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CENTRE NUMBER

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COMBINED SCIENCE

0653/22

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.

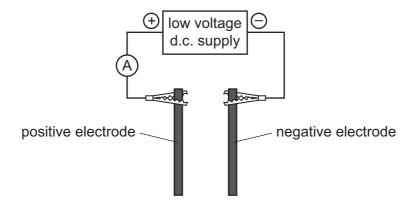
At the end of the examination, fasten all your work securely together.

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 (a) Fig. 1.1 shows apparatus that can be used to test the electrical conductivity materials contained in the beakers **Q**, **R** and **S**.



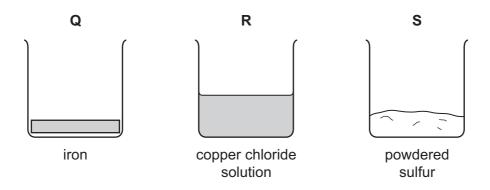


Fig. 1.1

(i) The contents of beakers **Q** and **S** are tested for electrical conductivity by lowering the electrodes into the beakers.

Predict and explain the results.

beaker Q	
prediction	
explanation	
beaker S	
prediction	
explanation	[3]

- (ii) When the electrodes are lowered into the solution in beaker **R**, the for observations are made.
 - Bubbles of gas form on the surface of the positive electrode.
 - A layer of an orange solid appears on the surface of the negative electrode.

Name the gas that forms and the substance in the orange layer.

gas	
orange layer	 [2

(iii) State the name of the process described in (ii).

.....[1]

(b) Fig. 1.2 shows names and molecular structure diagrams of some compounds containing carbon.

Draw straight lines to match the structures with names. One line has been drawn as an example.

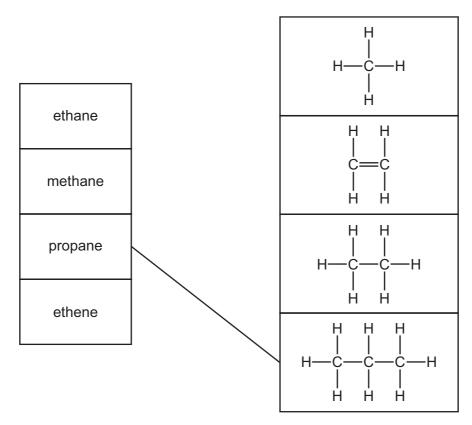


Fig. 1.2

[2]

(c) Fig. 1.3 shows the structure of one molecule of a type of compound called (chlorofluorocarbon).

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Fig. 1.3

(i)	State the chemical formula of the molecule whose structure is shown in Fig. 1.3.	
		[1]
(ii)	Explain whether or not the molecule in Fig. 1.3 is an example of a hydrocarbon.	
		נין

2 (a) Use the words or phrases below to complete the sentences.

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		5		The state of the s
Jse the words or	r phrases below to o	complete the senter	nces.	For piner's
amplitudes	frequencies	slows down	speed	speeds up
Each word or ph	rase can be used o	nce, more than onc	e, or not at all.	Se. COM
i) Light		when it travels	from air to gla	ss.

(ii)	In the electromagnetic spectrum, the waves are arranged in order of
	·
/iii\	20 Hz to 20 000 Hz is the approximate human range of audible

- (iii) 20 Hz to 20 000 Hz is the approximate human range of audible
- (iv) The _____ of sound waves determines the loudness of the sounds.

[4]

(b) Fig. 2.1 shows a demonstration of sound transmission using a bell jar.

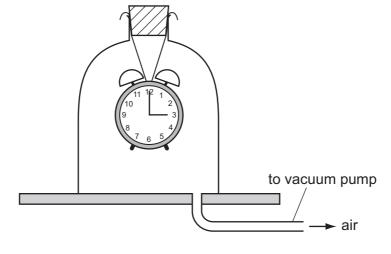


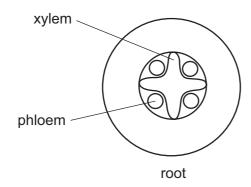
Fig. 2.1

As the air is removed from the bell jar, the ringing sound from inside the bell jar gets quieter. When all the air has been removed, the bell cannot be heard.

Explain these observations.	
[[3]

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3 (a) Fig. 3.1 shows cross-sections of a root and a stem.



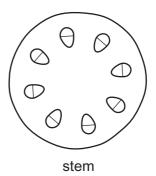


Fig. 3.1

- (i) On Fig. 3.1, use label lines to indicate the positions of the xylem and phloem on the diagram of the stem. [2]
- (ii) Describe the functions of xylem and phloem.

xylem	
phloem	

[4]

(b) The roots of most plants have root hairs near their tips.

ncentrations hall area of the Researchers grew two types of plants, A and B, in soil with different concentrations phosphate ions. They measured the mean number of root hairs in a small area of the roots, and also the mean length of the root hairs.

Table 3.1 shows their results.

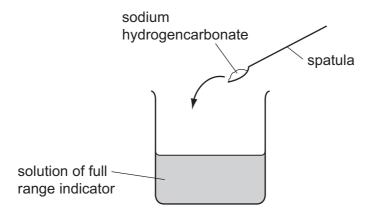
Table 3.1

type of plant	phosphate concentration	mean number of root hairs per unit area	mean length of root hairs/micrometres
۸	low	1.26	175
A	high	1.70	149
В	low	1.41	225
В	high	1.85	52

(1)	root hairs in type A plants.
	1
	2
	[2]
(ii)	Compare the effect of adding phosphate ions to the soil for type ${\bf A}$ plants and for type ${\bf B}$ plants.
	[2]
(iii)	Explain why a reduction in the length of its root hairs could reduce the rate of growth of a plant.
	[3]

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- 4 Sodium hydrogencarbonate, NaHCO₃, is a white solid compound which is soluble in
 - (a) A student adds some sodium hydrogencarbonate to a beaker which containes aqueous solution of full range indicator (Universal Indicator).



When the sodium hydrogencarbonate dissolves, the solution changes colour from green to blue.

(i)	State and explain briefly how the pH of the mixture changes when the sodium hydrogencarbonate dissolves.
(ii)	The student then adds excess dilute hydrochloric acid to the blue solution.
	Apart from an increase in volume, state two observations that are made when the acid is added.
	1
	2
	[2]

(b) Fig. 4.1 shows apparatus a teacher uses to demonstrate the heating of hydrogencarbonate.

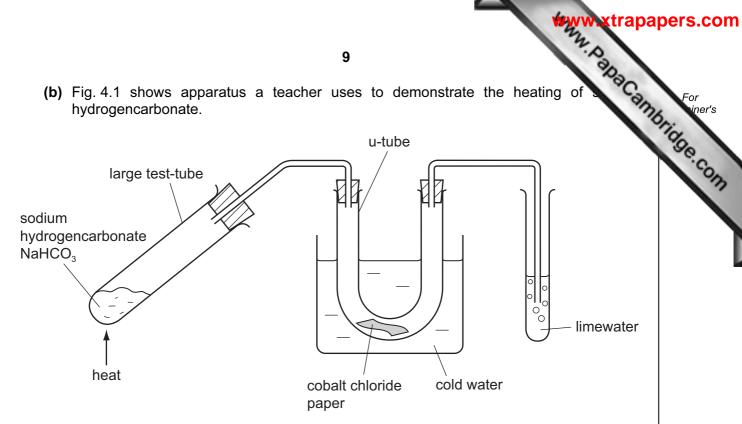


Fig. 4.1

The solid is heated strongly for a few minutes.

- The cobalt chloride paper changes colour from blue to pink.
- A gas bubbles out through the limewater, turning it cloudy.

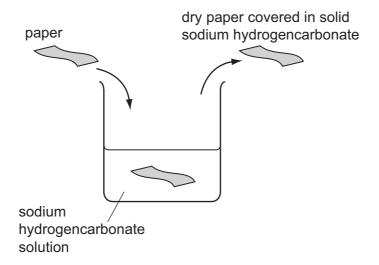
After the reaction, a white solid, sodium carbonate, remains in the large test-tube.

(1)	produce	tne	obser	vations	snow	tnat	both	water	and	carbon	dioxide	are
		 										[2]

[Turn over © UCLES 2013

(ii) A student places a piece of paper into a solution of sodium hydrogencarbona

She removes the paper and allows it to dry. She notices that crystals of soil sodium hydrogencarbonate are left on the paper.



The student found that it is now difficult to set fire to the paper.

difficult to get the paper to burn.	to suggest why the student finds it
	[2]

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5 (a) Fig. 5.1 shows a bicycle with two lights **A** and **B** at the front.

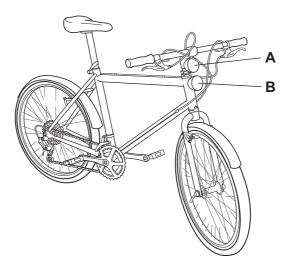


Fig. 5.1

Fig. 5.2 shows the circuit used to power the two lights.

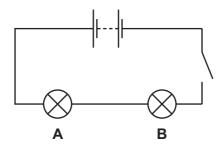


Fig. 5.2

(i) State the name given to this type of circuit arrangement.

(ii) To calculate the resistance of light **A**, the current flowing through it and the voltage across it must be measured.

On Fig. 5.2, using the correct symbols, draw an ammeter and a voltmeter correctly connected to make these measurements. [4]

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	aCanno
Ω	[2]
lov t	ume
cm³	[2]
	[1]
	cm ³

6 Fig. 6.1 shows the male reproductive system.

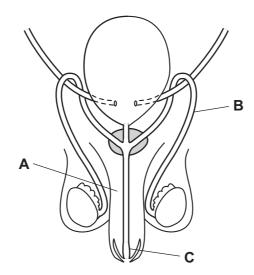


Fig. 6.1

(a)	Naı	me the parts labelled A , B and C .	
	Α.		
	В.		
	c .		[3]
(b)		infection may block the tube labelled B . If the tube on the other side is also blocked man may be unable to have children.	ed,
	Exp	olain why.	
			[2]
(c)	ΗI\	//AIDS is a disease that can be passed on by sexual intercourse.	
	(i)	What does HIV stand for?	
		I	[1]
	(ii)	State one way in which a man with HIV/AIDS can avoid passing it to anoth person.	er
			[1]

[1]

- 7 (a) The elements chlorine, bromine and iodine are found in Group 7 of the Periodic
 - (i) Complete Table 7.1 by writing the physical state (solid, liquid or gas) at root temperature (20 °C) of the elements.

Table 7.1

element	physical state
bromine	
iodine	

(ii)	Explain why an iodine atom is larger and heavier than a bromine atom.
	[2]
(iii)	An aqueous solution containing chlorine is added to a colourless solution of potassium iodide.
	chlorine solution colourless solution of potassium iodide
	Describe and explain briefly what is observed in this reaction.
	observation
	explanation

15

(b)	Explain why a dilute solution of chlorine is usually added to drinking water before supplied to homes.
	[2]
(c)	Helium is a gas found in Group 0 of the Periodic Table.
	Some helium is added to a flask containing chlorine and left for a few days.
	Predict and explain whether the flask now contains a mixture of the two elements or a compound.
	[2]

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8 (a) Fig. 8.1 shows a car moving along a road.

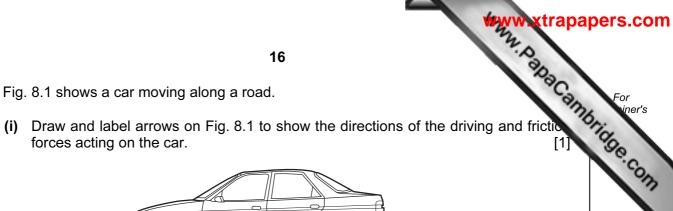




	Fig. 8.1
(ii)	State one source of friction on the moving car.
	[1]
(iii)	The driving and friction forces are balanced.
	Explain what is meant by the phrase forces are balanced.
	[1]
(iv)	Describe the movement of the car when these forces are balanced.
(1-7)	Describe the merement of the ear when these forces are balanced.
	[41]
	[1]
(v)	Apart from the driving and friction forces there are other forces acting on the car.
	Name one of these forces.
	[1]
(b) (i)	The car travels a distance of 400 m down a hill in 25 seconds.
	Calculate the average speed of the car.
	State the formula that you use and show your working.
	formula
	working

[2]

_____m/s

(ii)	The car is going faster at the bottom of the hill than it was at the top.	Can	For siner's
	State the type of energy which the car has gained.	10	Tity Ist's
(iii)	State the type of energy which the car will have lost as it travels down the hill.		Se. CO
		[1]	

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9 (a) Fig. 9.1 shows a food web in the Antarctic Ocean.

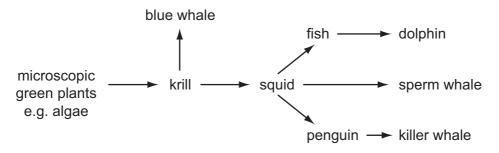


Fig. 9.1

		
	(i)	State the term used for organisms such as the microscopic green plants that make their own organic nutrients.
		[1]
	(ii)	Name one organic nutrient that is made by the green plants.
		[1]
	(iii)	State what is shown by the arrows in the food web.
		[1]
(b)	Fisl	ning boats catch large quantities of krill in the Antarctic Ocean.
	Sug	ggest how this could affect the numbers of the organisms in the food web in Fig. 9.1.
		[2]
(c)		ere is concern that global warming will damage the environment in the Antarctic ean.
	Nar	me two gases that contribute to global warming.
	1.	
	2	[2]

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140	141	144		150	152	157		162		167	169	173	175	
çe	P	Š	Pm		En	g d	Д	Dy	유	й	Ę	Υp	3	
Cerium	Praseodymium 59	Neodymiu 60	m Promethium 61	Samarium 62	Europium 63	Gadolinium 64		Dysprosium 66 6	- 1	Erbium 68	Thulium 69	Ytterbium 70	Lutetium 71	
232 Th	Pa	238 U	N	Pu	Am	Cm	Bk	Cf	Es	Fm	PΜ	S _o	Lr	10
Thorium	Protactinium 91	Uranium 92	Neptunium 93	Plutonium 94	Americium 95	Curium 96	Berkelium 97	Californium 98	Einsteinium 99	Fermium 100	Mendelevium 101	Nobelium 102	Lawrencium 103	WV.
The v	olume of	one mole	of any ge	as is 24 dr	m³ at roor	n tempera	ature and	The volume of one mole of any gas is 24 dm $^{\rm 3}$ at room temperature and pressure (r.t.p.).	(r.t.p.).				1	Papar
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*58-71 Lanthanoid series 90-103 Actinoid series b = proton (atomic) number

a = relative atomic mass X = atomic symbol

Key

	0	4 He Helium	Neon Neon 10	40 Ar Argon	84 Kr Krypton 36	131 Xe Xenon 54	Radon 86	
	IIΛ		19 Fluorine	35.5 C1 Chlorine	80 Br Bromine 35	127 T lodine	At Astatine 85	
	IN		16 Oxygen	32 S ulfur	Selenium	128 Te Tellurium	Po Polonium 84	
	>		Nitrogen	31 Phosphorus	75 As Arsenic	122 Sb Antimony 51	209 Bi Bismuth 83	
	<u>\</u>		12 Carbon	28 Si Silicon	73 Ge Germanium 32	Sn Tin	207 Pb Lead 82	
	≡		11 Boron	27 A1 Aluminium 13	70 Ga Gallium 31	115 In Indium 49	204 T t Thallium	
					65 Zn Zinc 30	112 Cd Cadmium 48	201 Hg Mercury 80	
					64 Copper	108 Ag Silver 47	197 Au Gold	
Group					59 X Nickel	106 Pd Palladium 46	195 Pt Platinum 78	
Gre					59 Co Cobalt	Rhodium 45	192 Ir Iridium	
		T Hydrogen			56 Fe Iron	101 Ru Ruthenium 44	190 Os Osmium 76	
					55 Mn Manganese 25	Tc Technetium 43	186 Re Rhenium 75	
					Chromium	96 Mo Molybdenum 42	184 W Tungsten 74	
					51 V Vanadium 23	Nobium A1	181 Ta Tantalum 73	
					48 T Titanium	91 Zr Zirconium 40	178 Hf Hafnium 72	
					Scandium	89 ≺ Yttrium	La Lanthanum 57 *	227 Ac Actinium †
	=		9 Be Beryllium	24 Mg Magnesium	40 Ca Calcium	Strontium	137 Ba Barium 56	226 Ra Radium 88
	_		7 Li Lithium	23 Na Sodium	39 K Potassium 19	Rb Rubidium 37	133 Cs Caesium 55	Fr Francium 87

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The Periodic Table of the Elements DATA SHEET