

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS General Certificate of Education Ordinary Level

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		



COMBINED SCIENCE

5129/22

Paper 2

May/June 2013

2 hours 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 or rough working.

Do not use staples, paper clips, highlighters, 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.

Electronic calculators may be used.

You may lose marks if you do not use appropriate units.

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 20 printed pages.



1	Use words from the list to complete the sentences below.						
	carbo	bon carbon dioxide		kide	chemical	chloroph	yll
		haemoglob	in	heat	hormones	light	
			nitrogen	oxygen	phloen	n	
	Eac	h word may be ι	used once, m	ore than once o	r not at all.		
	(a)	Energy from the	e Sun is conv	erted into		energy during	
		photosynthesis. This energy is trapped by and					
		used to combine water and to form glucose. [3					[3]
	(b)	lons containing	l	are	needed for a pla	ant to form proteins.	[1]
2	(a)	Magnesium rea			magnesium nitrio	de.	
		3Mg + N ₂ -		${\rm Mg_3N_2}$			
		The relative mo [A _r : Mg, 24; N,		, $M_{\rm r}$, of magnes	ium nitride is 100).	
		Complete the fo	ollowing sente	ences.			
		144g of magne	esium reacts v	vithç	g of nitrogen and	produces	
		g of	magnesium r	nitride.			
		14.4g of magne	esium reacts	with	g of nitrogen and	produces	
		g of	magnesium r	nitride.			
		2.4g of magnes	sium produce	sg o	f magnesium niti	ride.	[4]
	(b)	Explain why the	e bonding in n	nagnesium nitri	de is ionic.		

(c)	Nitrogen and oxygen are the major constituents of air.	For
	State the percentages of nitrogen and of oxygen in the air.	Examiner Use
	nitrogen	
	oxygen[1]	

3 Fig. 3.1 shows a measuring cylinder containing a liquid.

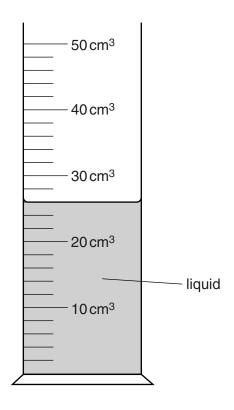


Fig. 3.1

(a) State the volume of the liquid in the cylinder.

volume = cm³ [1]

(b) The mass of the measuring cylinder and the liquid is 30.2g.

The mass of the empty measuring cylinder is 9.4g.

Calculate the density of the liquid.

density = units[3]

4 Fig. 4.1 shows how the speed of a runner changes with time.



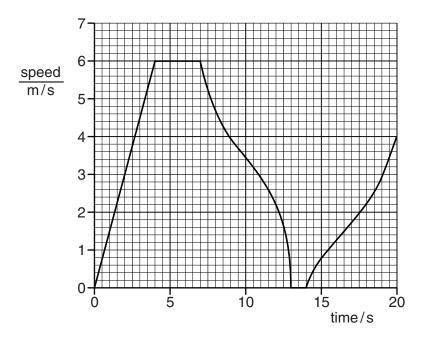


Fig. 4.1

(a)	Use Fig. 4.1 to d	calculate the l	ength of time	e that the runner is
-----	-------------------	-----------------	---------------	----------------------

(i) at rest,	s
--------------	---

[2]

(b)	Explain why it is possible for the runner to have a constant speed but not have a constant
	velocity.

[4]

(c) The runner has a mass of 70.0 kg.

At one time, the accelerating force produced by the runner is 175N.

Calculate the acceleration of the runner.

acceleration =
$$m/s^2$$
 [2]

5 Fig. 5.1 shows cell functions and different types of cell.

Examiner's Use

For

On Fig. 5.1, draw a line to link each cell function with the type of cell that carries out that function.

One line has been drawn for you.

Each type of cell may be linked-to once, more than once, or not at all.

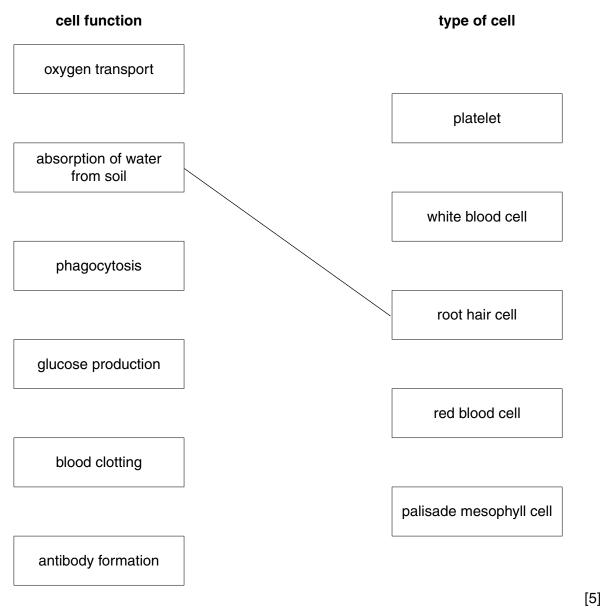


Fig. 5.1

Elei	Element P reacts with dilute hydrochloric acid but not with steam.					
Elei	Element Q does not react with dilute hydrochloric acid.					
Elei	ment	R reacts with both	dilute hydrochloric acid and cold water.			
Elei	ment	S reacts with both	dilute hydrochloric acid and steam but not cold water.			
(a)	Dec	duce the order of re	activity of the elements P, Q, R and S.			
	mos	st reactive				
	leas	st reactive	[2]			
(b)		en element S reacts ne chloride of S is p	s with dilute hydrochloric acid, hydrogen is given off and a solution produced.			
	(i)	State the test for h	nydrogen.			
		test				
		result				
			[2]			
	(ii)	Element S forms a	an ion \mathbf{S}^{2+} .			
		Deduce the formu	la of the chloride of S [1]			
(c)	One	e of the four elemer	nts P , Q , R and S is zinc.			
	Cor	mplete the equation	for the reaction of zinc with steam.			
		Zn + H ₂ O -	 + [1]			

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6

			<i>'</i>	
7	A w	eight	:-lifter lifts a weight of 1700N.	
	(a)	Cald	culate the work done on the weight in lifting it through a vertical distance of 2.0m.	
			work done =	<u>'</u>]
	(b)	Con	nplete the following sentence.	
		As t	he weight is being lifted, the useful energy changes are from	
			energy of the weight-lifter to	
		ene	rgy and energy of the weight. [2	<u>'</u>]
8	Sou	ınd is	s an example of a longitudinal wave.	
	Air	partic	cles vibrate as the sound wave passes through the air.	
	(a)	Fig.	8.1 shows the direction of vibration of an air particle as a sound wave moves throug air.	h
			direction of vibration	
			air particle	
			Fig. 8.1	
		On	Fig. 8.1, draw an arrow to show a possible direction of the sound wave. [1]
	(b)	(i)	Explain what is meant by <i>frequency</i> .	
			[1]
		(ii)	A sound wave has a frequency of 200Hz and travels at a speed of 340m/s.	
			Calculate the wavelength of the sound wave.	

 $wavelength = \dots \qquad m \ [2]$

9 Amylase is an enzyme that digests starch.

(a)	State the chemical produced when amylase digests starch.	
	[1	[[

lodine solution is a brown liquid. When starch and iodine solution are mixed together, the starch grains are stained black.

An experiment used to investigate amylase digesting starch is shown in Fig. 9.1.

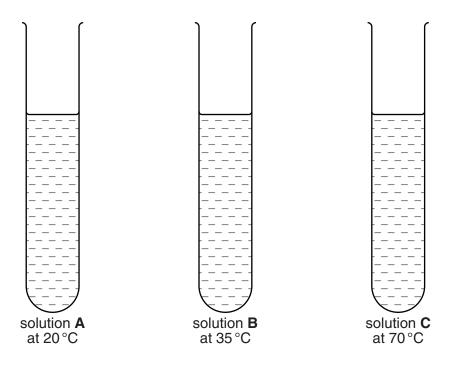


Fig. 9.1

Each tube contains the same concentrations of starch, amylase and iodine solution.

Each tube is kept at a different temperature, as shown in Fig. 9.1.

Table 9.1 shows the results of this experiment.

Table 9.1

	colour of solution					
time/min	solution A	solution B	solution C			
1 15	black black	black brown	black			
25	brown	brown	black			

(b)	Ехр	lain why solutions A and B change from black to brown.	For
			Examiner's Use
		[2]	
(c)	(i)	State which solution turns brown most quickly.	
		[1]	
	(ii)	Explain the difference in the timing of the colour change in solutions A and B .	
		[2]	
	(iii)	Explain why solution C remains black.	
		[2]	

10 Fig. 10.1 shows some reactions of ethene.

For Examiner's Use

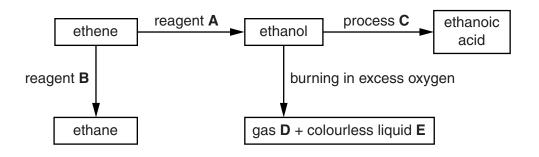


Fig. 10.1

(a)	(i)	Identify the rea	gents A an	ıd B ar	nd process C
-----	-----	------------------	------------	----------------	---------------------

(ii) Identify gas **D** and liquid **E**.

- (b) The molecular formula of ethanol is ${\rm C_2H_5OH.}$
 - (i) Draw the structure of ethanol.

[1]

(ii) State one use of ethanol.

_____[1]

11 Fig. 11.1 shows a lighting circuit.

For Examiner's Use

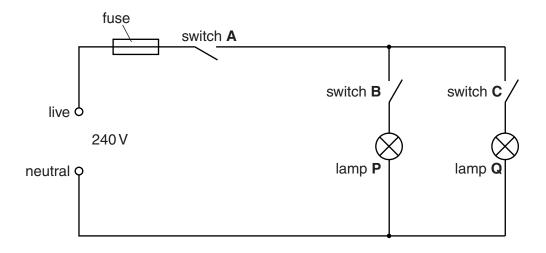


Fig. 11.1

(a) Switch A is left open and switches B and C are closed.

State which lamp or lamps, if any, will light.

[1]

(b) The circuit contains a fuse.

The fuse has a rating of 3A.

Explain what is meant by the *fuse rating*.

.....[2]

(c) When all the switches are closed to light both lamps, the current in lamp **P** is 0.25A and the current in lamp **Q** is 0.35A.

(i) Calculate the current in the fuse.

current = A [1]

(ii) The p.d. across lamp **P** when lit is 240V and the current in it is 0.25A.

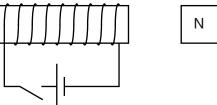
Calculate the power of lamp P.

power = W [2]

12 Fig. 12.1 shows an electromagnet, an iron rod and a permanent magnet. The poles of the permanent magnet are marked.

For Examiner's Use





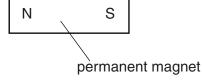


Fig. 12.1

(a) The current in the electromagnet is switched on and the iron rod becomes magnetised.
Both the iron rod and the permanent magnet are attracted to the electromagnet.

On Fig. 12.1, mark the poles of the iron rod.

[1]

- **(b)** The current in the electromagnet is now reversed.
 - (i) State whether the iron rod is attracted, repelled or neither attracted nor repelled.

The iron rod is

(ii) State whether the permanent magnet is attracted, repelled or neither attracted nor repelled.

The permanent magnet is

[2]

13 (a) Complete Table 13.1.

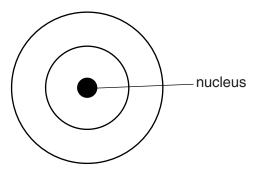
particle	number of protons	number of neutrons	number of electrons
¹⁶ O	8		8
²⁷ A l		14	13
³⁵ C <i>l</i> ⁻		18	18
⁴⁰ Ca ²⁺	20	20	

For Examiner's Use

[4]

Table 13.1

(b) Complete Fig. 13.1 to show the electronic structure of ¹⁶O.



[1]

Fig. 13.1

14 Fig. 14.1 shows a flower.



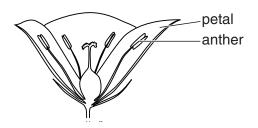


Fig. 14.1

(a)	(i)	State the function of petals.
	(ii)	State the function of anthers.
		[1]

(b) Fig. 14.2 shows a section through a seed.

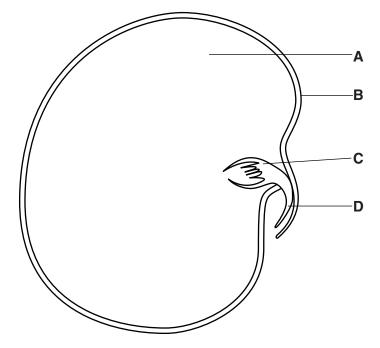


Fig. 14.2

(i)	Use	e letters from the	diagram to identify
	1.	the testa,	
	2.	the radicle.	

[2]

(c)	(i)	State two ways in which seeds are dispersed.	For
		1	Examiner's Use
		2	
		[2]	
	(ii)	Explain why it is important for seeds to be dispersed.	
		[1]	
(d)		mplete Table 14.1 to show differences between asexual reproduction and sexual roduction for the given features.	

Table 14.1

feature	asexual reproduction	sexual reproduction
number of parents		
appearance of offspring		

[2]

15 Fig. 15.1 shows a heater emitting infra-red radiation.

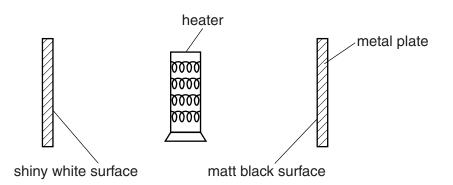


Fig. 15.1

Two metal plates are placed equal distances from the heater.

One plate has a shiny white surface and the other plate has a matt black surface.

(a)	The	re is a large air-gap between each plate and the heater.
	Sug	gest why there is very little heating of the plates by
	(i)	conduction,
		[1]
	(ii)	convection.
		[1]
(b)	•	lain why the plate with the matt black surface heats up more quickly than the plate the shiny white surface.
		[1]
(c)	Infra	a-red radiation is part of the electromagnetic spectrum.
		ne two components of the electromagnetic spectrum with longer wavelengths than a-red radiation.
	1	
	2	[2]

16	The follo	owing is a list of metal	ls.		
		copper	iron	le	ad
			sodium	zinc	
	Each wo	ord in the list may be u	used once, more tha	an once, or not a	at all.
	From the	e list, select the metal	that		
	(a) (i)	is extracted from ha	ematite,		
	(ii)	is used for electrical	wiring,		
	(iii)	forms compounds w	hich pollute the air,		
	(iv)	is used in galvanisin	ıg.		
					[4]
	(b) Bra	ss is an alloy.			
	(i)	State what is meant	by the term alloy.		
					[1]
	(ii)	Explain why metals	are made into alloys	S.	

17 Fig. 17.1 shows a magnet being pushed towards a coil to induce an e.m.f.



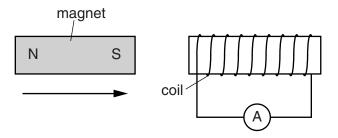


Fig. 17.1

	A cı	urren	it is induced in the coil.
	Ехр	lain	how the induced current produces effects that oppose the motion of the magnet.
			[2]
18	(a)	Def	ine a <i>drug</i> .
			[2]
	(b)	(i)	Alcohol is a drug.
			State three effects that the excessive consumption of alcohol may have on a person.
			1
			2
			3
			[3]
		(ii)	Name a drug of abuse other than alcohol.
			[1]

19 A student breaks a bottle containing potassium nitrate crystals.

For Examiner's Use

In order to separate the potassium nitrate from the broken glass, the student adds the mixture to water.

Use words from the list below to complete the following sentences.

Each word may be used once, more than once, or not at all.

	distillation	filtration	insoluble	soluble	
	solute	solution	1	solvent	
The potassi	um nitrate dissolve	es in the water to	form a colourle	ess	
The glass is	;	in water and	d is removed f	rom the solution by	
	In this	s experiment the p	ootassium nitra	ate acts as the	
					[4]

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	Elements
DATA SHEET	e Periodic Table of the
	님

	-							20 20	Group		2						
													>	>	N	II/	0
							- I										4 T
							Hydrogen										Helium 2
6						,						=	12	14	16	19	20
Ве												Ф	ပ	z	0	ш	Ne
Berylltum 4												Boron 5	Carbon 6	Nitrogen 7	Oxygen 8	Fluorine 9	Neon 10
24												22	28	31	32	35.5	40
Mg												ΝI	<u>S</u>	_		CI	Ā
Magnesium 12	-											Aluminium 13	Silicon 14	Phosphorus 15	Sulfur 16	Chlorine 17	Argon 18
45 48 51	48 51 52	51 52	52		55		56	59	59	64		70	73	75	62	80	84
Ca Sc Ti V Cr Mn	ວ່ > ⊏	ပ် >	ဝံ		Mn		Fe	ပိ	Z	ر د	Zu	Ga	Ge	As	Se	ğ	궃
Calcium Scandium Titanium Vanadium Chromium Manganese 20 21 22 23 24 25 25	Scandium Titanium Vanadium Chromium 21 23 24	Itanium Vanadium Chromium 23 24	Chromium 24	romium	Manganese 25		Iron 26		Nickel 28	Copper 29		Gallium 31	Germanium 32	Arsenic 33	Selenium 34	Bromine 35	Krypton 36
89 91 93	91 93	93		96			101		106	108	112	115		122	128	127	131
Mo	Zr Nb Mo	Nb Mo	Mo		ဥ			絽	Pd	Ag	ပ္ပ	In			<u>e</u>	Ι	Xe
Strontium Ytrium Ziroonium Niobium Mokybdenum Technetium 38 40 41 42 43 43	Yttrlum Zirconium Niobium Molybdenum 39 40 41 42	conium Niobium Molybdenum 41 42	iobium Molybdenum 42		Technetium 43		Ruthenium 44	Rhodium 45	Palladium 46		Cadmium 48	Indium 49	Tin 50	Antimony 51	Tellurium 52	lodine 53	Xenon 54
137 139 178 181 184 186	178 181 184	181 184	184		186		190	192	195	197	201	204	207	209	509	210	222
Ba La Hf Ta W Re	Hf Ta W	Ta W	>		Be		SO.	1	풉	Au		11	Ър	Ξ	8	At	R
Barlum Lanthanum Hafnium Tantalum Tungsten Rhenium 56 57 73 73 74 75	11 Tantalum Tantalum Tungsten 75 74 75 75 75 75 75 75 75 75 75 75 75 75 75	lafnium Tantalum Tungsten 75 75	ntalum Tungsten 75	ngsten 75	Rhenium 75		Osmium 76	Iridium 77	Platinum 78	Gold 79	Mercury 80	Thallium 81	Lead 82	Bismuth 83	Polonium 84	Astatine 85	Radon 86
226 227	227																
- 68																	
* F.8_71 anthonoid corios	140 141	141	141		144		147	150	152	157	159	162	165	167	169	173	175
Ce Pr Nd	Ce Pr Nd	Pr	Pr	D N			Pm	Sm	Ш		T	Dy	운	ш	Tm	Υb	Γn
Certum Praseodymium Neodymium S8 59 60	Cerium Praseodymium 58 59	Cerium Praseodymium 59	Cerium Praseodymium 59		Neodymium 60		Promethium 61	Samarium 62	Europium 63	Gadolinium 64	Terbium 65	Dysprosium 66	Holmium 67	Erbium 68	Thulium 69	Ytterbium 70	Lutetium 71
a a = relative atomic mass 232 231 238	232 231	232 231	231		238		237	244	243	247	247	251	252	257	258	259	260
X x = atomic symbol Th Pa U	Th	Th	Ра		-		N	Pu	Am	Cm	B	చ	Es	Fn	Md	8	בֿ
- F	Thorium Protactinium	Thorium Protactinium	horium Protactinium or	tactinium	Uranium 92		Neptunium 93	Plutonium 94	Americium	Curium	Berkelium 97	Californium	Einsteinium 99	Fermium 100	Mendelevium 101	_ 5	Lawrencium 103
				1		1			}	}	5		5				

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