

## **Cambridge International Examinations**

Cambridge Ordinary Level

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		



**COMBINED SCIENCE** 

5129/22

Paper 2

May/June 2018

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 an HB pencil for any diagrams, graphs or rough working.

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 24.

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 23 printed pages and 1 blank page.



1 Flowers are the reproductive organs of plants.

Fig. 1.1 shows a section through a flower.

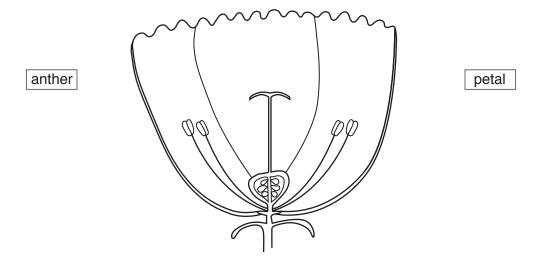


Fig. 1.1

(a)	(i)	On Fig. 1.1, draw a line from each box to show the position of an anther and a petal. [2]
	(ii)	State <b>one</b> function of an anther and <b>one</b> of a petal.
		anther
		petal
		[2]
(b)	Flov	vers produce seeds.
	See	ds need a suitable temperature to germinate.
	Stat	e two other conditions that affect germination.
		and [2]
(c)	Rep	roduction can be asexual or sexual.
		cribe an investigation and the result of the investigation that shows that seeds are duced by sexual reproduction.

2	Sodium reacts with oxygen to produce sodium oxide.
	The equation for the reaction is

$$4Na + O_2 \longrightarrow 2Na_2O$$

[A<sub>r</sub>: O, 16; Na, 23]

(a) (i) Calculate the relative molecular mass of sodium oxide.

		relative molecular mass =	.[1]
	(ii)	Complete the following sentences.	
		92 g of sodium reacts with g of oxygen and produces g of sodium oxide.	
		4.6g of sodium produces g of sodium oxide.	[3]
(b)	Sod	lium oxide dissolves in water.	
	A so	olution of sodium oxide turns Universal Indicator purple.	
	Sug	gest the pH of the solution.	.[1]
(c)	Stat	te the type of bonding in sodium oxide and give a reason for your answer.	
	type	e of bonding	
	reas	son	

[2]

3 A partly completed circuit containing a lamp is shown in Fig. 3.1.

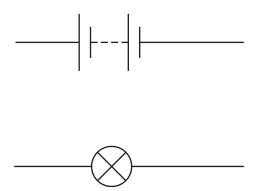


Fig. 3.1

- (a) Complete the circuit in Fig. 3.1 to show the symbol for an ammeter and the symbol for a voltmeter, connected so that the resistance of the lamp may be calculated. [2]
- (b) (i) State the current and the potential difference shown on the meters in Fig. 3.2.

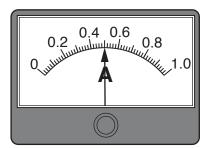




Fig. 3.2

(ii) Use your answers to (b)(i) to calculate the resistance of the lamp. State the unit.

resistance = ...... unit ...... [3]

4 Specialised cells carry out different processes in living organisms.

On Fig. 4.1, draw a straight line from each process to the cell where the process takes place.

## removal of urea from the blood kidney cell production of glycogen liver cell breakdown of alcohol mesophyll cell light energy transferred to chemical energy root hair cell absorption of ions

Fig. 4.1

[6]

**5** W, X, Y and Z are elements in the Periodic Table.

The atomic structures of an isotope of each of these elements are shown in Table 5.1.

The letters are **not** the chemical symbols of the elements.

Table 5.1

	number of protons	number of neutrons	electronic structure
<sup>24</sup> W	12		2,8,2
<sup>28</sup> X	14	14	
34ү		18	2,8,6
<sup>37</sup> Z	17	20	

wetna	ane	and ethane are the first two members of a nomologous series.	
(a) (	(i)	State the name of the homologous series to which they belong.	
			.[1]
<b>(</b> i	ii)	State the general formula of this homologous series.	
			.[1]
(ii	ii)	State how the melting point of this homologous series changes as the relative molecumass increases.	ılar
			.[1]
(b) N	Met	hane burns in excess oxygen to release energy.	
(	(i)	State the name given to reactions that release energy.	
			.[1]
(i	ii)	Name the products of the reaction when methane burns in excess oxygen.	
		and	[2]

7 Vernier calipers are used to measure lengths.

Calipers are used to measure the external diameter of the boiling tube as shown in Fig. 7.1.

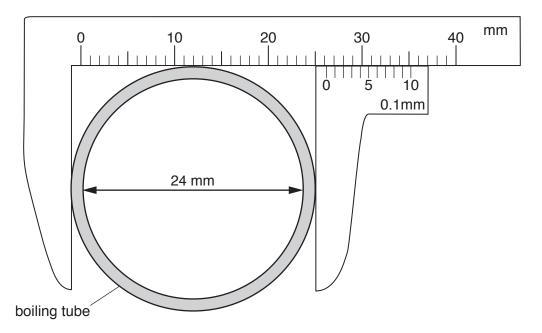


Fig. 7.1

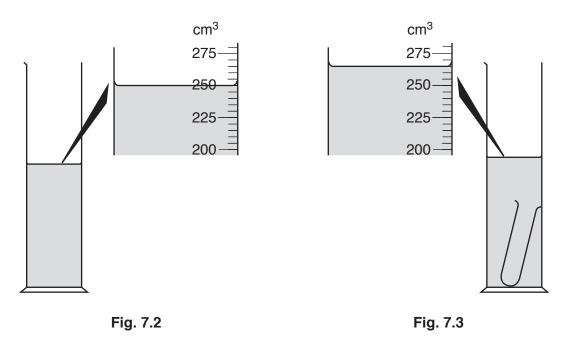
- (a) The glass boiling tube has an internal diameter of 24 mm.
  - (i) Determine the external diameter *d* of the boiling tube.

*d* = .....mm [1]

(ii) Calculate the thickness *t* of the glass wall of the boiling tube.

*t* = ......mm [2]

**(b)** A measuring cylinder contains water as shown in Fig. 7.2. The boiling tube is then placed in the measuring cylinder as shown in Fig. 7.3.



(i) Determine the volume V of glass used to make the boiling tube.

V =		cm <sup>3</sup>	[1]
-----	--	-----------------	-----

(ii) The mass of the boiling tube is 33.5 g.

Calculate the density *D* of the glass used to make the boiling tube.

 $D = \dots g/cm^3 [2]$ 

8	(a)	All cells in the body carry out aerobic respiration.
		Write the word equation for aerobic respiration.

(b) Respiration releases energy.

Fig. 8.1 shows the daily average energy requirements of different age groups of males and females.

[2]

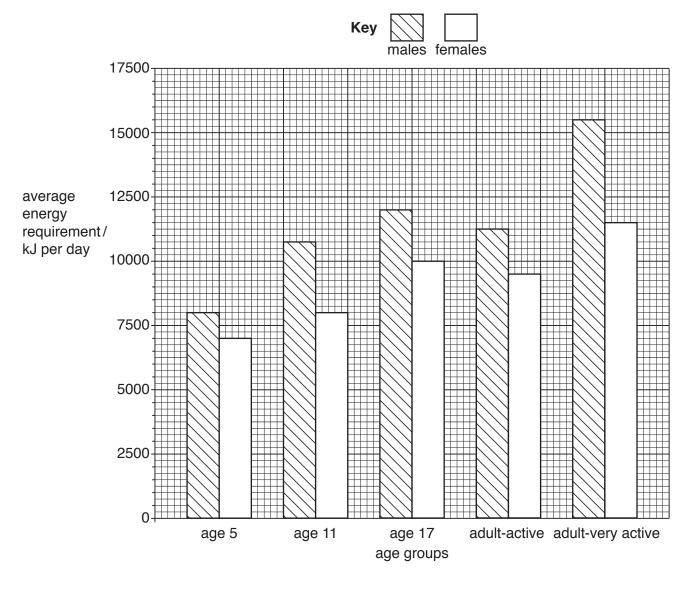


Fig. 8.1

(i)	State the average energy requirement of a 5 year old female.
	kJ per day [1]
(ii)	Identify the type of person who has an average daily energy requirement of 12000 kJ per day.
	[1]

(111)	and a 17 year old female.
	kJ per day [1]
(iv)	State <b>two</b> conclusions that can be drawn from the information given in Fig. 8.1.
	1
	2
	[2]

**9** The inside of an electrical plug is shown in Fig. 9.1.

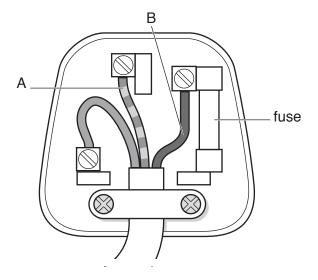


Fig. 9.1

(a)	Stat	te the name o	f lead A.					[4]
(b)	B is	the live lead.						[1]
	Ехр	lain the functi	on of the live	e lead.				
								[2]
(c)	(i)	When plugge	ed into a soc	cket, the plug	g supplies m	ains electrici	ty at 230 V to a	hairdryer.
		The power p	roduced in t	he hairdryer	is 700 W.			
		Calculate the	e current $I$ ir	the fuse.				
					I = .			A [2]
	(ii)	Draw a circle	around the	value of a s	suitable fuse	rating for the	e fuse in (c)(i).	
		3 <b>A</b>	5 <b>A</b>	3 V	5 V	3Ω	$5\Omega$	[1]

10	State <b>three</b> problems caused by the excessive consumption of alcohol over a period of sev years.								
	1								
	3								
			 [3]						
11	Iror	n is extracted from iron ore in a blast furnace.							
	(a)	State the name of an ore of iron.	[1]						
	(b)	Iron ore, limestone (calcium carbonate) and carbon are added at the top of the blast furn and hot air is passed in at the bottom.	ace						
		Complete the sentences about the reactions that take place in the blast furnace.							
		At the bottom of the blast furnace the carbon is to form							
		carbon dioxide.							
		Carbon dioxide reacts with more carbon to form a gas called							
		This gas the iron ore to iron.							
		The calcium carbonate decomposes to form calcium oxide, which reacts with the							
		impurities in the ore to form	 [5]						

12 Fig. 12.1 shows a plane mirror **A**, a lens **B** and a glass block **C**.

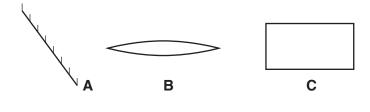


Fig. 12.1

Some of the objects in Fig. 12.1 are placed in the path of parallel rays of light.

The objects are hidden behind screens. Each screen covers one object only.

State the letters of the hidden objects  $\bf A$ ,  $\bf B$  or  $\bf C$ , that give rise to the ray diagrams shown in Fig. 12.2.

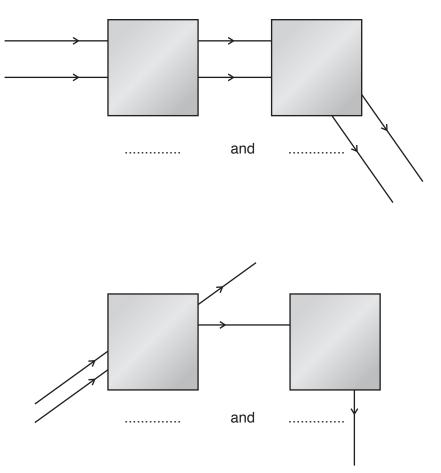


Fig. 12.2

[4]

**13** Fig. 13.1 shows a section through the heart.

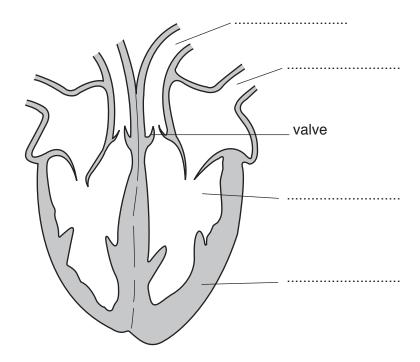


Fig. 13.1

(a) Complete the labels on Fig. 13.1 by using words from the following list.

	aorta	atrium	capillary	muscular wal	I
	pulmonary artery	pulmonary	vein	vena cava	ventricle [4]
(b)	Describe and explain wrelaxes.	hat happens to	the valve labe	lled in Fig. 13.1 who	en the heart muscle
					[2]

- 14 Hydrogen and chlorine react together to form hydrogen chloride, a covalent compound.
  - (a) Complete Fig. 14.1 to show the outer electrons in a molecule of hydrogen chloride.

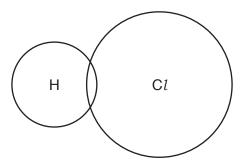


Fig. 14.1

[2]

(b) Hydrogen chloride dissolves in water to produce hydrochloric acid.

Hydrochloric acid reacts with copper oxide.

Complete the equation for this reaction.

1	<b>(C)</b>	Evnlain	why h	ydrochloric	acid does	not react	with con	ner metal
l		, схріані	willy II	yurucriionic	aciu uues	HUL TEACL	with cop	pei illetai

 	 [1]

Question 15 begins over the page.

**15** A stopwatch measures the time taken by a piece of modelling clay to fall through oil as shown in Fig. 15.1.

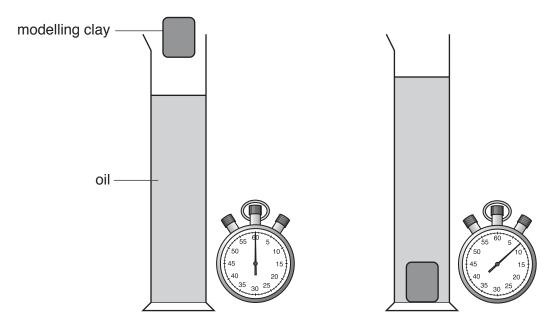


Fig. 15.1

(	a	The experiment is re	peated using the	same oil at a	higher temperature.
•			p		

State a physical property of oil that varies with temperature.
[1]

**(b)** The freezing point of the oil is -11 °C.

As the temperature increases, the time taken for the modelling clay to fall through oil decreases.

On Fig. 15.2, sketch a graph to show the relationship between the temperature of the oil and the time taken for the clay to fall through the oil.

Label the axes on the graph.

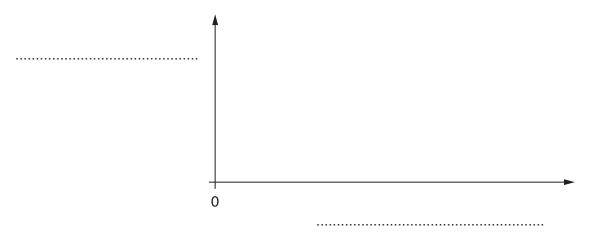


Fig. 15.2

[3]

(c) In one experiment, modelling clay of weight 0.6 N falls a distance of 0.4 m through the oil in a time of 8.0 s.

Calculate the work done by gravity W as the modelling clay falls this distance.

$$W = \dots J[2]$$

16 Fig. 16.1 shows a healthy plant and the same plant a few days later. The plant has wilted.

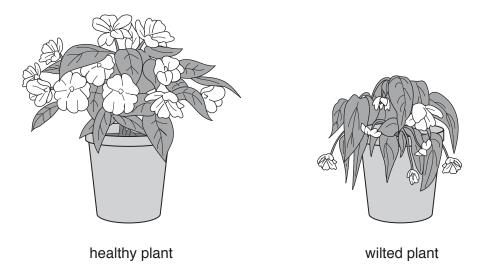


Fig. 16.1

(a)	Suggest <b>one</b> environmental cause of this wilting.
	[1]
(b)	Describe the process of wilting.
	[2]

17 Fig. 17.1 shows representations of elements, compounds and mixtures.

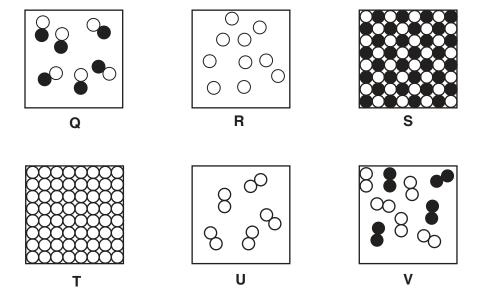


Fig. 17.1

State the letter that represents

an element in Group VII of the Periodic Table,	
an ionic compound,	
a metallic element,	
a mixture of two elements.	 [4]

18	An	elect	ric field exerts a force of $4.7 \times 10^{-14} \mathrm{N}_\odot$	on a stationary alpha-particle.	
	The	alph	na-particle accelerates with an initial ac	celeration of $7.08 \times 10^{12} \text{m/s}^2$ .	
	(a)	Cal	culate the mass $m$ of the alpha-particle		
				<i>m</i> =	رg [2]
	(b)	(i)	An alpha-particle has a positive charg	e of $3.2 \times 10^{-19}$ C.	
			Calculate the charge on one proton.		
				charge =	C [1]
		(ii)	Determine the charge on a beta-partic	cle.	
				ah aya a	O [4]
				charge =	C [1]

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The Periodic Table of Elements

	≡>	2 He	helium 4	10	Ne	neon 20	18	Ā	argon 40	36	궃	krypton 84	54	×e	Y         Zf         ND         NIO         IC         RU         KN         PG         AQ         CQ         IN         SD         IE         I         AE           yttrüm         zirconium         niobium         molybdenrum technetium         tuthenium         rhodium         plaledium         silver         cadmium         indium         tin         antimony         tellurium         indium         indium						
	=			6	ш	fluorine 19	17	Cl	chlorine 35.5	35	Ŗ	bromine 80	53	Н	iodine 127	85	Ą	astatine			
	>			8	0	oxygen 16	16	ഗ	sulfur 32	34	Se	selenium 79	52	<u>a</u>	tellurium 128	84	Ъ	moloulum -	116		livermorium -
	>			7	Z	nitrogen 14	15	ட	phosphorus 31	33	As	arsenic 75	51	Sb	antimony 122	83	<u>B</u>	bismuth 209			
	≥			9	ပ	carbon 12	14	S	silicon 28	32	Ge	germanium 73	50	Sn	tin 119	82	Pb	lead 207	114	Εl	flerovium —
	=			5	В	boron 11	13	$A^l$	aluminium 27	31	Ga	gallium 70	49	In	indium 115	81	11	thallium 204			
										30	Zu	zinc 65	48	පි	cadmium 112	80	Нg	mercury 201	112	S	copernicium —
										29	Cn	copper 64	47	Ag	silver 108	62	An	gold 197	111		
Group										28	Z	nickel 59	46	Pd	palladium 106	78	五	platinum 195	110	Ds	darmstadtium -
Ğ										27	ပိ	cobalt 59	45	R	rhodium 103	77	'n	iridium 192	109	Ħ	meitnerium -
		- I	hydrogen 1							26	Pe	iron 56	44	Ru	ruthenium 101	92	Os	osmium 190	108	Hs	hassium -
										25	Mn	manganese 55	43	ည	technetium -	75	Re	rhenium 186	107	Bh	bohrium —
					pol	ass				24	ට්	chromium 52	42	Mo	molybdenum 96	74	≥	tungsten 184	106	Sg	seaborgium -
			Key	atomic number	atomic symbo	name relative atomic mass				23	>	vanadium 51	14	g	niobium 93	73	<u>⊾</u>	tantalum 181	105	9	dubnium -
					atc	<u>a</u>				22	F	titanium 48	40	Zr	zirconium 91	72	Ξ	hafnium 178	104	꿒	rutherfordium -
										21	Sc	scandium 45	39	>	yttrium 89	57–71	lanthanoids		89–103	actinoids	
	=			4	Be	beryllium 9	12	Mg	magnesium 24	20	Ca	calcium 40	38	ഗ്	strontium 88	99	Ba	barium 137	88	Ra	radium -
	_			3	:=	lithium 7	#	Na	sodium 23	19	$\prec$	potassium 39	37	S S	rubidium 85	55	Cs	caesium 133	87	Ļ	francium -

71	lutetium 175	103	۲	lawrencium	I
۶ <b>۲</b>	ytterbium 173	102	%	nobelium	I
<sub>69</sub> L	thulium 169	101	Md	mendelevium	_
89 7	erbium 167	100	Fm	ferminm	I
67 Z	holmium 165	66	Es	einsteinium	_
99	dysprosium 163	86	ŭ	californium	-
65 Th	terbium 159	97	Ř	berkelium	1
<sup>4</sup> ك	gadolinium 157	96	CH	curium	ı
83 =	europium 152	92	Am	americium	_
62 C	samarium 150	94	Pu	plutonium	_
61 PB	promethium -	93	ď	neptunium	_
99 Z	neodymium 144	92	$\supset$	uranium	238
ي <b>ه</b> 59	praseodymium 141	91	Ра	protactinium	231
<sub>28</sub> م	cerium 140	06	Т	thorium	232
57	lanthanum 139	89	Ac	actinium	I

lanthanoids

actinoids

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