



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	
COMBINED SCIENCE 0653/23			
Paper 2 (Core)		Octob	er/November 2013
			1 hour 15 minutes
Candidates ans	swer on the Question Paper.		

READ THESE INSTRUCTIONS FIRST

No Additional Materials are required.

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 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 a root hair cell.



[3]

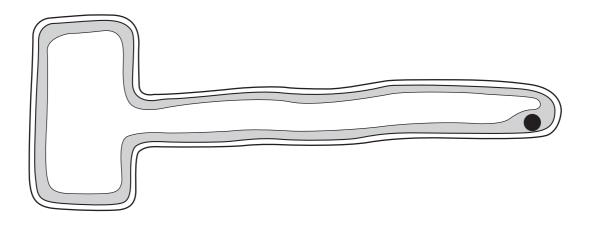


Fig. 1.1

- (a) Use the letters A, B and C to label these parts of the root hair cell in Fig. 1.1.
 - A the cell membrane
 - B the part that contains chromosomes
 - **C** a structure that is **not** present in animal cells
- (b) Name two substances that are absorbed by root hair cells.

1	

2 ______[2]

(c) Fig. 1.2 shows part of a plant stem from which the outer layer, including the phloem, has been removed.

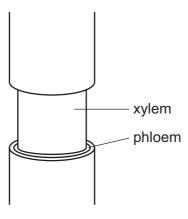


Fig. 1.2

(i)	State the function of phloem.	
		[2]
(ii)	Suggest why this treatment would cause the roots of the plant to die.	
		••••
		[2]

2 (a) Table 2.1 shows information about some chemical elements and their positions in the Periodic Table.

For Examiner's Use

Table 2.1

	<u> </u>
element	group number in the Periodic Table
oxygen	6
calcium	2
lithium	1
sulfur	6
fluorine	7

(i)	State the noble (inert) gas that is in the same period of the Periodic Table as sulfur.
	[1]
(ii)	Select two elements from Table 2.1 whose atoms form ionic chemical bonds with each other and explain your answer.
	and
	explanation
	[2]

(b) Fig. 2.1 shows a diagram of an atom.

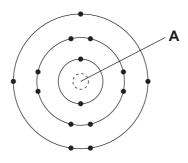


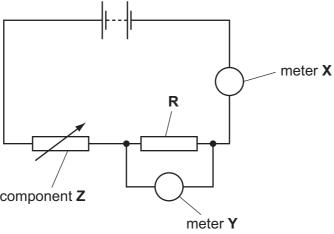
Fig. 2.1

(i) Name structure **A** in Fig 2.1. [1]

(ii)	State the proton number of the atom in Fig. 2.1.	
	Explain your answer briefly.	
	proton number	
	explanation	
		[2]

3 Fig. 3.1 shows a circuit used to measure the current passing through a resistor when the voltage across it is changed.

For Examiner's Use



	component Z	
	meter Y	
	Fig. 3.1	
(a)	Describe the purpose of component Z in the circuit.	
		[1]
(b)	The meters shown in the circuit give readings of 0.6 A and 8.0 V.	
	State which meter, X or Y , gives the reading of 0.6 A.	
	Explain your answer.	
	meter	
	explanation	
		[1]
(c)	Use the formula	
	resistance = potential difference/current	
	to calculate the resistance of the resistor.	
	State the units for your answer.	
	working	
	unit	[2]

4 Soya beans are an important crop in Brazil.

For Examiner's Use

(a) Table 4.1 contains information about the tests used and results obtained when testing soya beans for protein, fat and starch.

Table 4.1

nutrient tested for	reagent	result	conclusion
protein		purple	
starch			contains starch
fat		milky white	

	Complete the table. [3]
(b)	Explain why protein is an important part of a balanced diet.
	[2]
(c)	When a person eats soya beans, the beans are chewed in the mouth.
	Explain why this makes it easier for enzymes in the digestive system to digest the beans.
	[2]
(d)	Large areas of rainforest have been cleared in Brazil, to provide more land for growing soya beans.
	State two ways in which cutting down the rainforest can harm the environment.
	1
	2
	[2]

(a) A student placed four equally-sized pieces of different metals into colourless liquids contained in four test-tubes P, Q, R and S.
 Fig. 5.1 shows what the student observed.

For Examiner's Use

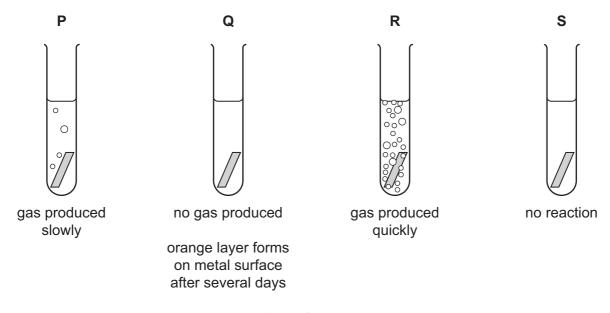


Fig. 5.1

Explain your answer.

test-tube

explanation

(i) Suggest which of the test-tubes in Fig. 5.1 contained water to which a piece of iron

(ii) The colourless liquid in test-tube **R** was dilute hydrochloric acid.

Suggest the name of the metal that was added to test-tube ${\bf R}$ and name the gas that was produced.

[3]

metal _____gas [2]

© UCLES 2013 0653/23/O/N/13

was added.

	(iii)	Test-tube P contained the same concentration of dilute hydrochloric acid at the same temperature as test-tube R .	For Examiner's Use	
		Suggest a reason why gas was produced more slowly in test-tube ${\bf P}$ than in test-tube ${\bf R}$.		
		[1]		
(b)		soline and diesel are mixtures of liquid hydrocarbons obtained from petroleum by process of fractional distillation.		
	(i)	State one difference in the properties of the hydrocarbons in gasoline that allows them to be separated by fractional distillation.		
		[1]		
	(ii)	State the main use of gasoline and explain, in terms of its chemical properties, why it is suitable for this use.		
		use		
		explanation		
		[2]		
(c)	Nat	tural gas contains mainly methane.		
	(i) Complete the diagram of the structure of one molecule of methane.			
		—с		
		[1]		
	(ii)	Complete the word chemical equation for the complete combustion of methane.		
m	ethar	ne +		
		[2]		

6 (a) Fig. 6.1 gives information about the uses of different types of electromagnetic waves and their effects on living tissue.

For Examiner's Use

Draw lines to link each electromagnetic wave with its effect on living tissue and its use. One has been completed as an example.

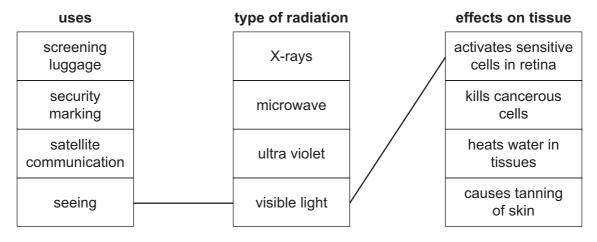


Fig. 6.1

[4]

(b) Electromagnetic waves are transverse waves. Water waves are also transverse.

Draw a diagram of a transverse wave on the axes below. Label the amplitude and **one** wavelength on your diagram.



[3]

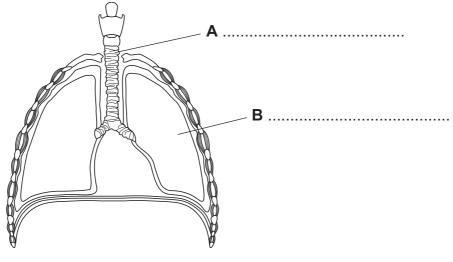
For

Use

11 (c) Fig. 6.2 shows a person looking into a mirror and seeing an image. Examiner's mirror Fig. 6.2 (i) Write the letter X on Fig. 6.2 to show the position of the image of the person's nose. [2] (ii) Select **three** words or phrases from the list that describe the image correctly. larger than object real same size as object smaller than object upright upside down virtual

7 Fig. 7.1 shows the contents of the human thorax (chest).





	A					
Fig. 7.1						
[2]	Fig. 7.1, name structures A and B .	(a) On				
the alveoli inside the lungs. Carbon dioxide	ygen diffuses into the blood from fuses into the alveoli from the blood.					
	Define the term diffusion.	(i)				
[2]						
transports dissolved carbon dioxide.	Name the component of blood that	(ii)				
[1]						
exercise, the concentration of carbon dioxide in	When a person is doing vigorous the blood increases.	(iii)				
	Explain why this happens.					
[2]						

(iv)	Suggest how this will affect the rate of diffusion of carbon dioxide from the blood the alveoli.	to
	Explain your answer.	
	effect on rate of diffusion	
	explanation	
		[2]

8 (a) Fig. 8.1 shows apparatus a student used to investigate the reaction between dilute nitric acid and excess calcium carbonate.

For Examiner's Use

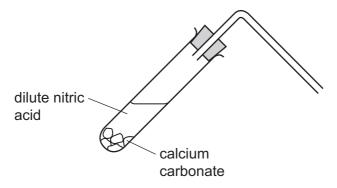


Fig. 8.1

(i)	Describe how the student could show that the reaction in Fig. 8.1 produced carbon dioxide. You may complete the diagram to help you answer this question.
	[2]
	[2]
(ii)	At the end of the reaction the test-tube in Fig. 8.1 contains a solution of the compound calcium nitrate.
	State the general name for compounds like calcium nitrate which are produced when an acid reacts with a metal carbonate.
	[1]
(iii)	The chemical formula of calcium nitrate is Ca(NO ₃) ₂ .
	State the total number of atoms and the number of different elements that are shown combined together in this formula.
	total number of atoms
	number of different elements [2]

(b) The student then carried out an investigation into the way that the rate of the reaction in (a) changed when he varied the concentration of the nitric acid.

For Examiner's Use

Fig. 8.2 shows the apparatus the student used to measure the rate of reaction.

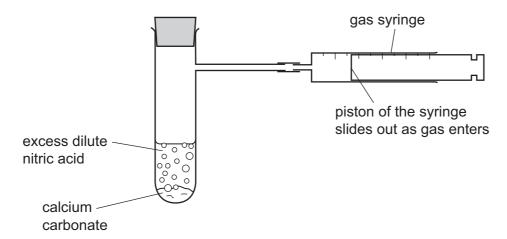


Fig. 8.2

The student measured the rate of reaction by finding how long it took for the gas syringe to fill with gas.

(i) After he had completed several measurements, the student wrote the following correct conclusion in his notebook.

Conclusion
The higher the pH of the dilute nitric acid
the longer it took for the gas syringe to
fill with gas.

Explain this conclusion briefly.
[2]
State two other variables that can affect the rate of reaction between dilute nitric acid and calcium carbonate.
1
2

(ii)

9 Fig. 9.1 shows a solar- powered golf cart used to carry golfers around a golf course.

For Examiner's Use



Fig. 9.1

(a) As the cart moves around the course, the motion of the cart is measured.

Fig. 9.2 shows a distance/time graph for a small part of the journey lasting 60 seconds.

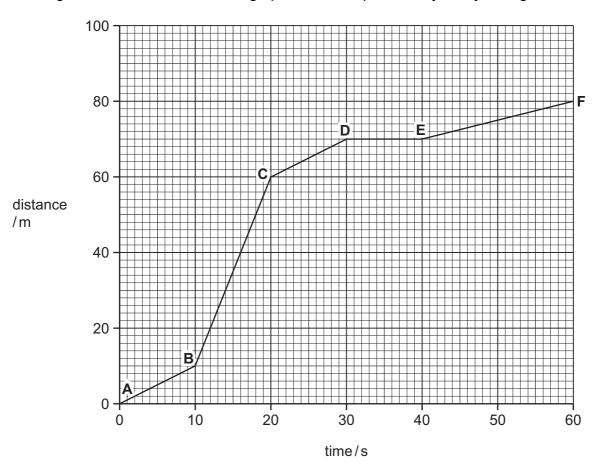


Fig. 9.2

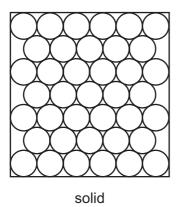
(i) Write down the total distance covered in 60 s. m [1]

	(ii)	Describe the motion of the cart between D and E .
		[1]
	(iii)	During another part of the journey, the cart is accelerating.
		State whether the forces acting on the cart are balanced or unbalanced.
		Explain your answer.
		[1]
(b)		cart is powered by solar cells on its roof. The solar cells produce electrical energy d to charge the rechargeable batteries in the cart.
	Nar	me one other renewable energy resource that could produce electrical energy.
		[1]
(c)	The	golfer hits a golf ball with his club. The ball flies through the air.
	(i)	State the form of energy given to the golf ball when the ball is hit.
		[1]
	(ii)	State the form of energy gained by the golf ball as it rises into the air after being hit.
		[1]
(d)	The	mass of a golf ball is 45 g. The volume of a golf ball is 36 cm ³ .
	Cal	culate the density of the golf ball.
	Sta	te the formula that you use and show your working.
		formula
		working
		g/cm ³ [2]

(e) The head of the golf club is made of solid metal. The air the golf ball is travelling through is a gas.

For Examiner's Use

Complete Fig. 9.3 below to show the arrangement of particles in a gas. The diagram for a solid has been done for you.



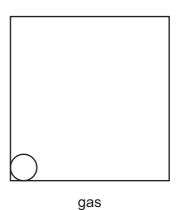


Fig. 9.3

[2]

BLANK PAGE

The Periodic Table of the Elements DATA SHEET

	0	4	He	Helium 2	20	Ne	Neon 10	40	Αr	Argon 18	84	ᅔ	Krypton 36	131	Xe	Xenon 54		Ru	Radon 86				175		Lutetium 71		בֿ	Lawrencium 103											
	=>				19	ш	Fluorine 9			_		Ā	Bromine 35	127	н	lodine 53			0				173	Υp	Ytterbium 70		No	Nobelium 102											
	 				16	0	Oxygen 8	32	S	Sulfur 16	79	Se	Selenium 34	128	<u>e</u>	Tellurium 52		Ъ	Polonium 84					Ξ			Md	Mendelevium 101											
	>				14	z	Nitrogen 7			Phosphorus 15		As	Arsenic 33	122	Sb	Antimony 51		B	Bismuth 83				167	ш	Erbium 68		Fm	Fermium 100											
	≥																12	ပ	Carbon 6	28	Si	Silicon 14	73	Ge	Germanium 32		Sn		207	Pb	Lead 82				165	웃	Holmium 67		Es
	=				11	Ф	Boron 5	27	ΝI	Aluminium 13	20	Ga	Gallium 31	115	In	Indium 49	204	11	Thallium 81					۵	Ę		₽	ε											
											65	Zu	Zinc 30	112	င္ပ	Cadmium 48	201						159	Д	Terbium 65			_											
											64	Cn	Copper 29	108	Ag		197	Αn	Gold 79						Gadolinium 64		Cm												
Group											29	Z	Nickel 28	106	Pd	Palladium 46	195	Ŧ	Platinum 78				152	En	Europium 63		Am	Americium 95											
Ď											69	ဝိ	Cobalt 27	103	R	Rhodium 45	192	Ä	Iridium 77				150		Samarium 62		Pu	Plutonium 94											
		-	I	Hydrogen 1							56	Fe	Iron 26	101		Ruthenium 44	190	SO.	Osmium 76						9		N	Neptunium 93											
												Mn	Manganese 25		ဥ	Technetium 43	186		_				144	N	um Neodymium 60	238	D	Uranium 92											
											25	ပ်	Chromium 24	96	Mo	Molybdenum 42	184	>	Tungsten 74				141	Ą	Praseodymium 59		Ра	Protactinium 91											
													51	>	Vanadium 23	93	Q N	Niobium 41	181	Та	Tantalum 73				140	ဝီ	Cerium 58	232		Thorium 90									
													48	j=	Titanium 22	91		Zirconium 40	178		Hafnium 72				,			nic mass	pol	nic) number									
											45	လွ	Scandium 21	68	>	Yttrium 39	139	La	Lanthanum 57 *	227	Ac	Adinium 89	001100	orion	5	a = relative atomic mass	X = atomic symbol	b = proton (atomic) number											
	=				6	Be	Beryllium 4	24	Mg	Magnesium 12	40	Sa	Calcium 20	88	S	Strontium 38	137	Ва	Barium 56	226	Ra	Radium 88	*58_71 Louthonoid corios	30-7 1 Lantination series	מוסוווסני	a a	× ×	٩											
	_				7	=	Lithium 3	23	Na	Sodium 11	39	¥	Potassium 19	85		Rubidium 37	133	Cs	Caesium 55	ı	Ţ	Francium 87	*58 71 1	100-7-02			Key	۵											

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

Cop
Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.