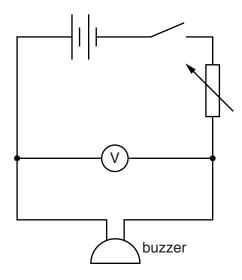
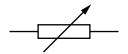


Fig. 9.1

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



	[1]
(ii)	State and explain why the student includes this component in his circuit.
	[2]

(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.

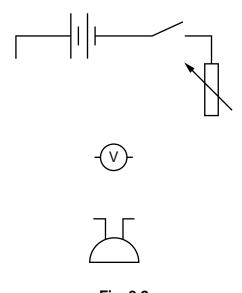


Fig. 9.2

[3]

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

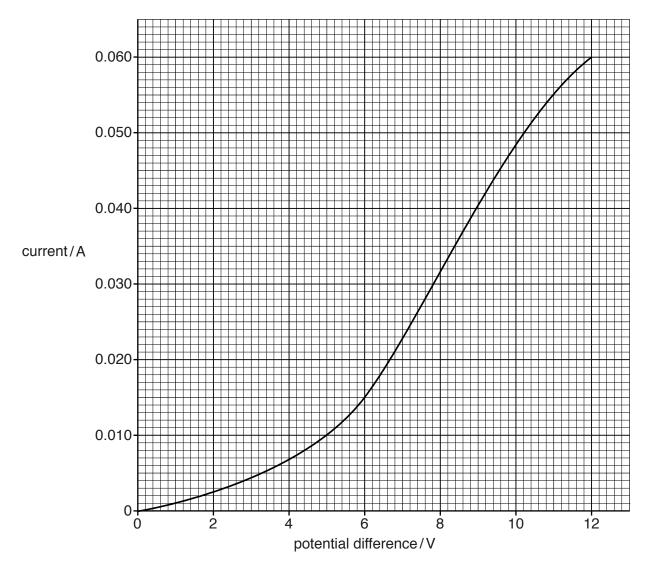


Fig. 9.3

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

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

(C)	As the current increases the sound emitted by the buzzer becomes louder but has the sar pitch.	ne
	State what happens to	
	the frequency of the sound waves,	
	the amplitude of the sound waves.	
		[2]

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 —

71		lutetium 175	103	۲	lawrencium	ı
20	ΥÞ	ytterbium 173	102	%	nobelium	1
69	μ	thulium 169	101	Md	mendelevium	ı
89	ய்	erbium 167	100	Fm	fermium	ı
29	웃	holmium 165	66	Es	einsteinium	ı
99	ò	dysprosium 163	86	ರ	californium	ı
65	Тр	terbium 159	97	ă	berkelium	ı
64	g	gadolinium 157	96	Cm	curium	ı
63	En	europium 152	92	Am	americium	ı
62	Sm	samarium 150	94	Pu	plutonium	ı
61	Pm	promethium -	93	δ	neptunium	ı
09	PΝ	neodymium 144	92	\supset	uranium	238
69	Ą	praseodymium 141	91	Ра	protactinium	731
28	Ce	cerium 140	06	H	thorium	727
22	Га	lanthanum 139	88	Ac	actinium	ı

lanthanoids

actinoids

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

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