

Cambridge International Examinations

Cambridge Ordinary Level

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

COMBINED SCIENCE

5129/22

Paper 2

October/November 2015

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.

A copy of the Periodic Table is printed on page 20.

Electronic calculators may be used.

You may lose marks if you do not show your working or 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.



(a)	To r	make proteins, plants require carbon dioxide, water and one particular element.	
	(i)	Name this element and explain how the plant obtains it.	
		element	
		explanation	
			. [3]
	(ii)	State a type of protein made by plants.	
			[1]
(b)	Exp	plain why animal life is completely dependent on plants.	
	••••		
			رد. ادا

Lith	ium is	s a metal in Group I of the Periodic Table.					
(a)	State	e the name given to the Group I elements.					
		[1]					
(b)	Lithi	um reacts with water to produce lithium hydroxide and hydrogen.					
	(i)	Balance the equation for the reaction between lithium and water.					
		Li + $H_2O \longrightarrow$ LiOH + H_2 [1]					
	(ii)	Universal Indicator is added to the reaction mixture.					
		State the colour of the solution at the end of the reaction.					
		[1]					
(c)	Pota	assium is another Group I metal.					
	State two visible differences between the reaction of potassium with water and the reaction of lithium with water.						
	1						
	2						
		[2]					

2

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

	d	lensity fi	ield	force	length	
		mass	volume	weig	ıht	
Eac	h word may be used	once, more tha	in once or	not at all.		
(a)	The of a body is a measure of the amount of substance in the body.					
	The	of an o	bject is les	s on the M	loon than on the	Earth because the
	gravitational		strength is	less on th	e Moon.	[3]
(b)	When a solid is heat	ted, the		of the	solid decreases.	[1]

(a)	Sta	ate two reasons why	solid food is chewed before it is swallowed.								
	1										
	2										
				[2]							
(b)	An	imals use their teeth	to chew food.								
	(i)	Sometimes teeth of	levelop dental decay.								
		Describe the cause	es of dental decay.								
	 \			[3]							
	(ii)		methods which people can use to prevent dental decay.								
	Complete Table 4.1 by explaining why each method is effective. Table 4.1										
		method of caring for the teeth	explanation of why the method is effective								
				1							

[2]

use a small brush

do not eat sweet foods between

or a twig

meals

4

5	Sulfur dioxide	reacts with	hydrogen	sulfide to	produce	sulfur	and w	ater.
---	----------------	-------------	----------	------------	---------	--------	-------	-------

The equation for the reaction is

$$SO_2 + 2H_2S \longrightarrow 3S + 2H_2O$$

(a)	Calculate the relative molecular mass of	
(a)	Calculate the relative molecular mass of	

(i)	sulfur dioxide,	
'''	ound dioxido,	

[A_r: S, 32; H, 1; O, 16]

/h)	Use your answe	ro in (a) to c	amplata tha	following oon	tonoo
(D)	USE Your answe	15 III (a) 10 0	Joinpiele lile	ioliowing Sen	nences

34 g of hydrogen sulfide produces g of sulfur.

1.7g of hydrogen	sulfide produces	a	of sulfur
1.7 g of flydrogon	damae produced		, or oamar

[2]

(C)	Sulfur dioxide	is a	pollutant of	f the	atmosp	ohere
•	_	Canan anomian	u	ponatant of		a	

(i)	State the source	of sulfur	dioxide	found i	n the	atmosphere
-----	------------------	-----------	---------	---------	-------	------------

 	[1]

(ii)	State and explain the adverse effects of sulfur dioxide on the environment

[2]

6 (a) Fig. 6.1 shows light incident on a glass block. The angle of incidence is 75° and the angle of refraction is 37°.

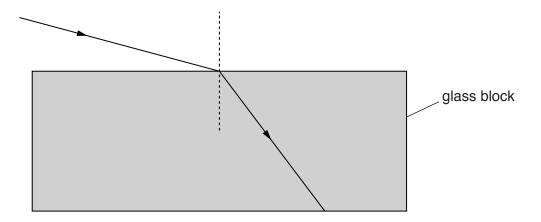


Fig. 6.1

(i) Calculate the refractive index of the glass.

refractive index =[2]

(ii) The glass block is replaced by a block made from a material with a lower refractive index. The angle of incidence remains the same, at 75°.

State the change, if any, in the value of the angle of refraction.

.....[1]

(b) Fig. 6.2 shows parallel rays of light incident on a thin converging (convex) lens.

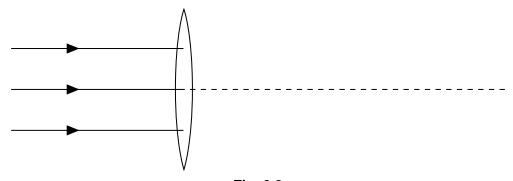


Fig. 6.2

Complete Fig. 6.2 to show the path of the rays after passing through the lens.

[2]

7 Fig. 7.1 shows the male reproductive system.

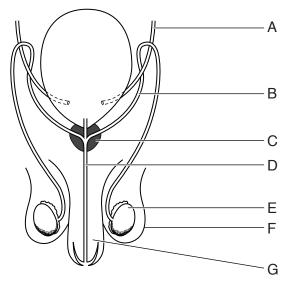


Fig. 7.1

- (a) State the letter in Fig. 7.1 which identifies
 - (i) a sperm duct,
 - (ii) a testis,
 - (iii) the urethra.

- **(b)** State the function of
 - (i) the penis,

[3]

8 (a) Use words from the following list to complete the sentences below.

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

		electrons	element	gained	ions	
		isotopes	lost	neutrons	protons	
	(i)	Atoms are made up	of a nucleus con	taining	and	
		surrounded by				[1]
	(ii)	In neutral atoms, the	ere are the same	numbers of	as	[1]
	(iii)	In negative ions, the	ere are more	than .		[1]
	(iv)	When an ionic bond	d is formed betwe	een a metal and a	non-metal,	are
		by	the metal.			[1]
(b)		element einsteiniun stein.	n was discovered	d in 1952 and is r	named after the scie	ntist Albert
	An a	atom of einsteinium is	s represented by	²⁵⁴ ₉₉ Es.		
	Cal	culate the number of	protons and the r	number of neutrons	in an atom of einstei	nium.
	nun	nber of protons =				
	ทมท	nber of neutrons =				[2]

9 Fig. 9.1 shows an incomplete electrical circuit.

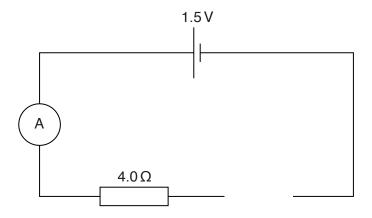


Fig. 9.1

- (a) Complete the circuit diagram of Fig. 9.1 by drawing the symbol for a variable resistor. [1]
- **(b)** For the completed circuit of Fig. 9.1, the potential difference (p.d.) across the cell is 1.5V and the ammeter reads 0.13A.
 - (i) Calculate the p.d. across the resistor of resistance 4.0Ω .

(ii) Calculate the p.d. across the variable resistor when the current in it is 0.13A.

10	(a)	Define transpiration.	
			[2]
	(b)	Fig. 10.1 shows a healthy plant and its appear	rance some time later, after it has wilted.
		healthy plant	wilted plant

 11 Three states of matter are solid, liquid and gas.

Fig. 11.1 shows the arrangement of the particles in a solid and a liquid.

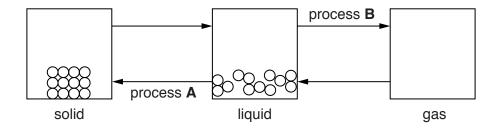


Fig. 11.1

(a)	Cor	mplete Fig. 11.1 to show the arrangement of the particles in a gas.	[1]
(b)	Des soli	scribe, in terms of energy and movement, how particles in a liquid differ from particles i d.	n a
(c)	Nar	me	[2]
(0)	ivai		
	(i)	process A ,	
	(ii)	process B	[2]

12 Fig. 12.1 shows a sound wave transmitted from the bottom of a boat.

The diagram is not to scale.

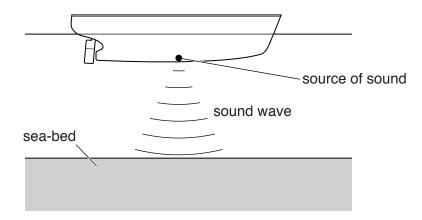


Fig. 12.1

The pulse of sound transmitted from the bottom of the boat is reflected from the sea-bed and detected back at the bottom of the boat 0.040s later.

The speed of sound in sea-water is 1400 m/s.

(a) Calculate the distance from the bottom of the boat to the sea-bed.

(ii) Calculate the wavelength of the sound in sea-water.

wavelength = unit [3]

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

alcohols

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

antibodies

	carbon dioxide	chlorophyll	haemoglobin
	oxygen	phagocytosis	photosynthesis
Red b	olood cells are able to tra	ansport	from lungs to
tissue	cells because they con	tain	
White	blood cells protect the I	body from infection by p	producing
and th	ney carry out the proces	s of	
Platel	ets are another blood co	omponent. They are res	ponsible for

blood clotting

[5]

14 Fig. 14.1 shows the electronic structures of an atom of nitrogen and an atom of hydrogen.

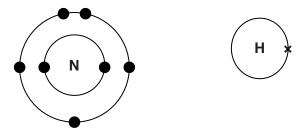


Fig. 14.1

(a) In the space below, construct a 'dot and cross' diagram to show the outer shell electrons in a molecule of ammonia.

(b) Ammonia dissolves in water to form an alkaline solution which turns Universal Indicator blue.
(i) State the name of the ion which causes the solution to be alkaline.
[1]
(ii) Suggest a pH value for ammonium hydroxide solution.
[1]
(c) Ammonia reacts with sulfuric acid to form ammonium sulfate.

Deduce the formula of ammonium sulfate.[1]

Ammonium sulfate contains ammonium ions (NH_4^+) and sulfate ions (SO_4^{2-}) .

[2]

		16	
15	A lic	iquid-in-glass thermometer measures temperature using the change in volume of the lic	ղuid.
	(a)	State two other physical properties that may be used for the measurement of tempera	ature.
		1	
		2	[2]
	(b)	State one feature of a liquid-in-glass thermometer that determines its sensitivity.	
			[1]
	(c)	Fig. 15.1 shows a thermometer used to measure the increase in temperature of cold a metal can placed near an infra-red heater.	water in
		metal can cold water cold water cold water	
		Fig. 15.1	
		(i) State the main method by which heat energy is transferred through the air to the	can.
			[1]

(ii) State the method by which heat energy is transferred through the metal of the can.

[1]

(d)	The outside of the metal can is white.
	Explain why the temperature of the water rises more quickly when the can is black.
	[1
(e)	Explain, in detail, how air above the heater becomes warmer.
	[2
(f)	Both infra-red radiation and sound are waves.
	Sound, but not infra-red radiation, can be heard.
	State one other difference between infra-red radiation and sound.
	[1

16	Ethe	ene is the simplest molecule in the alkene homologous series.
	(a)	State how the molecular structure of alkenes differs from the molecular structure of alkanes.
		[1]
	(b)	Ethene burns in excess oxygen to form carbon dioxide and water.
		State the test for carbon dioxide and the result of the test.
		test
		result[2]
	(c)	State the name of the reagent that is used to distinguish between alkenes and alkanes.
		[1]
	(d)	Poly(ethene) is made from ethene by polymerisation.
		Explain the meaning of the term <i>polymerisation</i> .
		[2]
17	A nı	ucleus of uranium $^{238}_{92}$ U decays by emitting an alpha-particle (α -particle) to form thorium (Th).
	Con	nplete the nuclear equation for this decay.
		$^{238}_{92}$ U \longrightarrow $^{}_{}$ α + $^{}_{}$ Th
		[4]

18 Fig. 18.1 shows a list of processes carried out by certain cells and a list of specialised cells.

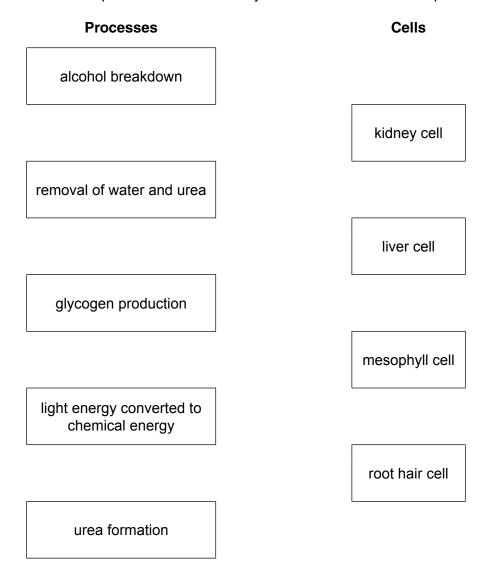


Fig. 18.1

On Fig. 18.1, draw **one** line from each process to a cell where the process takes place. [5]

DATA SHEET
The Periodic Table of the Elements

	0	4 He lium	20 Neon 10 Argon 18 Argon 18	84 Kr ypton 36	131 Xe Xenon S4	222 Ran Radon 86		Lutetium 7.1	260 Lr Lawrencium
	IIA		19 Fluorine 9 35.5 C1 Chlorine	Φ	127 I lodine 53	210 At Astatine 85		173 Yb Ytterbium 70	Nobelium
	I		16 Oxygen 8 32 S	Selenium 34	128 Te Tellurium 52	Po Po Polonium 84		169 Tm Thulium	-
	>		14 Nitrogen 7 31 P	AS Arsenic 33	122 Sb Antimony 51	209 Bi Bismuth		167 Er Erbium 68	257 F m srmium
	ΛΙ		12 Carbon 6 Si Silicon 14	Ę	Sn Tin 50	207 Pb Lead 82		165 Ho Holmium 67	252 ES Einsteinium 99
	=		11 B Boron 5 27 A1 Aluminium 13	70 Ga Galium 31	115 In Indium 49	204 T t Thallium 81		162 Dy Dysprosium 66	251 C Californium 98
				65 Zn Zinc 30	112 Cd Cadmium 48	201 Hg Mercury 80		159 Tb Terbium 65	247 BK Berkelium
				64 Copper 29	108 Ag Silver 47	197 Au Gold 79		157 Gd Gadolinium 64	247 Cm Curium
Group				59 N ickel 28	106 Pd Palladium 46	195 Pt Platinum 78		152 Eu Europium 63	243 Am Americium 95
้์				59 Co Cobalt	103 Rh Rhodium 45	192 Ir Iridium 77		Sm Samarium 62	
		Hydrogen		56 Fe	101 Ru Ruthenium 44	190 Os Osmium 76		Pm Promethium 61	Np Neptunium
				Manganese	Tc Technetium 43	186 Re Rhenium 75		Neodymium 60	238 C Uranium
				Chromium 24	96 Mo Molybdenum 42	184 W Tungsten 74		Pr Praseodymium 59	Pa Protactinium 91
				51 Vanadium 23	93 Nb Niobium 41	181 Ta Tantalum 73		140 Cer ium 58	232 Th Thorium
				48 T Titanium 22	91 Zr Zirconium 40	178 Hf Hafnium 72			nic mass bol on) number
				45 Scandium 21	89 Y ttrium 39	139 La Lanthanum 57 *	227 Ac Actinium 89	id series series	 a = relative atomic mass X = atomic symbol b = atomic (proton) number
	=		Beryllium 4 24 Magnesium 12	40 Ca Calcium	Sr Strontium 38	137 Ba Barium 56	226 Ra Radium 88	* 58–71 Lanthanoid series † 90–103 Actinoid series	а Х
	_		7 Lithium 3 23 Na Sodum 11	39 K	Rubidium	133 Caesium 55	223 Fr Francium 87	* 58–71 † 90–10′	Key

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

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