



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

COMBINED SCIENCE

0653/23

Paper 2 (Core)

October/November 2013

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 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.

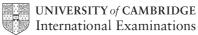
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

This document consists of **19** printed pages and **1** blank page.



1 Fig. 1.1 shows a root hair cell.

For Examiner's Use

[3]

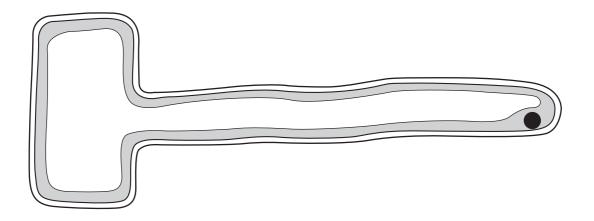


Fig. 1.1

- (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.

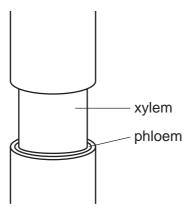


Fig. 1.2

(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

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.

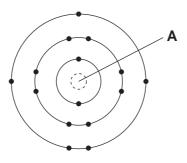
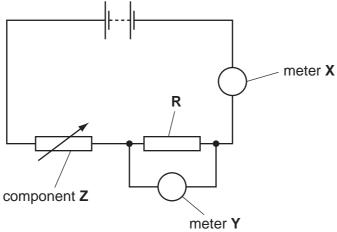


Fig. 2.1

(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.



	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 0.6A and 8.0V.	
	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]

8 5 (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. Ρ R S Q gas produced gas produced no reaction no gas produced slowly quickly orange layer forms on metal surface after several days Fig. 5.1 (i) Suggest which of the test-tubes in Fig. 5.1 contained water to which a piece of iron was added. Explain your answer. test-tube explanation [3] (ii) The colourless liquid in test-tube **R** was dilute hydrochloric acid. Suggest the name of the metal that was added to test-tube R and name the gas that was produced.

For Examiner's Use

metal

gas

[2]

	(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.	
		—c	
		[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.

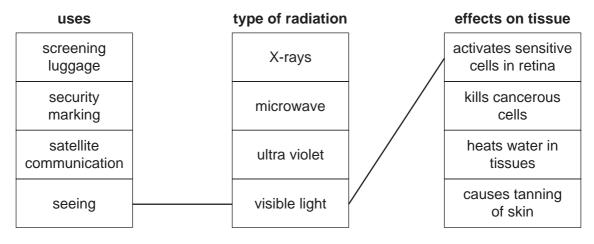


Fig. 6.1

[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]

(c) Fig. 6.2 shows a person looking into a mirror and seeing an image.





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 obje	ct
smalle	r than object	upright	upside down	virtual
				[3]

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

For Examiner's Use

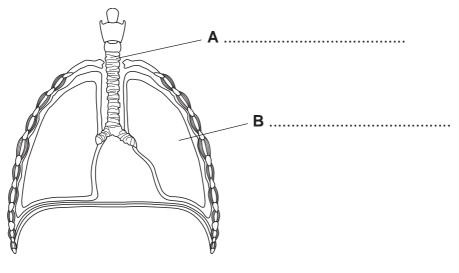


Fig. 7.1

В.

Explain why this happens.

[2]

(b) Oxygen diffuses into the blood from the alveoli inside the lungs. Carbon dioxide diffuses into the alveoli from the blood.

(i)	Define the term diffusion.	
		[2]
(ii)	Name the component of blood that transports dissolved carbon dioxide.	
		[1]
(iii)	When a person is doing vigorous exercise, the concentration of carbon dioxide	e in

(iii) When a person is doing vigorous exercise, the concentration of carbon dioxide in the blood increases.

[2

(iv)	Suggest how this will affect the rate of diffusion of carbon dioxide from the blood to the alveoli.					
	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.

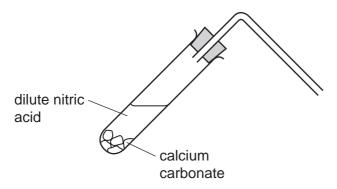


Fig. 8.1

(1)	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]							
(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.

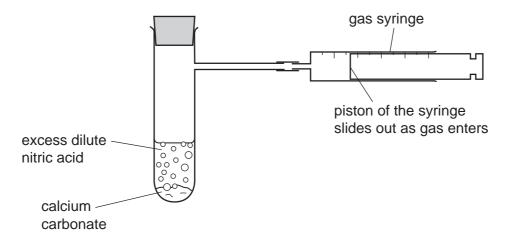


Fig. 8.2

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

(ii)

[2]

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.

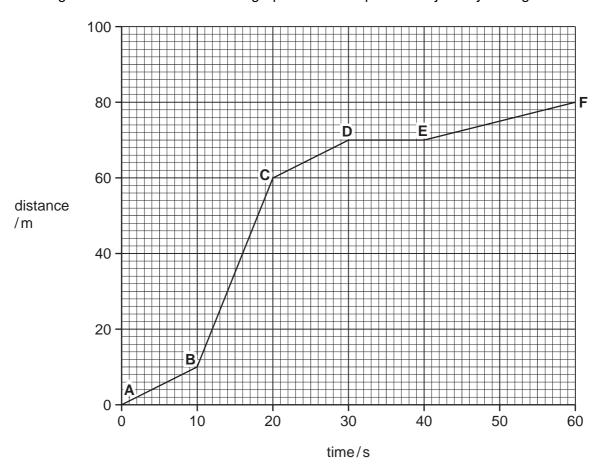


Fig. 9.2

(i) Write down the total distance covered in 60 s.

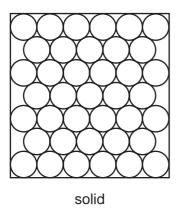
m [1]

i)	Describe the motion of the cart between D and E .				
	[1]				
i)	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]				
	cart is powered by solar cells on its roof. The solar cells produce electrical energy d to charge the rechargeable batteries in the cart.				
Van	ne one other renewable energy resource that could produce electrical energy.				
	[1]				
Γhο	golfor hito a golf hall with his alub. The hall flies through the air				
ne	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]				
i)	State the form of energy gained by the golf ball as it rises into the air after being hit.				
	[1]				
「he	mass of a golf ball is 45 g. The volume of a golf ball is 36 cm ³ .				
Calculate the density of the golf ball. State the formula that you use and show your working.					
	working				
	g/cm ³ [2]				
	i) The lise lise lise lise lise lise lise lis				

(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.



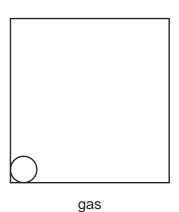


Fig. 9.3

[2]

© UCLES 2013 0653/23/O/N/13

BLANK PAGE

The Periodic Table of the Elements DATA SHEET

	0	4 He Helium	20 Neon 10 At Argom	84 Krypton 36	131 Xe Xenon 54	Radon 86		Lutetium 771	Lr Lawrencium 103
Group	II /		19 Fluorine 9 35.5 C 1 Chlorine	80 Br Bromine 35	127 	At Astatine 85		173 Yb Ytterbium 70	Nobelium 102
	5		16 Oxygen 8 32 S Sulfur	Selenium	128 Te Tellurium 52	Po Polonium 84		169 Tm Thulium	Md Mendelevium 101
	>		14 Nitrogen 7 31 Phosphorus 15	75 AS Arsenic 33	122 Sb Antimony 51	209 Bi Bismuth		167 Er Erbium 68	Fm Fermium
	≥		12 Carbon 6 Si Silicon 14	73 Ge Germanium 32	Sn Tin	207 Pb Lead		165 Ho Holmium 67	ES Einsteinium 99
	=		11 B Boron 5 27 Al Muminium	70 Ga Gallium 31	115 n Indium	204 T 1 Thallium		162 Dy Dysprosium 66	Cf Californium 98
				65 Zn Zinc 30	112 Cd Cadmium 48	201 Hg Mercury 80		159 Tb Terbium 65	BK Berkelium 97
				64 Cu Copper 29	108 Ag Silver 47	197 Au Gold		157 Gd Gadolinium 64	Curium 96
				59 Nickel	106 Pd Palladium 46	195 Pt Platinum 78		152 Eu Europium 63	Am Americium 95
				59 Co Cobalt	Rhodium 45	192 F		Sm Samarium 62	Pu Plutonium
		1 Hydrogen		56 Iron	Ru Ruthenium 44	190 Os Osmium 76		Pm Promethium 61	Neptunium 93
				Manganese	Tc Technetium 43	186 Re Rhenium 75		Neodymium 60	238 U Uranium 92
				52 Cr Chromium 24	96 Mo Molybdenum 42	184 W Tungsten 74		Pr Praseodymium 59	Pa Protactinium 91
				51 Vanadium 23	93 Niobium 41	181 Ta Tantalum 73		140 Ce Cerium	232 Th Thorium
				48 Ti Titanium	91 Zr Zirconium 40	178 Ha fnium * 72			nic mass Ibol nic) number
				Scandium 21	89 Y Yttrium 39	139 La Lanthanum 57 *	227 Ac Actinium 89	series eries	a = relative atomic mass X = atomic symbol b = proton (atomic) number
	=		Be Beryllium 4 24 Magnesium 12	40 Ca Calcium	Strontium	137 Ba Barium 56	226 Ra Radium 88	*58-71 Lanthanoid series	∞ × m
	_		7	39 Potassium	Rb Rubidium 37	Caesium 55	Francium 87	*58-71 L	Key

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.

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