

## UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CANDIDATE NAME						
CENTRE NUMBER				ANDIDATE UMBER		

**COMBINED SCIENCE** 

0653/02

Paper 2 (Core)

October/November 2009

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 19 printed pages and 1 blank page.



[Turn over

1 Table 1.1 shows the results of food tests made on two different foods.

For Examiner's Use

## Table 1.1

food	colour with iodine solution	colour with biuret solution
Α	blue-black	blue
В	brown	purple

(a)	Use	the results in Table 1.1 to state the nutrient present in food <b>A</b> and in food <b>B</b> .	
	food	d A	
	food	i B	[2]
(b)	The	enzyme amylase is present in saliva. It helps to digest starch in the mouth.	
	(i)	Explain what is meant by the term <i>enzyme</i> .	
			••••
			[2]
	(ii)	Some people do not produce amylase in their saliva or other digestive juices.	
		Explain why these people <b>cannot</b> obtain energy from the starch in their diet.	
			••••
			[3]
(	(iii)	The inability to produce amylase can be passed on from parents to their children	
		Suggest what causes this inability.	
			[1]
(	(iv)	Dogs are carnivores. Dogs do not produce amylase.	
		Explain why carnivores, such as dogs, do not need to produce amylase.	
			[1]

**2** (a) Fig. 2.1 shows some of the gases which are released into the air when volcanoes erupt.

For Examiner's Use

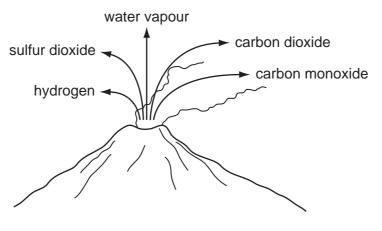


Fig. 2.1

(i)	Which gas shown in Fig. 2.1 is an element?	[1]
(ii)	Explain how volcanic eruptions could cause acid rain.	
		[2]

- (b) Carbon dioxide molecules are formed when two non-metallic elements combine.
  - (i) State the type of chemical bonding in a carbon dioxide molecule.

[1]

(ii) Complete Table 2.1 by drawing the displayed (graphical) formula of carbon dioxide.

Table 2.1

	molecular formula	displayed formula
water	H <sub>2</sub> O	H – O – H
carbon dioxide	CO <sub>2</sub>	

[2]

3 Radiation can be used to monitor the thickness of paper in a paper mill.

For Examiner's Use

Fig. 3.1 shows a radiation detector connected to a control unit. This sends messages to machines that adjust the gap between the rollers.

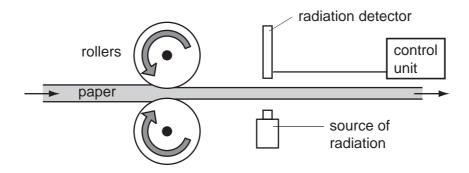


Fig. 3.1

(a) The following sentences describe what happens if the paper sheet produced is too thin.

The sentences are in the wrong order.

- **A** The gap between the rollers is increased.
- **B** The paper sheet is now rolled a little thicker.
- **C** A signal goes from the detector to the control unit.
- **D** The paper sheet absorbs less beta radiation so more reaches the detector.

Arrange the sentences in the correct order.



[2]

(b)	Explain why	an alpha	radiation	source	cannot	oe used	l to r	monitor	the	thickness	of the
	paper sheet.										

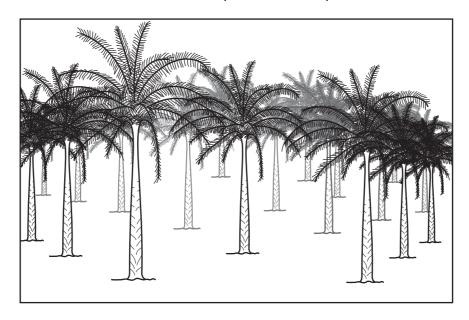
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(c)	Radioactive materials give out radiation.
	Describe how this radiation can harm people.
	[0]
	[2]
(d)	The technician servicing this equipment must be able to handle radioactive substances safely. Suggest two safety precautions that he uses.
	1st precaution
	2nd precaution
	[2]

4 In some countries in south-east Asia, large areas of tropical rainforest have been cut down to clear the land. The land has then been planted with oil-palm trees.

For Examiner's Use

[2]



(a)	Exp	plain how cutting down tropical rainforest may affect each of the following.
	(i)	soil erosion
		[2]
	(ii)	species diversity

(b)		Oil palm rats often live in oil-palm plantations. The rats eat the oil-palm fruits. Owls prey on the oil-palm rats.									
	(i)	Draw a food chain to show this information.									
		[2]									
	(ii)	For each organism in your food chain, state whether it is a producer or a consumer.									
		[1]									

(a) ACI	ds are neutralised by alkalis.
(i)	Complete the general word equation below.
а	acid + alkali +
	[2
(ii)	State the element which is present in all acids.
(iii)	Sodium hydroxide solution is an example of an alkali.
()	Write the chemical formula of sodium hydroxide.
	[
(b) (i)	Name the main metallic element in steel.
	[
(ii)	Describe what is meant by the term <i>galvanised</i> , and state briefly why some steel galvanised.
(iii)	Explain why galvanised steel is <b>not</b> a suitable material for making containers use for storing acids.

(c)		Poly(propene) is a compound used in making plastics. Poly(propene) is a polymer made of the monomer, propene ( $C_3H_6$ ).					
	(i)	State the total number of atoms combined in one molecule of propene.					
		[1]					
	(ii)	Explain why propene is an example of a hydrocarbon.					
		[1]					
	(iii)	Poly(propene) molecules are formed when propene is heated with a catalyst.					
		Describe how propene molecules react to form poly(propene). You may draw a simple diagram if it helps you to answer this question.					
		[2]					

**6** A motorcyclist begins a journey on his motorcycle. The motorcycle starts from rest and stops at a road junction after 80 seconds. The motorcycle then moves off again and completes the journey.

For Examiner's Use

(a) Fig. 6.1 shows a graph of the motion of the motorcycle.

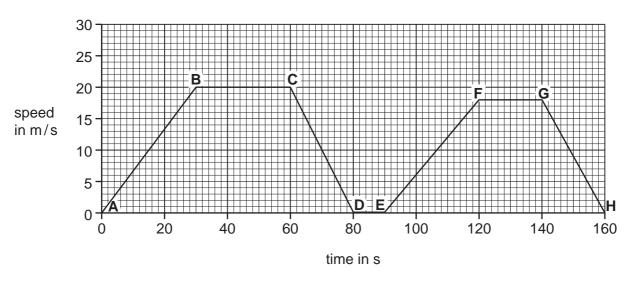


Fig. 6.1

(i)	From the start of the journey, how long did it take the motorcyclist to reach a speed
	of 10 m/s?

s [	1
 ٠ .	

(ii) For how long was the motorcyclist travelling at a steady speed of 20 m/s?

(iii) During which two parts of the journey was the motorcyclist slowing down?

from	to	
and from	to	Г1

**(b)** Describe the motion of the moving motorcycle if the total frictional force it experiences is the same as the force produced by the engine.

Explain your answer.	
	[2]

(c) Motorcycle engines use petrol as a fuel.

For Examiner's Use

When motorcycle engines are tested at the factory, a tube should be attached to the exhaust pipe.

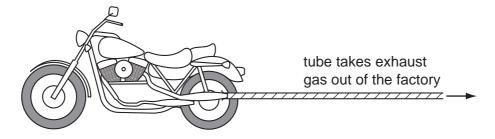


Fig. 6.2

(i)	Exp	lain why the exhaust gas must be rem	oved from the factory.	
				[2]
(ii)	Cor eng	nplete the sentences to show the endine.	ergy changes involved in the moto	rcycle
	•	Fuel contains	energy.	
	•	Fuel burns in the engine to produce	energy	′
		and	energy.	[3]

7 Fig. 7.1 shows a transverse section of part of a leaf. The arrows show water movement.



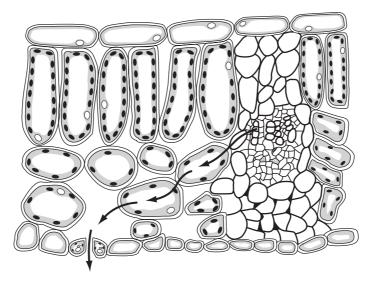


Fig. 7.1

(a)	On	Fig. 7.1, label each of following structures, using label lines.	
	(i)	a palisade cell	[1]
	(ii)	a stoma	[1]
(b)	Des	scribe the function of each of these parts of a palisade cell.	
	(i)	nucleus	
			[2]
	(ii) 	cell surface membrane	[1]
(c)	(i)	Explain why palisade cells need a good supply of water.	
			[2]
	(ii)	Name the type of cell that transports water from the roots to a leaf.	[4]
			1711

(d) (i)	Fig. 7.1 shows water moving through the leaf and out into the surrounding air.	Exa
	In what state, solid, liquid or gas, is the water as it moves from the leaf into the air?	LXC
	[1]	
(ii)	Name the process by which the water moves out of the leaf into the air.	
	[1]	

**8** (a) Fig. 8.1 shows an aluminium saucepan on a cooker. Vegetables are being cooked in boiling water in the pan.

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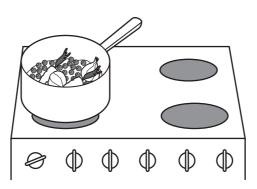
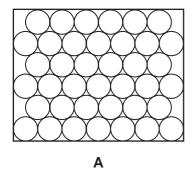


Fig. 8.1

(i)	State how the energy passes from the hot cooker through the base of the panthe water.	to
		[1]
(ii)	Suggest why saucepan handles are often made from plastic rather than metal.	
		[1]

(b) Fig. 8.2 shows three different ways in which particles may be arranged in substances.



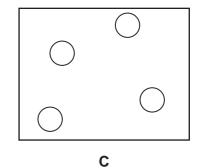


Fig. 8.2

В

(i) Which diagram best represents the way particles are arranged in the aluminium saucepan?

Explain your answer.

diagram

explanation

[1]

	(ii)	Which diagram best represents the way particles are arranged in the water in the saucepan?
		Explain your answer.
		diagram
		explanation
		[1]
(c)	Fig.	8.3 shows a block of aluminium which has a mass of 540 g.
		aluminium
		2 cm 540 g 10 cm
		<b>←</b> 10 cm
		Fig. 8.3
	(i)	Calculate the density of the block.
		State the formula that you use and show your working.
		g/cm <sup>3</sup> [3]
	(ii)	Calculate the weight of the block. Assume that the gravitational field strength of the
	(11)	Earth is 10 N/kg.
		N [1]

9 A student uses dilute hydrochloric acid to test four pieces of rock, W, X, Y and Z.
She allows some of the acid to fall onto the samples and observes what happens.

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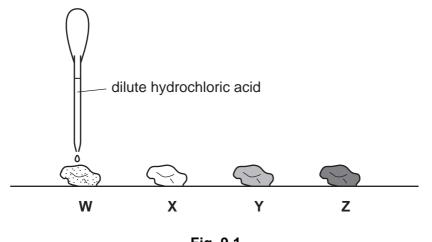


Fig. 9.1

Her observations are shown in Table 9.1.

Table 9.1

rock	appearance before acid added	reaction with acid
w	light grey	carbon dioxide gas produced
Х	white	no reaction
Υ	green	carbon dioxide gas produced
Z	dark grey	no reaction

(a) (i)	State which of the rocks <b>W</b> , <b>X</b> , <b>Y</b> and <b>Z</b> , contain a carbonate.
	Explain your answer.
	rocks
	explanation
	[2]
(ii)	Copper is a transition metal. Suggest and explain which rock contains the compound, copper carbonate.
	rock
	explanation
	[2]

**(b)** Copper metal can be extracted from copper carbonate in two stages as shown in Fig. 9.2.

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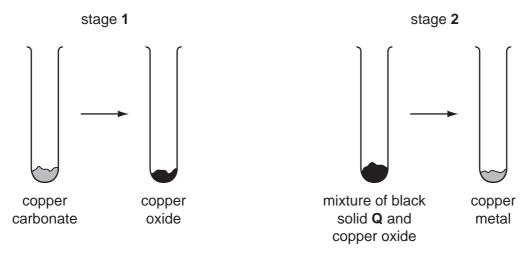


Fig. 9.2

(i) The reaction in stage 1 is an example of thermal decomposition.

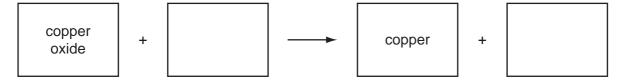
State what has to be done to copper carbonate in order to cause this reaction to occur.

[1]

(ii) A black solid **Q** is mixed with the copper oxide made in stage **1**.

The reaction in stage 2 occurs when this mixture is heated.

Complete the word equation for this reaction, using the correct chemical name for substance  $\mathbf{Q}$ .



[2]

(iii) Name the type of chemical reaction in (ii) and explain your answer briefly.

[2]

(iv) Draw a diagram of a simple electrical circuit which could be used to show that the product of the reaction in stage 2 is a metal.

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[2]

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DATA SHEET
The Periodic Table of the Elements

	0	<b>4</b> ₽	Helium 2	20	Ne	Neon 10	40	Ā	Argon 18	84	궃	Krypton 36	131	×	Xenon 54		R	Radon 86				175	ר	Lutetium 71		۲	Lawrencium 103
				19	ш	Fluorine 9	35.5	CI	Chlorine 17	80	Ā	Bromine 35	127	Ι	lodine 53		¥	Astatine 85				173	Υb	Ytterbium 70		8	Nobelium 102
	5			16	0	Oxygen 8	32	တ	Sulfur 16	62	Se	Selenium 34	128	<u>a</u>	Tellurium 52		Ъо	Polonium 84				169	Ę	Thulium 69		Md	Mendelevium 101
	>			14	z	Nitrogen 7	31	凸	Phosphorus 15	75	As	Arsenic 33	122		Antimony 51	509	Ξ	Bismuth 83				167	ш	Erbium 68		Fm	Fermium 100
	2			12	ပ	Carbon 6	28	Si	Silicon 14	73	Ge	Germanium 32	119		Tin 50	207	Pb	Lead 82				165	운	Holmium 67		Es	Einsteinium 99
	=			1	Δ	Boron 5	27	Ν	Aluminium 13	20	Ga	Gallium 31	115	In	Indium 49	204	11	Thallium 81				162	ρ	Dysprosium 66		ర	Californium 98
										65	Zn	Zinc 30	112	ဦ	Cadmium 48	201	Ηg	Mercury 80				159	욘	Terbium 65		쓢	Berkelium 97
										64	ე ე	Copper 29	108	Ag		197	Αn	Gold 79				157		Gadolinium 64		C	Curium 96
Group										69	Z	Nickel 28	106	Pd	Palladium 46	195	₹	Platinum 78				152	En	Europium 63		Am	Americium 95
Ğ										69	ပိ	Cobalt 27	103	Rh	Rhodium 45	192	Ir	Iridium 77				150	Sm	Samarium 62		Pu	Plutonium 94
		- <b>エ</b>	Hydrogen 1							26	Fe	Iron 26	101	Ru	Ruthenium 44	190	Os	Osmium 76					Pm	Promethium 61		S N	Neptunium 93
				•						55	Mn	Manganese 25			Technetium 43	186	Re	Rhenium 75				144	ΡN	Neodymium 60	238		Uranium 92
										29	ဝံ	Chromium 24	96	Mo	Molybdenum 42	184	≥	Tungsten 74				141	P	Praseodymium 59		Ра	Protactinium 91
										51	>	Vanadium 23	93	Q Q	Niobium 41	181	Та	Tantalum 73				140	ပီ	Cerium 58	232	ᄕ	Thorium 90
										48	j=	Titanium 22	91	Zr	Zirconium 40	178	Ξ	Hafnium 72							nic mass	lod	iic) number
										45	လွ	Scandium 21	68	>	Yttrium 39	139	Гa	Lanthanum 57 *	227	Ac	89 †	corioc	pripo	2	a = relative atomic mass	X = atomic symbol	b = proton (atomic) number
	=			6	Be	Beryllium 4	24	Mg	Magnesium 12	40	Ça	Calcium 20	88	Š	Strontium 38	137	Ba	Barium 56	226	<b>B</b>	88	*58-71 Lanthanoid ceries	30-7 1 cantinandia sene 190-103 Actinoid series		a	× ×	۵
	_			7	=	Lithium 3	23	Na	Sodium 11	39	¥	Potassium 19	85		Rubidium 37	133	Cs	Caesium 55	١	L .	87	*58-71	100-103 100-103	2		Key	Ω

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).

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