



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

NAME CENTRE			CANDIDATE		
NUMBER COMBINED SC	IENCE		NUMBER	069	53/32

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.

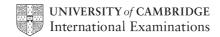
A copy of the Periodic Table is printed on page 20.

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
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

This document consists of 20 printed pages.



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

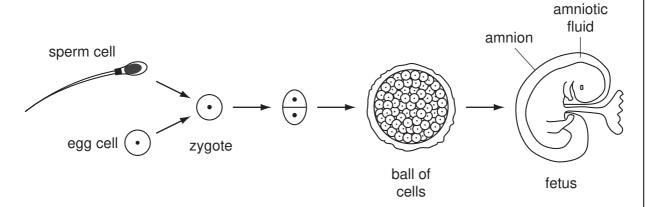


Fig. 1.1

(a)		t human cells contain 46 chr hromosomes each.	omosomes, but egg cells and sperm cells contain o	nly
	Sug	gest a reason for this.		
				 [1]
(b)	Nam	ne the part of the reproductive	e 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 amni	ion.	
				[2]

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

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The haemoglobin gene has two alleles, ${\bf T}$ and ${\bf t}$. A person with the alleles ${\bf tt}$ has thalassaemia, but a person with alleles ${\bf Tt}$ does not.

(i)	State which allele, T or t , is domin	ant. Explair	n your ans	swer.		
	allele					
	explanation					
						[1]
(ii)	Complete the genetic diagram thalassaemia could have a child w			parents wh	no do not ha	ave
	phenotypes of parents	man withouthalassaer			an without assaemia	
	genotypes of parents	Tt				
	gametes	and (and	
		g	gametes fr	rom woman		
	gametes from mar					
						[4]
(iii)	Thalassaemia reduces the amour	nt of normal	haemoglo	obin in a per	rson's blood.	
	Explain why someone with thala vigorous exercise.	ssaemia of	ten does	not have the	he energy to	do
						[2]

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

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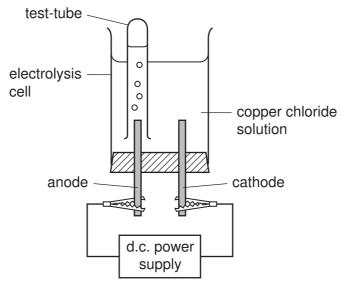


Fig. 2.1

(i)	Describe what is observed at the cathode.	
		[1]
(ii)	Chloride ions have a single negative electrical charge, Cl ⁻ .	

(ii) Chloride ions have a single negative electrical charge, Cl^2 .

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 have 17 protons in their nucleus.

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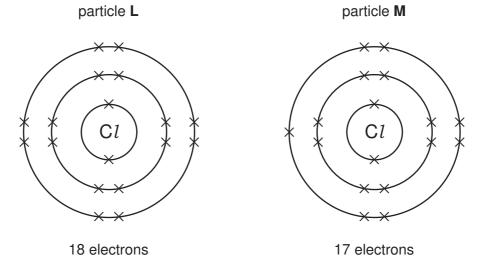


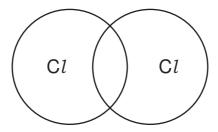
Fig. 2.2

State and explain which one of these particles, ${\bf L}$ or ${\bf M}$, 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.



[2]

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



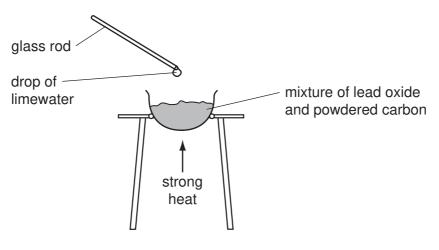


Fig. 2.3

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 oxide and carbon.
	[2]

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

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Table 3.1

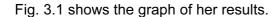
	description	charge	range in air	ionising ability	
alpha		positive	5 cm	very strong	
beta	electron		50 cm		
gamma	electromagnetic wave		many kilometres	weak	

[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.
	[1]

(b) A scientist uses a Geiger counter to measure the radiation from a radioactive source. She records the results every hour.

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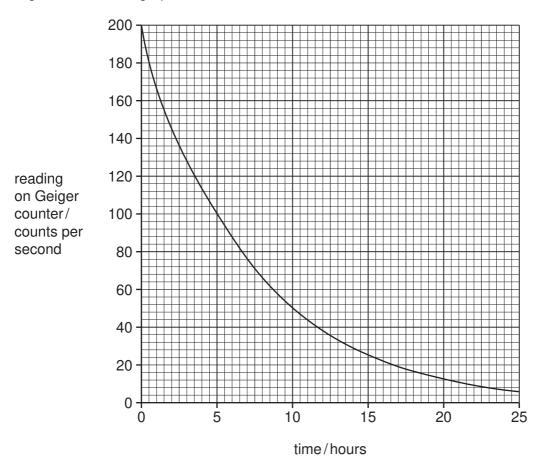


Fig. 3.1

Calculate the half-life of the radioactive source.

Show your working.

[2]

Soya beans are an important crop in many tropical and subtropical countries, because they contain a lot of protein. (a) A farmer grows soya beans in a field on a steep slope. Describe **two** things the farmer could do to reduce the risk of soil erosion. (b) Soya beans and other crops are often attacked by aphids and other insect pests. Farmers 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 systemic pesticide and explain one advantage of using a systemic pesticide rather than a contact pesticide. meaning advantage

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

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[2]

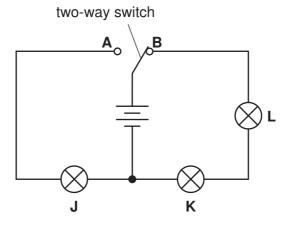


Fig. 5.1

- (i) The switch is at position **B**. Which lamps will be lit? ______[1]
- (ii) The switch is then moved to position ${\bf A}$.

What happens to lamps J, K and L?

lamp **J**

lamp **K**

lamp L

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

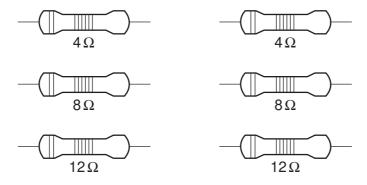


Fig. 5.2

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.

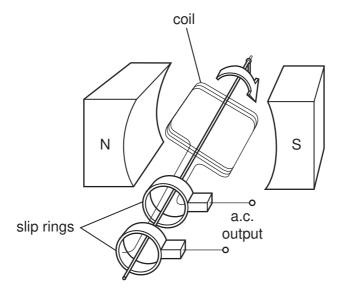


Fig. 5.3

(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]

6 A solution of sodium chloride is produced when sodium hydroxide solution, an alkali, is neutralised by dilute hydrochloric acid. Fig. 6.1 shows apparatus which can be used to carry out this neutralisation.

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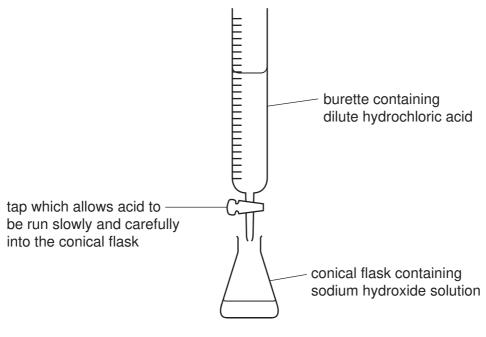


Fig. 6.1

(a) Complete the balanced symbolic equation, involving ions and molecules, for the neutralisation reaction between an aqueous acid and an aqueous alkali.

H [⊤] +	-	\rightarrow		2	

(b) A student adds a few drops of litmus solution, an indicator, to the sodium hydroxide solution.

sodium chloride, using only the apparatus shown in Fig. 6.1.
[0]

Suggest what the student should then do in order to produce a neutral solution of

(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.

.... [3]

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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)	b) An elephant can communicate with other elephants using infra-sound. This is a very low frequency vibration, which is usually impossible for a human to hear.							
(i) Suggest a possible frequency for this vibration and explain how you canswer.								
		frequency Hz						
		explanation						
		[1]						
	(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						

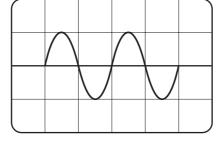
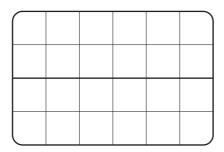


Fig. 7.1

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.

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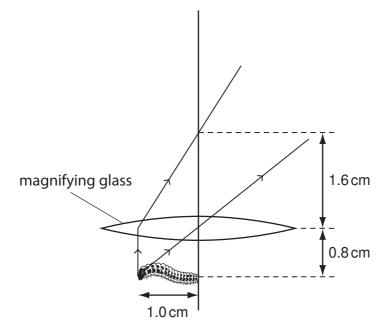


Fig. 7.3

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

Explain the meaning of the term *virtual image*.

.....[1]

8	Carbon and hydrogen combine to form hydrocarbons.						
Ethene, C ₂ H ₄ , is a gaseous, unsaturated hydrocarbon, which is of industrial importan							
(a) Complete the displayed formula of the ethene molecule which has been sta							
		Н					
		C					
		[2]					
		[-]					
	(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					
		[3]					
	(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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(d) Calculate the relative formula mass of ethene.	
Show your working.	
[2	2]

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

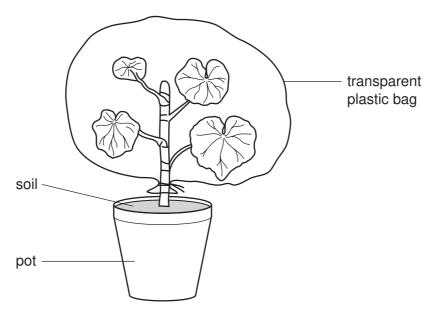


Fig. 9.1

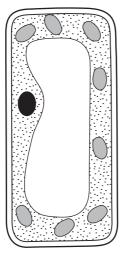
(a)	The temperature near the window fell overnight.	The nex	t morning,	small	droplets	of
	water were visible on the inside of the plastic bag.					

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

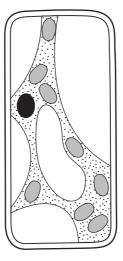
(b) The plastic bag was then removed from the plant. The next day was warm and sunny, and by the end of the day the plant had lost so much water that it wilted.

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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** structures 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]

DATA SHEET
The Periodic Table of the Elements

	0	4 He Helium	20 Ne Neon	40 Ar Argon	84 Krypton 36	131 Xe Xenon 54	Radon 86		175 Cu Lutetium 71	Lawrencium 103			
	II/		19 T Fluorine	35.5 C1 Chlorine	80 Br Bromine	127 I lodine 53	At		Yb Ytterbium 70				
	IN		16 Oxygen 8	32 S Sulfur	Selenium 34		Po Polonium 84		169 Tm Thulium	Md delevium			
	>		14 N itrogen 7	31 Phosphorus 15	75 AS Arsenic	122 Sb Antimony 51	209 Bi Bismuth 83		167 Er Erbium 68	Fm Fermium			
	/ I		12 C Carbon 6	28 Si Silicon	73 Ge Germanium		207 Pb Lead		165 Ho Holmium 67				
	≡		11 Boron 5	27 A1 Aluminium 13	70 Ga Gallium 31	115 In	204 T 1 Thallium 81		162 Dy Dysprosium 66				
		'			65 Zn Zinc	112 Cd Idmium	201 Hg Mercury		159 Tb Terbium	BK Berkelium 97			
					64 C u Copper	108 Ag Silver	197 Au Gold		157 Gd Gadolinium 64	Cm Ourium 96			
Group					59 Nickel	106 Pd Palladium 46	195 Pt Platinum 78		152 Eu Europium 63				
Gro					59 Co Cobalt	103 Rh Rhodium 45			Samarium 62				
		Hydrogen			56 Fe Iron	RC Henium	190 Os Osmium 76		Pm Promethium 61	Neptunium 93			
					Mn Manganese	Tc Technetium 43	186 Re Rhenium 75		Neodymium 60	238 U Uranium 92			
					52 Çr Chromium 24	96 Mo Molybdenum 42	184 W Tungsten 74		Pr Praseodymium 59	Pa Protactinium 91			
								51 V Vanadium 23	93 Nobium	181 Ta Tantalum 73		140 Ce Cerium	232 Tho Thorium
					48 T Titanium	91 Zr Zirconium 40	178 ‡ Hafnium			nic mass ool nic) number			
					45 Sc Scandium 21	89 Y ttrium	139 La Lanthanum 57 *	227 Ac Actinium 89	series eries	 a = relative atomic mass X = atomic symbol b = proton (atomic) number 			
	=		9 Be Beryllium 4	Mg Magnesium	40 Ca Calcium	Strontium	137 Ba Barium 56	226 Ra Radium	*58-71 Lanthanoid series 190-103 Actinoid series	а Х			
	_		7 Li Lithium	Na Sodium	39 K	Rb Rubidium 37	Caesium	Francium 87	*58-71 L	Key			

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

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