

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

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CANDIDATE NAME						
CENTRE NUMBER				CANDIDATE NUMBER		

COMBINED SCIENCE

0653/33

Paper 3 (Extended)

October/November 2010

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
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Total	

This document consists of 20 printed pages.

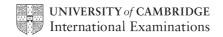


Fig. 1.1 shows some stages in the formation of a human fetus. 1

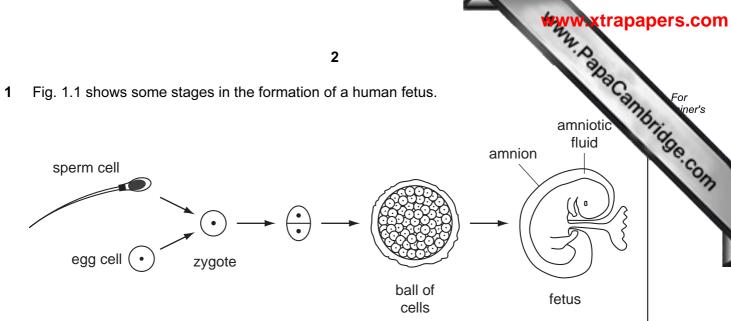


Fig. 1.1

(a)		thuman cells contain 46 cl nromosomes each.	hromosomes, but egg cells and sperm cells contain o	nly
	Sugg	gest a reason for this.		
				[1]
(b)	Nam	e the part of the reproducti	ive system in which each of these events takes place.	
	(i)	Eggs are produced.		[1]
	(ii)	Fertilisation takes place.		[1]
(c)	Desc	cribe the function of the am	nion.	
				[2]

(d) A disease called thalassaemia is caused by a person's genes.

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	3
A d	lisease called thalassaemia is caused by a person's genes.
The tha	3 lisease called thalassaemia is caused by a person's genes. e haemoglobin gene has two alleles, T and t. A person with the alleles tt halassaemia, but a person with alleles Tt does not. State which allele, T or t, is dominant. Explain your answer.
(i)	State which allele, T or t , is dominant. Explain your answer.
	allele
	explanation
	[1]
(ii)	Complete the genetic diagram to show how two parents who do not have thalassaemia could have a child with thalassaemia.
	phenotypes of parents man without woman without thalassaemia thalassaemia
	genotypes of parents Tt
	gametes and and
	gametes from woman
	gametes from man
	[4]
iii)	Thalassaemia reduces the amount of normal haemoglobin in a person's blood.
	Explain why someone with thalassaemia often does not have the energy to do vigorous exercise.
	[2]

2 (a) Fig. 2.1 shows apparatus used in the electrolysis of copper chloride solution.

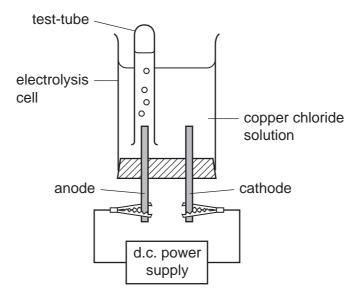


Fig. 2.1

(i)	Describe what is observed at the cathode.	
		[1]
(ii)	Chloride ions have a single negative electrical charge, Cl ⁻ .	
	For every copper ion in the solution, two chloride ions are present.	
	Deduce the electrical charge of a copper ion.	

Show how you obtained your answer.

[2]

(iii) Fig. 2.2 shows diagrams of two particles, L and M. Each of these particles 17 protons in their nucleus.

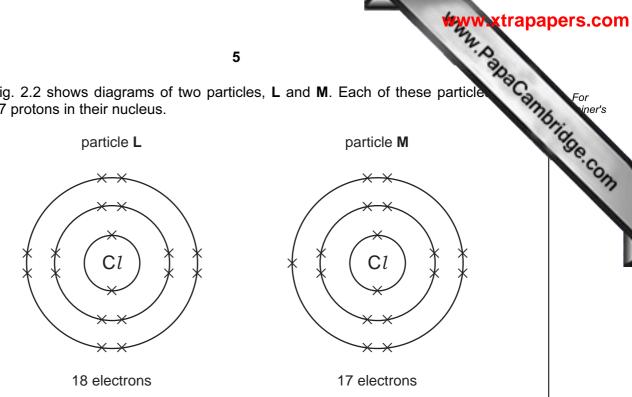


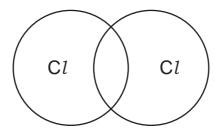
Fig. 2.2

State and explain which one of these particles, L or M, moves towards the anode during electrolysis.

particle	
explanation	
	[2]

(iv) The bubbles of gas which rise from the anode contain diatomic molecules of chlorine.

Complete the bonding diagram below to show how the outer electrons are arranged in a chlorine molecule.



(b) The apparatus shown in Fig. 2.3 can be used to react lead oxide, PbO, and carb

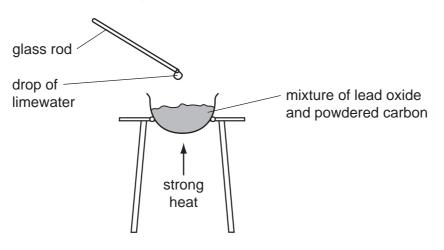


Fig. 2.3

When the mixture is heated, a redox reaction occurs in which lead oxide is reduced.

The drop of limewater suspended on the glass rod turns cloudy.

(i) Name the gas which is produced in this redox reaction.

		[1]
(ii)	Suggest the balanced symbolic equation for the redox reaction between lead ox and carbon.	ide
		[2]

(a) (i) Complete Table 3.1 to show the properties of alpha, beta and gamma radiate

Table 3.1

	description	charge	range in air	ionising ability
alpha		positive	5 cm	very strong
beta	electron		50 cm	
gamma	electromagnetic wave		many kilometres	weak

[4]

(ii)	Many people have smoke detectors in their houses.
	Smoke detectors contain a radioactive source which emits alpha radiation.
	Explain why the alpha radiation from the smoke detector is not dangerous to people living in the house.

(b) A scientist uses a Geiger counter to measure the radiation from a radioactive solution from a radioactive from a

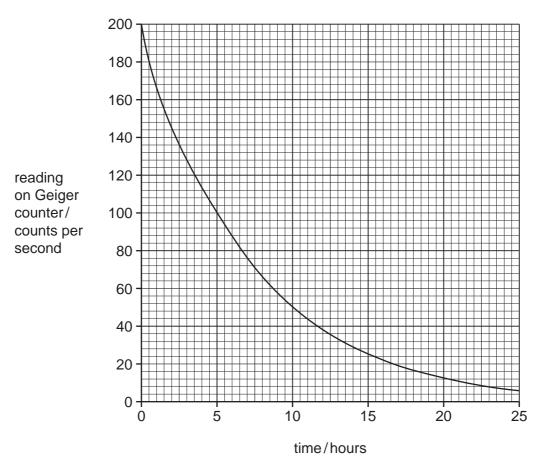


Fig. 3.1

Calculate the half-life of the radioactive source.

Show your working.

[2]
 -

4	Soy	/a be Itain	eans are an important crop in many tropical and subtropical countries, because a lot of protein.
	(a)	A fa	armer grows soya beans in a field on a steep slope.
		Des	scribe two things the farmer could do to reduce the risk of soil erosion.
		1	
		2	
			[2]
	(b)	Soy	va beans and other crops are often attacked by aphids and other insect pests.
		Far	mers may use pesticides or biological control to kill the pests.
		(i)	Describe one advantage and one disadvantage of using pesticides, rather than biological control, to control pests of crops.
			advantage
			disadvantage
			[2]
		(ii)	State what is meant by a <i>systemic pesticide</i> and explain one advantage of using a systemic pesticide rather than a contact pesticide.
			meaning
			advantage
			[2]

5 (a) Fig. 5.1 shows a circuit built by a student.

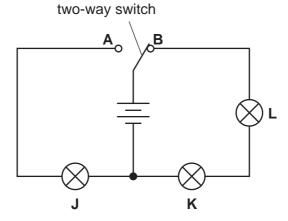


Fig. 5.1

(i)	The switch is at position B . Which	amps will be lit? [1

(ii) The switch is then moved to position **A**.

What happens to lamps ${\bf J},\,{\bf K}$ and ${\bf L}?$

lamp **J**

lamp **K**

lamp **L** [2]

(b) The student has six resistors as shown in Fig. 5.2.

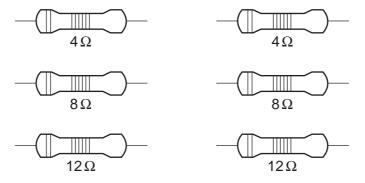


Fig. 5.2

Explain how he can combine **two** of these resistors to get a total resistance of 6 ohms.

(c) Fig. 5.3 shows a simple electrical generator.

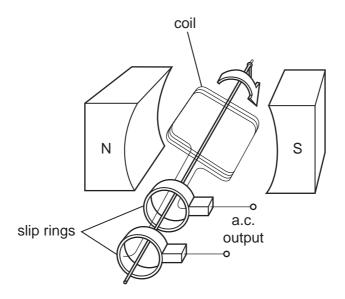


Fig. 5.3

(i)	Explain why a voltage is induced in the coil when the coil is turned.			
		[1]		
(ii)	Explain why this generator produces an alternating current.			
		[1]		

WWW. PapaCambridge.com A solution of sodium chloride is produced when sodium hydroxide solution, an an 6 neutralised by dilute hydrochloric acid. Fig. 6.1 shows apparatus which can be used to out this neutralisation. burette containing dilute hydrochloric acid tap which allows acid to be run slowly and carefully into the conical flask conical flask containing sodium hydroxide solution Fig. 6.1 (a) Complete the balanced symbolic equation, involving ions and molecules, for the neutralisation reaction between an aqueous acid and an aqueous alkali. H⁺ + _____ [2] (b) A student adds a few drops of litmus solution, an indicator, to the sodium hydroxide solution. Suggest what the student should then do in order to produce a neutral solution of sodium chloride, using only the apparatus shown in Fig. 6.1. (c) Suggest how the student could use information gained from the experiment in (b) to obtain a sample of dry, colourless sodium chloride crystals which do not contain any litmus.

7 (a) Polar bears live in the cold, arctic region. They have thick, white fur.



(i)	Describe how fur keeps a polar bear warm.	
		[2]
(ii)	Explain why white fur will keep a polar bear warmer than black fur.	
		••••
		••••
		[2

(b)		elephant can communicate with other elephants using infra-sound. This is frequency vibration, which is usually impossible for a human to hear.
	(i)	Suggest a possible frequency for this vibration and explain how you chos

answer.

WANN. Papa Cambridge. Com frequency Hz explanation (ii) State the meaning of the term frequency. [1]

(iii) Fig. 7.1 shows an oscilloscope trace for a low frequency sound which the human ear can just hear.

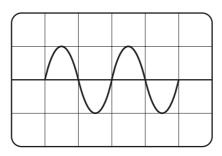
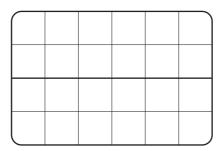


Fig. 7.1

On Fig. 7.2 draw the trace of an infra-sound wave of the same amplitude.



[2]

Fig. 7.2

(c) Fig. 7.3 shows a magnifying glass being used to look at a caterpillar.

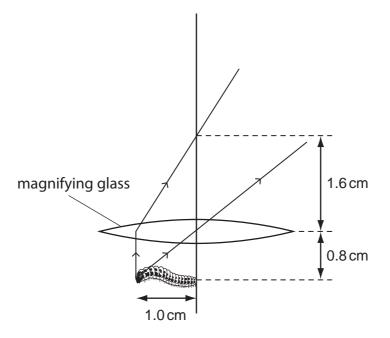


Fig. 7.3

(1)	State the focal length of the lens.	[1]
(ii)	Complete the ray diagram to show how the eye sees an enlarged image of caterpillar.	the [2]
iii)	This image is called a virtual image.	
	Explain the meaning of the term <i>virtual image</i> .	
		[1]

[2]

[3]

8 Carbon and hydrogen combine to form hydrocarbons.

Ethene, C₂H₄, is a gaseous, unsaturated hydrocarbon, which is of industrial importance.

(a) Complete the displayed formula of the ethene molecule which has been started below.

H | C

(b)	Unsaturated hydrocarbons are made in industry from fractions obtained by the fractional distillation of oil (petroleum).
	Name the process which is used to make unsaturated hydrocarbons, and describe briefly how it is done.
	name of process
	description

(c) Describe, in terms of changes to chemical bonds, what happens when ethene

molecules react to form molecules of poly(ethene).

. [2]

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For iner's (d) Calculate the relative formula mass of ethene. Show your working. [2]

9 A healthy plant growing in a pot was watered and placed in a sunny window. A transplastic bag was placed over the plant, as shown in Fig. 9.1.

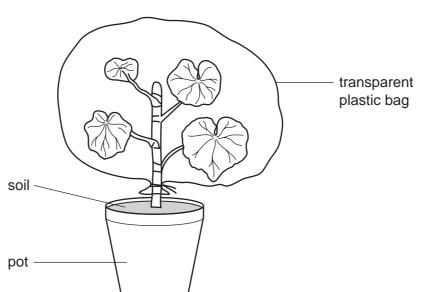


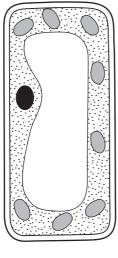
Fig. 9.1

(a) The temperature near the window fell overnight. The next morning, small droplets of water were visible on the inside of the plastic bag.

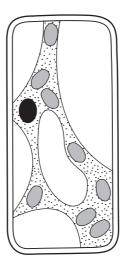
Explain why the droplets of water appeared on the inside of the plastic bag.	
	••••
	••••
	[4]

(b) The plastic bag was then removed from the plant. The next day was warm and and by the end of the day the plant had lost so much water that it wilted.

Fig. 9.2 shows a cell from a leaf before and after the plant wilted.







after wilting

Fig. 9.2

(i)	On the diagram of the cell before wilting in Fig. 9.2, label and name two structure.	ctures
	that would not be present in an animal cell.	[2]

(ii) Using your knowledge of osmosis, explain what happened to the plant cell to

cause its appearance after the plant wilted.	
	[3]

The Periodic Table of the Elements DATA SHEET

								_	1	***WW	xtrapapers.com
					2	0		1			Para
	0	4 He ium	20 N eon 10	40 Ar Argon	84 Kr Krypton 36	131 Xe Xenon 54	Radon 86		175 Lu Lutetium 71	Lr Lawrencium 103	Astrapapers.com Papa Cambridge Com
	\		19 Fluorine	35.5 C1 Chlorine	80 Br Bromine 35	127 I lodine 53	At Astatine 85		173 Yb Ytterbium 70	Nobelium 102	Se COM
	>		16 Oxygen 8	32 S Sulfur	79 Se Selenium 34	128 Te Tellurium 52	Po Polonium 84		169 Tm Thulium	Md Mendelevium 101	
	>		14 N itrogen 7	31 P Phosphorus 15	AS Arsenic	Sb Antimony 51	209 Bi Bismuth		167 Er Erbium 68	Fm Fermium 100	
	2		12 Carbon 6	28 Si Silicon	73 Ge Germanium 32	119 Sn Tin	207 Pb Lead		165 Ho Holmium 67	ES Einsteinium 99	(r.t.p.).
	=		11 Boron 5	27 A1 Aluminium 13	70 Ga Gallium 31	115 In Indium 49	204 T (Thallium		162 Dy Dysprosium 66	Cf Californium 98	pressure
					65 Zn 2inc 30	112 Cd Cadmium 48	201 Hg Mercury 80		159 Tb Terbium 65	Bk Berkeiium 97	ature and
					64 Cu Copper 29	108 Ag Silver 47	197 Au Gold		157 Gd Gadolinium 64	Curium 96	n tempera
Group					59 X Nickel 28	106 Pd Palladium 46	195 Pt Platinum 78		152 Eu Europium 63	Am Americium 95	n³ at roon
Gro					59 Co Cobalt 27	103 Rh Rhodium 45	192 I r Iridium		Sm Samarium 62	Pu Plutonium 94	is is 24 dr
		T Hydrogen			56 Fe Iron 26	101 Ru Ruthenium 44	190 Os Osmium 76		Pm Promethium 61	Neptunium	The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).
					55 Mn Manganese 25	Tc Technetium 43	186 Re Rhenium 75		144 Na Neodymium 60	238 U Uranium 92	one mole
					52 Cr Chromium 24	96 Mo Molybdenum 42	184 W Tungsten 74		Pr Praseodymium 59	Pa Protactinium 91	olume of c
					51 V Vanadium 23	93 Nb Niobium 41	181 Ta Tantalum 73		140 Ce Cerium	232 Th Thorium	The «
					48 Ti Titanium 22	91 Zr Zirconium 40	178 # Hafnium			nic mass bol nic) number	
					45 Sc Scandium 21	89 × Y Yttrium 39	139 La Lanthanum s	227 Ac Actinium †	series eries	a = relative atomic mass X = atomic symbol b = proton (atomic) number	
	=		9 Be Beryllium	24 Mg Magnesium	40 Ca Calcium	Strontium	137 Ba Barium 56	226 Ra Radium 88	*58-71 Lanthanoid series 190-103 Actinoid series	« × □	
	_		7 L.i Lithium	23 Na Sodium	39 K Potassium 19	85 Rb Rubidium 37	133 Cs Caesium 55	Francium 87	*58-71 L ₂	Key	

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