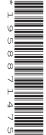


UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS General Certificate of Education Ordinary Level

CANDIDATE NAME				
CENTRE NUMBER		CANDIDATE NUMBER		



COMBINED SCIENCE

5129/21

Paper 2

October/November 2012

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.

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.

For Examiner's Use

This document consists of 23 printed pages and 1 blank page.



fibrin

fibrinogen

hormones

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

antibodies

enzymes

For
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Πea

	platelets	plasma	red	white	water	
Each word may	be used once,	more than or	nce, or not	at all.		
The liquid part of	of the blood is o	called				
This liquid conta	ains several diff	ferent types o	f blood cel	l.		
The function of	the		blc	ood cells is to	carry oxygen.	
The		blood c	ells carry o	out phagocy	tosis and produce	
The platelets he	elp the blood to	clot by turnin	ıg			
into						[6]

2 Fig. 2.1 shows a paper chromatogram obtained from three coloured dyes and three unknown dyes W, X and Y.

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		0		\wedge	0	
0	\bigcap		0	Û	\bigcap	
yellow	blue	red	dye W	dye X	dye Y	pencil origin line

Fig. 2.1

(a)	Explain why the origin line on the chromatography paper is drawn using a pencil rather than a pen.
	[1]
(b)	Which coloured dyes are present in dye W ?
	[2]
(c)	Which of the unknown dyes W , X or Y is a pure substance?
	Explain your answer.
	[2]

[1]

For Examiner's Use

4

3 A student measures the time for 20 complete oscillations of a pendulum.

She repeats the experiment for different lengths of the pendulum.

The results are shown in Fig. 3.1.

length/m	time for 20 oscillations/s	period/s
0.30	22.0	1.10
0.80	35.8	
1.20	44.0	2.20

Fig. 3.1

(a) (i) Complete Fig. 3.1 by calculating the period of the pendulum for a length of 0.80 m.

(ii)	Using the results from Fig. 3.1, state how the period of a pendulum varies with its length.	S
	r4	1

(b) Three different positions of a swinging pendulum are shown in Fig. 3.2.



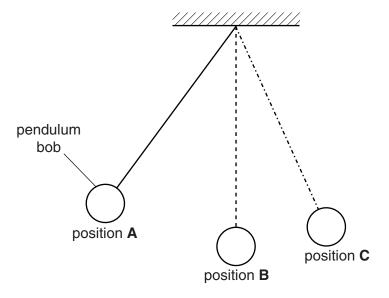


Fig. 3.2

(i) State the letter of the position or positions where the pendulum has most kinetic energy.

.....[1]

(ii) State the energy changes that take place as the pendulum swings from position ${\bf A}$ to position ${\bf B}$.

from to [1]

4 Information about the height and mass of humans is given in Fig. 4.1.

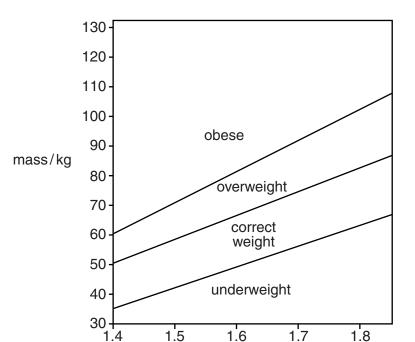


Fig. 4.1

height/m

The heights and masses of four students are:

student A 1.75 m and 88 kg student B 1.65 m and 65 kg student C 1.82 m and 58 kg student D 1.45 m and 70 kg

(a) State which student is obese and which student has the correct weight.

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For Examiner's Use **(b)** Table 4.1 gives information about the energy and nutrients provided by 1.0 kg of six types of food.

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Table 4.1

food	energy /kJ	protein /g	fat /g	carbohydrate /g
oily fish	9700	170	190	0
eggs	6700	120	120	0
cheese	16000	250	310	0
milk	2900	31	39	50
beef	13000	150	280	0
leafy vegetables	1100	27	0	38

	vege	etables	1100		Ŭ	00	
	(i)	An obese	student wishes	to reach a correc	et body mass.		
		Name two	foods in Table 4	1.1 that he should	d avoid.		
		1					
		2					[2]
	(ii)		another way, oth s body mass.	er than eating dit	ferent foods, by	which this studer	nt could
							[1]
(c)	Lea	fy vegetab	les provide fibre	in the diet.			
	Ехр	lain					
	(i)	what is m	eant by fibre,				
							,
							[1]
	(ii)	why it is ir	mportant to inclu	de fibre in the di	et.		
							[2]

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5 Fig. 5.1 shows the structure of an atom of carbon.

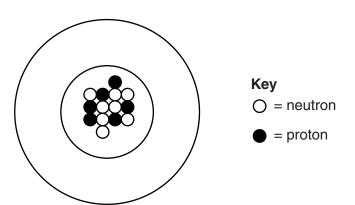


		Fig. 5.1	
(a)	For	this atom, state	
	(i)	the nucleon number,	
	(ii)	the proton number.	[2]
(b)	Cor	mplete Fig. 5.1 to show the electronic structure of an atom of carbon.	[1]
(c)	Car	bon combines with hydrogen to form methane, CH ₄ .	
		te the type of bonding present in methane and explain fully how the bonds and.	are
	type	e of bonding	
	ехр	lanation	
			 [3]

6 Two lamps are connected in parallel, as shown in Fig. 6.1.

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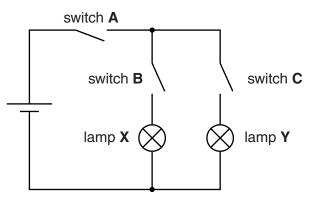


Fig. 6.1

(a) There are three switches A, B and C in the circuit.

State which switch, or switches, are closed to light lamp Y only.

	[1	1]	
--	----	---	---	--

- (b) With all the switches closed, the current in lamp X is 0.2 A.
 - (i) The current from the cell is 0.5 A.

Calculate the current in lamp Y.

(ii) The potential difference across lamp **X** is 1.5 V.

Calculate the resistance of lamp X.

7 The boxes on the left state processes carried out in the body.

The boxes on the right represent organs in the body.

Draw **one** line from each process to the organ where the process takes place.

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process	organ
breaks down alcohol	
doobyoya	
destroys hormones	kidney
excretes carbon dioxide	liver
excretes urea	lung
forms urea	

[5]

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8	The formula of sulfuric acid is H ₂ SO ₄ .		
	The form	nula of sodium hydroxide is NaOH.	
	(a) (i)	Name the ion that causes acidity.	
		[1]	
	(ii)	Name the ion that causes alkalinity.	
		[1]	
	(b) Wh	en sulfuric acid is added to sodium hydroxide the solution becomes neutral.	
	(i)	What is the pH of the solution when it is exactly neutral?[1]	
	(ii) What is the colour of Universal Indicator in the neutral solution?		
		[1]	
	(iii)	Balance the equation for the reaction between sulfuric acid and sodium hydroxide.	
		$H_2SO_4 + \dots NaOH \longrightarrow Na_2SO_4 + \dots H_2O$ [1]	
	(iv)	Construct the ionic equation for the reaction between an acid and an alkali.	

12

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9 Fig. 9.1 shows a ray of light incident on the surface of a glass block. The glass block is in air.

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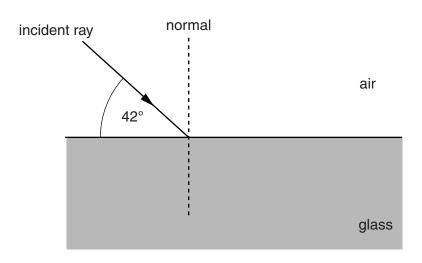


Fig. 9.1

(a) (i) Some of the incident light is reflected.

On Fig. 9.1, draw the reflected ray.

[1]

(ii) Calculate the angle of reflection.

angle of reflection =° [1]

(b) Some of the incident light is refracted.

On Fig. 9.1, draw the refracted ray.

[1]

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10 Fig. 10.1 shows the male reproductive system.

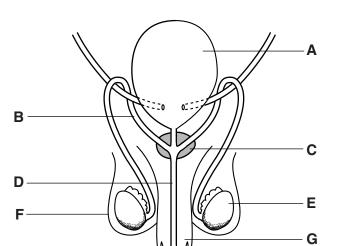


Fig. 10.1

		_	
(a)	(i)	Use the letters on Fig. 10.1 to identify the	
		prostate gland	
		testis	
		urethra[3	3]
	(ii)	State a reproductive function of each of the following structures.	
		prostate gland	
		testis	
		urethra	
		[3	 3]
		•	-

	(iii)	Explain the importance of the scrotum for the production of healthy sperm.	For Examiner's
			Use
		[2]	
(b)	One	e method of male birth control involves a surgical procedure.	
		Fig. 10.1, mark with an X one of the tubes a surgeon would cut when carrying out procedure. [1]	

For Examiner's Use

11 Study the reaction scheme in Fig. 11.1.

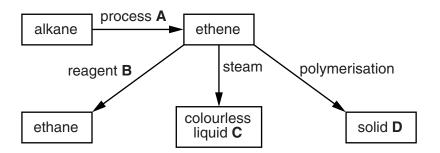


Fig. 11.1

(a)	(i)	Identify the process	A	[1]
	(ii)	Identify substances	B, C and D.	
		reagent B		
		colourless liquid C		
		solid D		[3]
(b)	Bro	mine water is used to	show that ethene is an unsaturated hydrocarbon.	
	(i)	What is meant by the	e term <i>unsaturated</i> ?	
				. [1]
	(ii)	How does the colour	r of the bromine water change when it is added to ethene?	

12 A simple a.c. generator consists of a coil rotating in a uniform magnetic field.

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(a) Complete Fig. 12.1 to show how the voltage output of the generator varies with time during one rotation of the coil. [2]

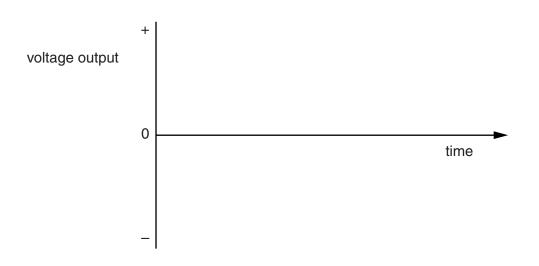


Fig. 12.1

/ L	State two factors affecti	na tha aita af tha	mavimum valtaga	autout of the generate	
w	Siale iwo iaciois allecii	no me size oi me	emaximum voilade	omoni oi me denerato	1.
\-	Clare the lactors arrest		maximmann rondgo	carpar or the generate	

1.		•
2.		
	[2]

(c) The generator has an average power output of 200W.

Calculate the electrical energy produced in 5 minutes.

3	(a)	Describe the intake of water by plants.	Fo
		[2]	
	(b)	Fig. 13.1 shows the appearance of a healthy plant at 07.00 hours.	
		Fig. 13.2 shows the appearance of the same plant 14 hours later.	
		Fig. 13.1 Fig. 13.2	
		(i) State what has happened to this plant.	
		[1]	
		(ii) Explain what has caused this change.	
		[2]	

14	(a)	Define relative molecular mass.	For Examiner's
		[2]	
	(b)	When it is heated, sodium hydrogen carbonate decomposes to form sodium carbonate, carbon dioxide and water.	
		The equation for the reaction is	
		$2NaHCO_3 \longrightarrow Na_2CO_3 + CO_2 + H_2O$	
		The relative molecular mass, $M_{\rm r}$, of sodium hydrogen carbonate is 84. ($A_{\rm r}$: Na, 23; O, 16; C, 12; H, 1)	
		Complete the following sentences.	
		168 g of sodium hydrogen carbonate producesg of sodium	
		carbonate andg of carbon dioxide.	
		16.8 g of sodium hydrogen carbonate producesg of sodium	
		carbonate andg of carbon dioxide.	
		4.2 g of sodium hydrogen carbonate producesg of sodium carbonate. [4]	

15 A measuring cylinder contains 32 cm³ of water.

A stone is added to the measuring cylinder, as shown in Fig. 15.1.



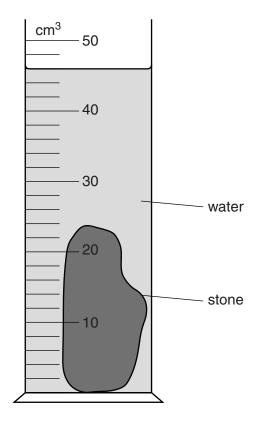


Fig. 15.1

(a) Use Fig. 15.1 to calculate the volume of the stone.

(b) The density of the stone is $3.0\,\mathrm{g/cm^3}$.

Calculate the mass of the stone.

16 A metal can is filled with hot water and placed on a metal table, as shown in Fig. 16.1.



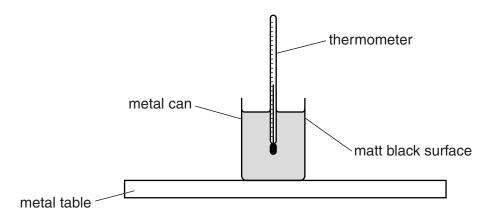


Fig. 16.1

The surface of the metal can is matt black.

The temperature is seen to fall quickly.

(a)	Exp	plain why the temperature falls more slowly when
	(i)	the can is placed on a wooden table,
		[1]
	(ii)	the surface of the can is shiny white instead of matt black.
		[1]
(b)	Air	above the can becomes heated and rises.
	Exp	plain why hot air rises.
		[1]
(c)	A la	aboratory liquid-in-glass thermometer is used to measure the temperature of the er.
	-	plain two differences between a laboratory liquid-in-glass thermometer and a clinical id-in-glass thermometer.
	1	

17 Fig. 17.1 shows some properties of five elements, A, B, C, D and E.

The letters are not the symbols of the elements.

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element	melting point /°C	boiling point /°C	electronic structure
Α	-248	-246	2,8,8
В	- 7	59	2,8,18,7
С	63	766	2,8,1
D	119	444	2,8,6
E	659	2447	2,8,3

Fig. 17.1

Use the letters $\mathbf{A} - \mathbf{E}$ to answer the questions.

(a)	Which element is a liquid at room temperature?		[1]
(b)	Which element is in Group 3 of the Periodic Table?		[1]
(c)	Which element is a solid non-metal at room temper	ature?	
	Explain why you have chosen this element.		
	element		
	explanation		
			[3]

18	(a)	State the sign of the charge on the nucleus of an atom.	For Examiner's Use
		[1]	
	(b)	Explain why an electron is attracted to the nucleus of an atom.	
		[1]	
	(c)	Some nuclei are unstable and emit gamma-rays.	
		State the speed of gamma-rays in a vacuumm/s [1]	
19	Fig.	19.1 shows a mains plug.	
		lead X lead Z	
		Fig. 19.1	
	(a)	Identify the leads X, Y and Z.	
		X	
		Υ	
		Z [2]	
	(b)	The fuse has a rating of 10A.	
		Explain what is meant by a fuse <i>rating</i> .	
		[2]	

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The Periodic Table of the Elements DATA SHEET

Figure 1 Figure 2 Figure 3) - -	S S	Group		2						
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11								- I										4 T
Sample Part								Hydrogen 1										
Fig.	o.						,						=	12	14	16	19	50
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Signor S	24												27	28	31	32	35.5	40
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The volume of one mole of any gas is 24dm3 at room temperature and pressure (r.t.p.).