



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CANDIDATE NAME				
CENTRE NUMBER		CANDIDATE NUMBER		

COMBINED SCIENCE

0653/21

Paper 2 (Core)

October/November 2012

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 soft pencil for any diagrams, graphs, tables or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

DO **NOT** WRITE IN ANY BARCODES.

Answer all questions.

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.

For Exam	iner's Use
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

This document consists of 18 printed pages and 2 blank pages.



1 (a) Complete Table 1.1 by choosing one of the words from the list to match each statement.

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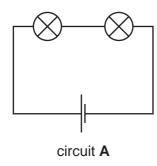
ammeter	ampere	electron	insulator	
ohm	volt	voltmeter	watt	

Table 1.1

statement	word
a particle with a negative electrical charge	
an instrument that measures electrical current	
the unit of potential difference	
a material that does not conduct electricity	

[4]

(b) Fig. 1.1 shows two circuits, **A** and **B**. All the lamps and both cells are the same.



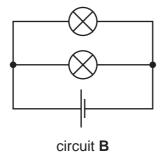


Fig. 1.1

(i) One lamp is unscrewed from circuit A.

State what happens to the other lamp.

Explain your answer.

rol

[2]

(ii)	Explain why lights in a house are connected as in circuit B and not as in circuit A .	For Examiner's Use
	[2]	
(iii)	The resistance of each lamp is 1.2Ω .	
	Calculate the combined resistance of the two lamps in circuit A .	
	State the formula that you use and show your working.	
	formula used	
	working	
	Ω [2]	

2 (a) Fig. 2.1 shows part of the carbon cycle.

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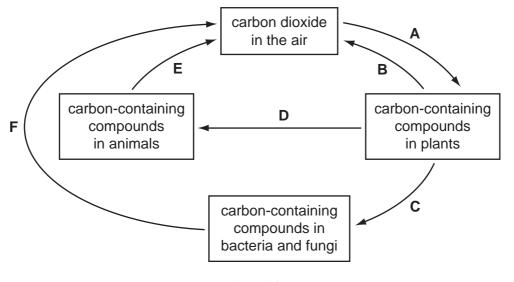


Fig. 2.1

(i)	State the letter that represents photosynthesis in Fig. 2.1.	[1]
(ii)	State the three letters that represent respiration in Fig. 2.1.	
		[1]
iii)	Name one carbon-containing compound in plants.	
		[1]
iv)	State the approximate percentage of carbon dioxide in the air.	
		[1]
(i)	Earthworms play an important part in the carbon cycle. They eat leaves, and eg material containing plant nutrients into the soil.	est
	Explain the meaning of the term egest.	

(ii) Underline the **two** words that describe the position of an earthworm in a food chain.

carnivore consumer herbivore producer

[1]

(b)

(iii)	Fishermen catch large numbers of earthworms to use as bait.
	There are concerns that too many earthworms are being collected.
	Suggest why it is important to conserve earthworms.
	[2]

3 (a) Fig. 3.1 shows how a digital pH meter is used to measure the pH of some liquids.

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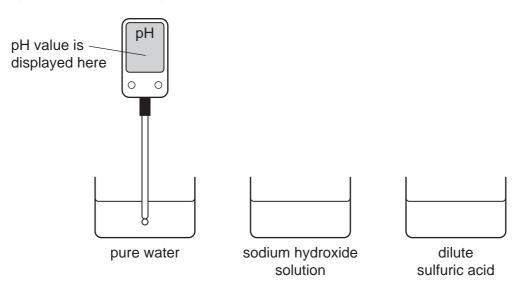


Fig. 3.1

(i) Complete Table 3.1 by suggesting suitable pH values for the different liquids.

Table 3.1

liquid	рН
pure water	
sodium hydroxide solution	
dilute sulfuric acid	

[3]

	(ii)	Suggest one advantage of using a digital pH meter rather than a piece of litm paper to compare the acidity of two different acid solutions.	nus
			[1]
(b)		scribe how a student could use a solution of acidified silver nitrate to find ether or not an unlabelled solution contains sodium chloride.	out
			[2]

(C)		en a reactive metal is added to a dilute acid, the metal reacts and dissolves and is given off.	ı a
	(i)	Name one reactive metal that must not be added to a dilute acid.	
		Explain why this metal should not be added to acid.	
		metal	
		explanation	
			[2]

(ii) Fig. 3.2 shows how a student tested the gas given off when magnesium was added to dilute hydrochloric acid.

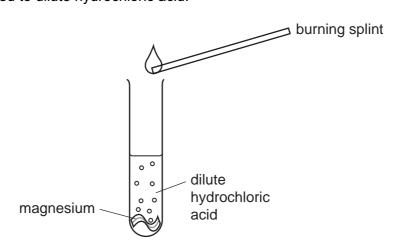


Fig. 3.2

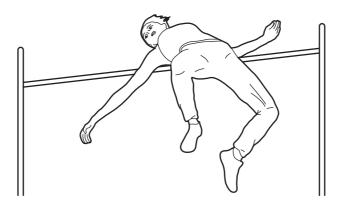
State and explain what the student observed when he carried out this test.

observation	
explanation	[2]

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4 An athlete competes in the high jump.





(a)		scribe the energy changes that take place between the athlete taking off and landing or the high jump.
		[3]
(b)	Afte	er jumping, the athlete is sweating.
	(i)	Describe, in terms of particles, how evaporation occurs from the surface of a liquid.
		[2]
	(ii)	Explain how this process will cool down the athlete.
		[1]

Please turn over for Question 5.

5 Table 5.1 shows some of the nutrients contained in 100 g of five foods.

Table 5.1

		nutrients											
food	sugar/g	starch/g	protein/g	fat/g									
Α	0	0	13	10									
В	14	6	7	0									
С	0	0	14	6									
D	6	8	12	14									
E	9	14	3	0									

(a)	(1)	Which two nutrients listed in Table 5.1 are carbohydrates?
		and[2]
	(ii)	Which nutrient listed in Table 5.1 contains nitrogen atoms in its molecules?
		[1]
	(iii)	State the letters of two foods in Table 5.1 that could have come from animals.
		and[1]
	(iv)	State the letter of one food that would appear orange-brown when tested with iodine solution, and give a purple colour when tested with biuret reagent.
		[1]
	(v)	State the letter of the food that provides the most energy per 100 g.
		[1]
(b)	Tab	ole 5.1 does not contain information about vitamins or minerals.
	Out	lline the symptoms that a person may develop if their diet is deficient in
	(i)	vitamin D,
		[1]
	(ii)	iron.
		[1]

(c)	Explain why eating a lot of foods containing sugar can increase the risk of tooth decay.
	[3]

6 Some types of firework are made by filling a cardboard tube with firework mixture. Firework mixture is made from several solid substances which have been powdered and mixed together.

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Fig. 6.1 shows a typical firework.

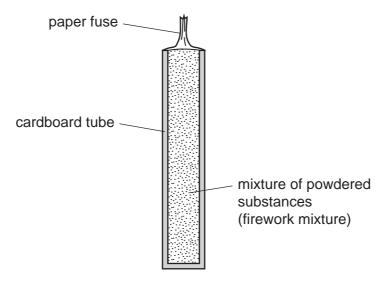


Fig. 6.1

When the paper fuse is lit, exothermic chemical reactions occur inside the firework.

(a) (i) State two forms of energy that are released when the firework mixture reacts.

1	
2	 2]

(ii) State the effect on the rate of reaction of using firework mixture in the form of a powder.

[1]

(b) Some firework mixtures contain aluminium which is oxidised when the firework is lit.

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Table 6.1 shows the numbers of protons and electrons in four particles, $\bf A$, $\bf B$, $\bf C$ and $\bf D$, which are involved in the oxidation of aluminium.

Table 6.1

particle	number of protons	number of electrons				
Α	8	10				
В	13	13				
С	8	8				
D	13	10				

	(i)	Atoms of the element aluminium have the proton number 13.
		State and explain which particle, B or D , in Table 6.1 is an atom of aluminium.
		particle
		explanation
		[1]
	(ii)	State and explain which two particles in Table 6.1 could be found bonded together in aluminium oxide.
		particles and
		explanation
		[3]
(c)	Fire	ework mixtures contain the compound potassium perchlorate, KC <i>l</i> O ₄ .
		en potassium perchlorate is heated, a colourless gas is given off which re-lights a wing splint.
	(i)	State the name of this gas. [1]
	(ii)	Suggest how potassium perchlorate in the firework mixture helps the mixture to burn.
		[2]

7 (a) On the grid below, draw a wave with an amplitude of 2 cm and a wavelength of 4 cm.On your diagram, clearly label the amplitude and the wavelength.

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Ľ				Ι		Г	Ι	П			Γ	LΤ		Ι	LΠ	Ι		Ι		LΤ	Ι	Т	Γ					Г	Ι	Ι			Γ				Г	\Box			Ι			Ι	I		Ι	LΤ		Ι	Γ			Ι	LΤ	Г	Ι	LΤ	
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[3]

(b)	(i)	Two sound waves, ${\bf A}$ and ${\bf B}$, have the same frequency. ${\bf A}$ has a greater amplitude than ${\bf B}$.
		What difference would you hear?
		[1
	(ii)	Two sound waves, ${\bf X}$ and ${\bf Y}$, have the same amplitude. ${\bf X}$ has a greater frequence than ${\bf Y}$.
		What difference would you hear?
		[1
(c)	Ene	ergy travels to the Earth from the Sun.
	Sta	te whether this transfer of energy is by conduction, convection or radiation.

Explain your answer.

8 Fig. 8.1 shows the male reproductive system.

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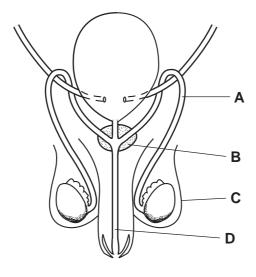


Fig. 8.1

(a)	(i)	Name parts C and D .	
		c	
		D	[2]
	(ii)	State the functions of parts A and B .	
		A	
		В	[2]
(iii)	On Fig. 8.1, use a label line and the letter S to indicate where male gametes a made.	are [1]
(b)	The	e human immunodeficiency virus (HIV) can be transmitted during sexual intercours	se.
	Out	tline two other ways in which HIV can be transmitted.	
	1.		
	2.		
			[2]

9	Chl	orine	e is released when hydrochloric acid reacts with the compound, manganese dioxide.
	(a)	(i)	Explain why chlorine is an example of an element and not a compound.
			[2]
		(ii)	Describe a safe test for chlorine gas.
			[2]
	(b)	Chl	orine is produced in the chemical industry by electrolysis.
		A si	mplified diagram of the apparatus used to produce chlorine is shown in Fig. 9.1.
			solution of compound X solution of compound X alkaline solution
			Fig. 9.1
		(i)	State the meaning of the term <i>anode</i> .
			[1]

	(ii)	A student knows that compound ${\bf X}$ in Fig. 9.1 is either sodium hydroxide, NaOH, or sodium chloride, NaC $\it l$.
		Using information from Fig. 9.1, deduce whether compound ${\bf X}$ is sodium hydroxide or sodium chloride.
		Explain your answer.
		X is
		explanation
		[1]
(c)		orine is found in Group 7 of the Periodic Table. Two of the other elements in oup 7 are bromine and iodine.
	(i)	Chlorine is a gas at room temperature.
		What are the physical states of bromine and iodine at room temperature?
		bromine
		iodine [2]
	(ii)	Explain briefly why a solution of sodium bromide turns orange when chlorine is bubbled through it.
		[2]

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DATA SHEET
The Periodic Table of the Elements

	0	4 He Helium	20 Ne Neon	40 Ar Argon	84 K	Krypton 36	131	Xenon Xenon 54	ı	Rn Radon 86		175 Lu Lutetium 71	Lr Lawrencium 103
	II/		19 F Fluorine	35.5 C1 Chlorine	80 D	Bromine 35	127	lodine 53		At Astatine 85		173 Yb Ytterbium 70	Nobelium
	>		16 Oxygen 8	32 S Sulfur	79 Se	Selenium 34	128	Tellurium 52	1	Po Polonium 84		169 Tm Thulium 69	Mendelevium
	^		14 N Nitrogen 7	31 Phosphorus 15	75 As	Arsenic 33	122	Sb Antimony 51	209	Bi Bismuth 83		167 Er Erbium 68	Fm Fermium 100
	2		12 C Carbon 6	28 Si Silicon		Germanium 32		So III	207	Pb Lead 82		165 Ho Holmium 67	ES Einsteinium 99
	=		11 B Boron 5	27 A1 Aluminium 13	70 Ga	Gallium 31	115	Indium	204	T t Thallium 81		162 Dy Dysprosium 66	Cf Californium 98
					65 Zn	Zinc 30	112	Cadmium 48	201	Hg Mercury 80		159 Tb Terbium 65	Bk Berkelium 97
					°54	Copper 29	108	Ag Silver 47		Au Gold 79		157 Gd Gadolinium 64	Cm Curium 96
Group					²⁸	Nickel 28	106	Palladium 46	195	Pt Platinum 78		152 Eu Europium 63	Am Americium 95
ອັ					°29	Cobalt 27	103	Khodium 45	192	lridium 77		Samarium 62	Pu Plutonium 94
		T Hydrogen			56 Fe	Iron 26	101	Ku Ruthenium 44	190	Osmium 76		Pm Promethium 61	Neptunium 93
					SS Mn	Manganese 25	ı	Technetium 43	186	Re Rhenium 75		144 Nd um Neodymium 60	238 U Uranium
					ن و	Chromium 24	96	Molybdenum 42	184	Tungsten 74		141 Pr Praseodymium 59	Pa Protactinium 91
					55 >	Vanadium 23	93	Niobium 41	181	Ta Tantalum 73		140 Ce Cerium 58	232 Th Thorium
					⁴⁸	Titanium 22	91	Zirconium 40	178	Hatnium 72		ı	a = relative atomic mass X = atomic symbol b = proton (atomic) number
					Sc 55	Scandium 21	88	Yttrium 39	139	Lanthanum 57	Actinium 89	d series series	a = relative atomic mass X = atomic symbol b = proton (atomic) numb
	=		9 Be Beryllium	24 Magnesium 12	6 Ca	Calcium 20	88 (Strontium 38	137	Ba Barium 56	226 Rad ium Radium	*58-71 Lanthanoid series 190-103 Actinoid series	æ ×
	_		7 Lithium 3	23 Na Sodium	® ¥	Potassium 19	85	Rubidium 37	133	Caesium 55	Fr Francium 87	*58-71 L	Key

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