



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

CO-ORDINATED SCIENCES

0654/02

Paper 2 (Core)

October/November 2008

2 hours

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 28.

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	
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9	
10	
11	
Total	

This document consists of 25 printed pages and 3 blank pages.



1

Are the forces on the ball balanced or unbalanced? Explain your answer. [1] The players need a lot of energy to play a game of football. State the two main food types which supply the players with this energy.	A f	ootba	all match is taking place.	
Calculate the kinetic energy of the ball. State the formula that you use and show your working. formula working	(a)	Wh	en the ball is kicked it travels at 5 m/s.	
State the formula that you use and show your working. formula working		(i)	The ball has a mass of 0.6 kg.	
formula working			Calculate the kinetic energy of the ball.	
working			State the formula that you use and show your working.	
(ii) Calculate the momentum of the ball. State the formula that you use and show your working. formula working kg m/s [2] Towards the end of the ball's journey it is slowing down. Are the forces on the ball balanced or unbalanced? Explain your answer. [1] The players need a lot of energy to play a game of football. State the two main food types which supply the players with this energy.			formula	
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The players need a lot of energy to play a game of football. State the two main food types which supply the players with this energy.				
State the two main food types which supply the players with this energy. 1				[1]
1	(c)			
2 [2]		2		[2]
2		1		

2 In the 1930s, farmers growing sugar cane in tropical parts of Australia had problems with insect pests, such as lacebugs, that ate the crop. Cane toads, *Bufo marinus*, were introduced from central America to try to solve the problem. Cane toads kill and eat insects and other small animals.

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Fig. 2.1 shows a cane toad.

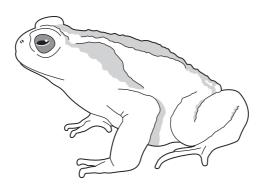


Fig. 2.1

(a)	State one feature of a cane toad, visible in Fig. 2.1, which shows that it is an amphibian.
	[1]
(b)	Name the genus to which cane toads belong.
	[1]
(c)	Use the information above to write a food chain involving cane toads. For each organism, state whether it is a producer or a consumer.
	[2]

(d) Biologists noticed that some cane toads had longer legs than others. They thought that perhaps toads with longer legs could travel faster than other toads.

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They collected toads with different leg lengths, and measured the distance the toads travelled in 24 hours. The results are shown in Fig. 2.2.

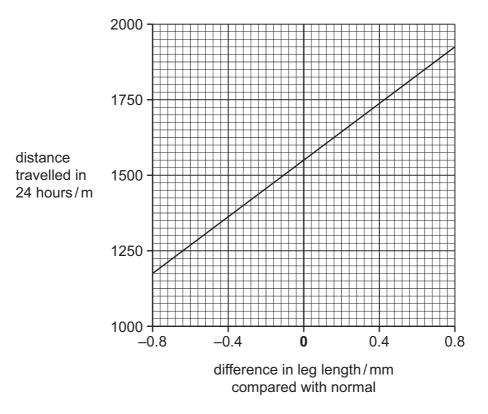


Fig. 2.2

(i) The number 0 on the x axis indicates toads that had normal leg lengths.

Calculate the speed at which a toad with normal leg length travelled. Show your working.

..... m per hour

[2]

(ii)	Describe the relationship between the length of the toad's legs and the speed which it travelled.	l at
		[1]

(iii) State **two** variables that the researchers should have kept the same in their investigation.

1	••••
2	[2]

(e)		digestive system of a cane toad is very similar to the human digestive system. The of a cane toad is high in protein.
	(i)	Name the kind of enzyme that digests proteins to amino acids.
		[1]
	(ii)	Suggest the part of a cane toad's digestive system where the amino acids are absorbed into the blood.
		[1]

3 A student investigates the reaction between magnesium and dilute acid Y. Fig. 3.1 shows the metal being added to the acid contained in a test-tube, and also the same tube some time later.

For Examiner's Use

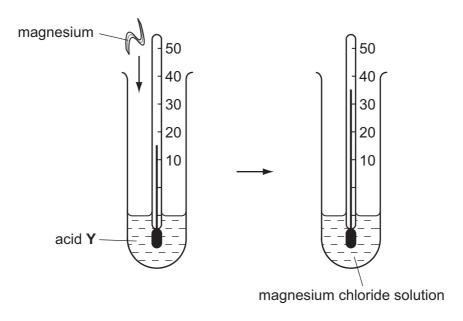


Fig. 3.1

(a)	(i)	Name the compound present after the reaction that was not present before.	
			[1]
	(ii)	Name acid Y .	
			[1]
	(iii)	The student observed bubbles of gas escaping from the mixture. She collect samples of this gas and tested them with limewater, a glowing wooden splint and lit wooden splint.	
		Explain which one of these tests produced a positive result.	
			[2]
	(iv)	Explain how it is possible to tell from Fig. 3.1 that the reaction was exothermic.	
			[2]

(b)	Mag	gnesium alloys are widely used in making parts for aircraft and racing car engines.
	(i)	One type of magnesium alloy contains the elements zinc and zirconium.
		Suggest how this magnesium alloy is made.
		[1]
	(ii)	Suggest and explain why a magnesium alloy, rather than a transition metal such as iron, is used to make parts for aircraft and racing cars.
		[2]

4 (a) Some countries use nuclear fission reactors to generate electricity.

(i) What is meant by the term *nuclear fission*?

[2]

(ii) State **one** advantage and **one** disadvantage of generating electricity using nuclear reactors.

advantage

disadvantage

[2]

(iii) Complete the boxes to show how nuclear power stations transfer energy.

of steam

energy

of turbine

energy

[2]

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(b) When nuclear fuel is used in a power station, ionising radiation is released.

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Table 4.1 shows some information about three types of ionising radiation.

Table 4.1

radiation	ionising power	deflection by electric field
alpha	very strong	small
beta	moderate	large
gamma	weak	none

(i)	Explain why alpha and beta radiations are deflected by an electric field but gam radiation is not.	ma
		[1]
(ii)	Explain why beta radiation is deflected more than alpha radiation by an electical.	tric
		[1]
(iii)	Explain why alpha radiation is the most ionising.	
		[1]
(iv)	State one effect of ionising radiation on living things.	
		[1]
(v)	Why are radioactive sources stored in lead containers?	
		[1]

5 Fig. 5.1 shows the female reproductive system.

For Examiner's Use

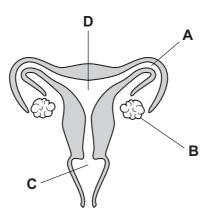


Fig.5.1

(a) Give the letter on the diagram which represents each of the following struction

vagina ovary uterus oviduct

.....

[2]

(b) Fig. 5.2 shows how the thickness of the uterus lining changes during one month of the menstrual cycle.

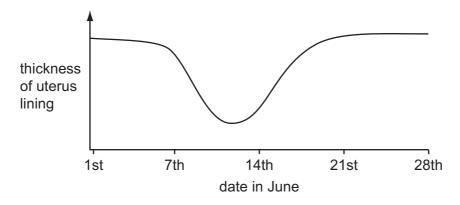


Fig. 5.2

(i)	Explain how the graph shows that menstruation began on June 7th.				
		••••			
		[1]			

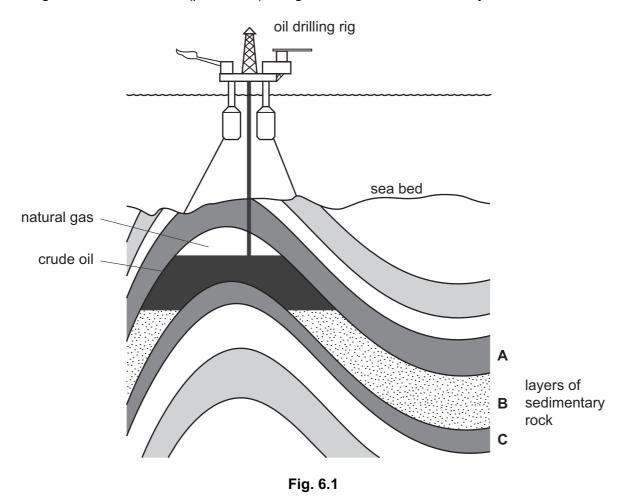
(ii) Suggest the date on which ovulation (the release of an egg from an ovary) occurred.

[1]
 ١.

(c)	Dur	ring fertilisation, a sperm fuses with an egg.		
	(i)	Name the part of the reproductive system where fertilisation takes place.		
		[1]		
	(ii)	A sperm contains 23 chromosomes.		
		How many chromosomes does an egg contain?		
		[1]		
	(iii)	Name the part of a sperm or an egg which contains the chromosomes.		
		[1]		
(d)	(i)	AIDS can be transmitted from one person to another during sexual intercourse.		
		Explain how this transmission can take place.		
		[2]		
	(ii)	Outline two ways by which the spread of AIDS by this method can be limited.		
		[2]		

6 Fig. 6.1 shows crude oil (petroleum) being extracted from sedimentary rock under the sea.

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- (a) The oil shown in Fig. 6.1 is contained in the layer of sedimentary rock labelled B.
 - (i) Name the two other main types of rock, in addition to sedimentary rocks, which make up the Earth's crust.

1	
2	
	[2]

(ii) The oil in Fig. 6.1 is found only in rock layer **B** and not in layers **A** or **C**.

allows it to contain oil.

Suggest the property of rock B which is different from rocks A and C, and which

(b) Crude oil is a mixture of different hydrocarbon molecules. A typical hydrocarbon molecule is shown in Fig. 6.2.

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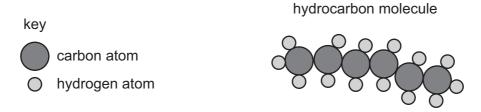


Fig. 6.2

Some hydrocarbon molecules are different from others in crude oil because their carbon atoms form a branched chain as shown in Fig. 6.3.

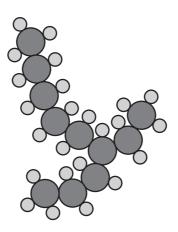


Fig. 6.3

Describe **two** other ways in which hydrocarbon molecules can be different from one another.

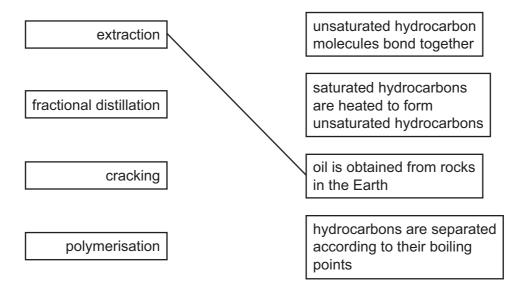
1	
2	
	[2]

(c) Some hydrocarbons are changed by chemical reactions into a very wide range of materials including plastics. Plastics are made of polymer molecules.

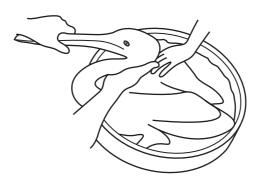
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[2]

Some of the reactions and processes which are required to produce a typical plastic are shown below. Draw lines linking the statements. One line has already been drawn.



(d) If an oil tanker is involved in an accident, oil may spill into the sea. If sea birds become covered in crude oil they will die unless the oil can be removed.



(i)	Why is water alone not able to wash the oil from the birds?
	[1]
(ii)	Suggest what could be added to the water in order to remove the oil from the birds.
	[1]

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Please turn over for Question 7

An airline passenger enters an airport.	For Everying 1/2
(a) He buys some hot food at the restaurant and carries it away in a polystyrene container.	Examiner's Use
Explain why a polystyrene container is used to keep food hot.	
[1]	
(b) He then moves up an escalator (moving staircase) as shown in Fig. 7.1.	
6 m	
Fig. 7.1	
The passenger weighs 900N.	
(i) Calculate the work done lifting the passenger a vertical distance of 6 metres.	
State the formula that you use and show your working.	
formula	
working	
J [2]	
(ii) State the potential energy the passenger has gained when he reaches the top of the escalator.	
J [1]	

(c)	The	e aeroplane that the passenger travels on is able to navigate using radar.		For Examiner's
	Thi	s involves the use of microwaves. These are part of the electromagnetic spectrum	٦.	Use
	(i)	Name one other wave which is part of the electromagnetic spectrum.		
			[1]	
	(ii)	State the speed at which these waves travel in a vacuum.		
		m/s	[1]	

8 Fig. 8.1 shows an alveolus and a blood capillary in the lungs.

For Examiner's Use

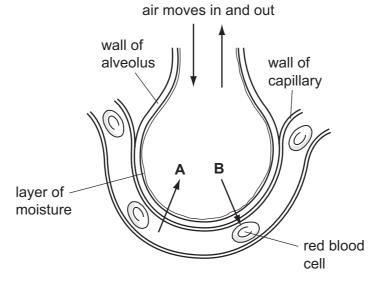


Fig. 8.1

(a)	(1)	Name the gases that move as indicated by arrows A and B.	
		A	
		В	[2]
	(ii)	Name the process by which the gases move.	
			[1]
(b)	Des	scribe what happens in the red blood cells as they pass through the lungs.	
			[2]

(c) Fig. 8.2 shows the structure of a leaf.

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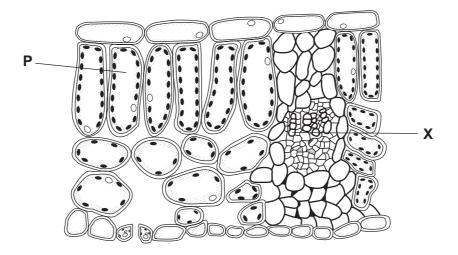


Fig. 8.2

(i)	Cell P contains many chloroplasts and can photosynthesise.	
	At night, cell P takes in oxygen and gives out carbon dioxide.	
	In the daytime, cell P takes in carbon dioxide and gives out oxygen.	
	Explain why this happens.	
	at night	
	in daytime	
		[3]
(ii)	On Fig. 8.2, draw an arrow to show how gases travel to cell P from the air.	[1]
(iii)	Cell X is a xylem vessel.	
	Give two functions of a xylem vessel in a leaf.	
	1	
	2	[2]

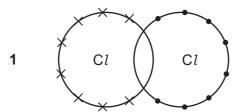
9	Litmus and alizarin yellow are substances which can be used to indicate the pH of a
	solution. The colours of these substances in solutions of different pH ranges are shown
	below.

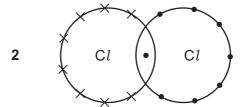
20101	••				
			pH 4.5 and lower	pH 8.3 and higher	
		litmus	red	blue	
			pH 10.1 and lower	pH 12.0 and higher]
		alizarin yellow	yellow	brown	
		, , , , , , , , , , , , , , , , , , ,	, , ,]
		ent wishes to find ou substances named a		ion is an acid or an alkali by	using one
E	Explair	n why she should us	e litmus and not alizar	in yellow.	
					[2]
			olant material and al n yellow is C ₁₃ H ₈ N ₃ Nao	izarin yellow is a synthetic O_5 .	dye. The
(i) Ex	xplain the meaning o	f the term <i>synthetic dy</i>	ve.	
					[2]
(i	ii) Ho	ow many metallic ele	ments are shown in th	ne formula of alizarin yellow?	
ν.	.,	ow many motame ore			[1]
(ii	•	ame a method which mus and alizarin yello		d out whether a mixture conta	ained both
					[1]

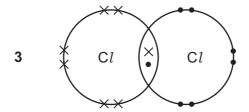
(c) The atoms in molecules are joined by covalent chemical bonds.

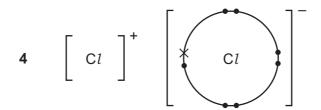
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Explain which **one** of the diagrams, **1** to **4**, shows a covalent bond between the atoms in a chlorine molecule.









		[2]

10 (a) A simple circuit is shown in Fig. 10.1.

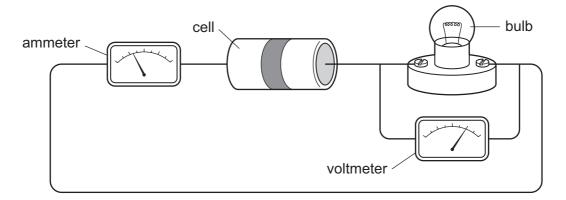


Fig. 10.1

In the space below, draw the circuit diagram for this circuit using the correct symbols.

[3]

(b) Fig. 10.2 shows a d.c. electric motor.

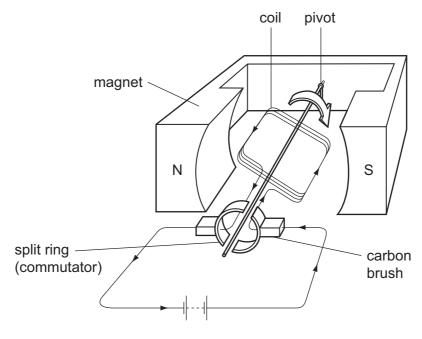


Fig. 10.2

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	(i)	Suggest two ways of making the coil spin more quickly.
		1
		_
		2
		[2]
	(ii)	Apart from changing the direction of the current in the coil, how could you reverse the motion of the coil?
		[1]
(c)	An	electric motor is connected to a 240 V supply.
	The	e maximum current used by the motor is 4A.
	(i)	Use the formula power = voltage x current to calculate the maximum power put into the motor.
		Show your working.
		W [1]
	(ii)	Explain why the electrical input power will be greater than the useful mechanical output power.
		[2]

11 Fig. 11.1 shows the apparatus and substances used by a student to make an electrical cell.

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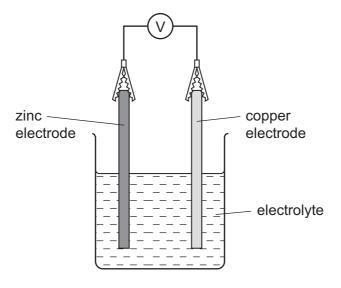


Fig. 11.1

(a)	(i)	What type of compound must be dissolved in water to produce an electrolyte?	
			[1]
	(ii)	The student finds that the voltmeter reads 1.1 V.	
	(11)		
		He then replaces the copper electrode with another electrode made of zinc.	
		Predict and explain briefly the new voltmeter reading.	
			••••
			••••
			[2]

(b)) In the electrical cell in Fig. 11.1 zinc atoms are converted into positively charged zinc ions, Zn ²⁺ .						
	(i)	State the number of electrons in one atom of zinc. Use your copy of the Periodic Table on page 28 to help you to answer this question.					
		[1]					
	(ii)	Describe what happens to a zinc atom when it changes into a zinc ion.					
		[2]					
(c)	Fig.	. 11.2 shows an electrical cell used in a personal stereo.					
		- +					
		Fig. 11.2					
	The	Fig. 11.2 e following chemical reaction occurs inside the cell when the stereo is switched on.					
	The	_					
		e following chemical reaction occurs inside the cell when the stereo is switched on.					
	Nar	e following chemical reaction occurs inside the cell when the stereo is switched on. $Zn \ + \ 2MnO_2 \ \rightarrow \ ZnO \ + \ Mn_2O_3$					
	Nar Exp	e following chemical reaction occurs inside the cell when the stereo is switched on. $Zn \ + \ 2MnO_2 \ \rightarrow \ ZnO \ + \ Mn_2O_3$ me the substance which is oxidised in this reaction.					
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DATA SHEET
The Periodic Table of the Elements

	0	4 Helium	Neon 10 At 40 At 40	18	ᇫ	Krypton 36	131	Xe	Xenon 54		Ru	Radon 86			175	Lutetium	:	בֿ	Lawrencium
	II/		19 Fluorine 9 35.5 C.1		B	Bromine 35	127	_	lodine 53		¥	Astatine 85			173	Yb Ytterbium		^o N	
	I		Oxygen 8		Se	Selenium 34	128	Цe	Tellurium 52			Polonium 84			169	Tm Thulium		Md	Ę
	>		Nitrogen 7 31	15			122	Sb	Antimony 51	209	Ξ	Bismuth 83			167	Erbium	3	Fm	
	<u> </u>		Carbon 6 Carbon 8 S S Since	14	ge 3	Germanium 32	119	Sn		207	Pb	Lead 82			165	Holmium 67	5	Es	Einsteinium
	≡		11 B Boron 5 A1	13	ga Ca	Gallium 31	115	I	Indium 49	204	11	Thallium 81			162	Dy Dysprosium	3	Ç	Californium
					Zu	Zinc 30	112	ဦ	Cadmium 48	201	Нg	Mercury 80			159	Tb Terbium 65	3	æ	Berkelium
				29	C	Copper 29	108	Ag		197	Αn	Gold 79			157	Gd Gadolinium 64	S	Cm	Curium
Group				o u	Ë	Nickel 28	106	Pd	Palladium 46	195	₹	Platinum 78			152	Europium	3	Am	Americium
ອັ				or or	္ပင္ပ	Cobalt 27	103	뫕	Rhodium 45	192	<u>-</u>	Iridium 77			150	Samarium Sanarium	4	Pu	Plutonium
		1 Hydrogen		ŭ	E E	Iron 26	101	Ru	Ruthenium 44	190	Os	Osmium 76				Pm Promethium		N	Neptunium
				r,	M	Manganese 25			Technetium 43	186	Re	Rhenium 75			144	Neodymium No	238		Uranium
				2	່ວ້	Chromium 24	96	Mo	Molybdenum 42	184	>	Tungsten 74			141	Pr Praseodymium	3	Ра	Protactinium
				2	>	Vanadium 23	93	S S	Niobium 41	181	<u>a</u>	Tantalum 73			140	Cerium	232	보	Thorium
				φ.	; ;	Titanium 22	91	Zr	Zirconium 40	178	Ξ	Hafnium 72			1		nic mass	lod	nic) number
			ı	π. π.	လို	Scandium 21	88	>	Yttrium 39	139	La	Lanthanum 57 *	227 A C	Actinium 189	7	series	a = relative atomic mass	X = atomic symbol	b = proton (atomic) number
	=		Beryllium 4 24 Magnagina	12	C	Calcium 20	88	Š	Strontium 38	137	Ва	Barium 56	226 Ra	Radium 88	ioacd+ac	50-7 1 Lantination series 190-103 Actinoid series	a	×	
	_		Lithium 3 Lithium 3 23 Na Rodiima	11	×	Potassium 19	85	Rb	Rubidium 37	133	S	Caesium 55	ù	Francium 87	* 50 71	38-7 1 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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