



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	
COMBINED SO	CIENCE		0653/02
Paper 2 (Core)		Oct	ober/November 2007
			1 hour 15 minutes
Candidates ans	swer on the Question Paper.		
No Additional M	laterials 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.

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1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

This document consists of ${\bf 19}$ printed pages and ${\bf 1}$ blank page.



1 Fig. 1.1 shows a plant, and also a cell from part of the plant.



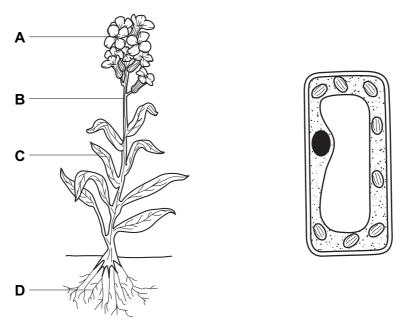


Fig. 1.1

- (a) From which part of the plant, A, B, C or D, does the cell come?
- (b) On the diagram of the cell in Fig. 1.1, label the following structures.Use label lines and the appropriate letters.
 - P a partially permeable membrane
 - **Q** the part of the cell that contains DNA
 - R a structure where energy from sunlight is absorbed [3]

(c)	Describe how you would test a leaf from the plant for starch.	For Examiner's Use
	[3]	
(d)	Complete these sentences about part A of the plant shown in Fig. 1.1. Use some of these words.	
	anthers asexual ovules petals sepals sexual stigma	
	Flowers are responsible forreproduction.	
	Themake pollen, which contains the male gametes.	
	The female gametes are found inside the[3]	

2 Fig. 2.1 shows the inside of a refrigerator.

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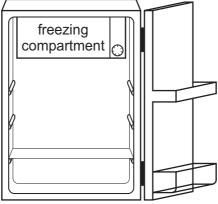
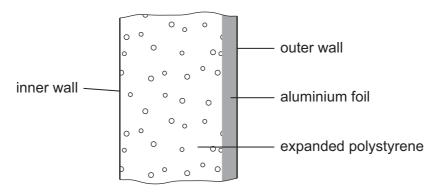


	Fig. 2.1				
(a)	(i)	Draw arrows on Fig. 2.1 to show what happens to the air cooled by the freezing compartment. [1]			
	(ii)	Name this method of heat transfer.			
		[1]			
	(iii)	Use the idea of density to explain why this happens.			
		[2]			
(b)		e refrigerator has a lamp inside. The supply voltage is 240 V and the current passing bugh the lamp when lit is 0.04 A.			
	Cal	culate the resistance of the lamp.			
	Sta	te the formula that you use and show your working.			
		formula used			
		working			
		Ω [2]			

(c) The refrigerator walls are insulated using both expanded polystyrene and aluminium foil.

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temperature inside the reingerator.	
	[3]

Explain how the structure of the refrigerator wall will help to maintain a lower

3

Hydrogen peroxide, H₂O₂, is a colourless liquid.
Hydrogen peroxide slowly decomposes into simpler substances. The equation for the decomposition reaction is shown below.
hydrogen peroxide → water + oxygen
(a) How many atoms are there in one molecule of hydrogen peroxide?
[1]
(b) (i) The decomposition of hydrogen peroxide is usually carried out in the presence of a catalyst.
State the purpose of adding a catalyst to a reaction mixture.
[1]
(ii) The solid compound manganese dioxide, MnO₂, is used as a catalyst in the reaction above. Manganese is a metal in the fourth period of the Periodic Table.
What name is given to the family of metals which contains manganese?

(c) (i)	Hydrogen peroxide contains two non-metallic elements bonded together.
	Name the type of chemical bonding in hydrogen peroxide molecules.
	[1]
(ii)	Oxygen molecules, O ₂ , are made of two oxygen atoms joined by a double bond.
	Suggest the displayed formula of an oxygen molecule.
	[1]
(iii)	The symbolic equation for the decomposition of hydrogen peroxide is shown below. The equation is not balanced.
	Balance the equation.
	$H_2O_2 \longrightarrowH_2O + O_2$ [1]
	1.1

4 Fig. 4.1 shows part of the carbon cycle.

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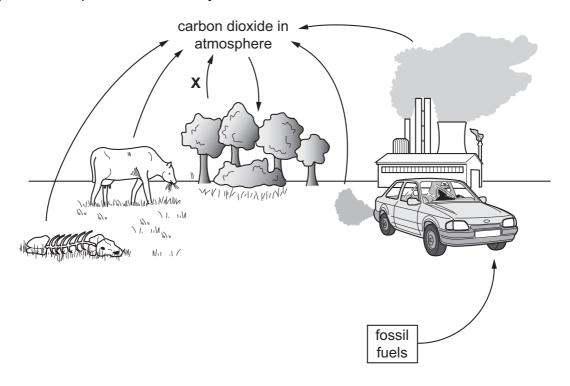
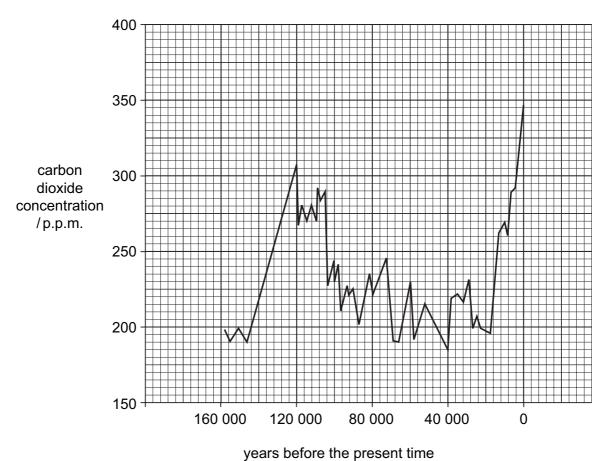


Fig. 4.1

(a)	Name the process labelled X on Fig. 4.1.	
		[1]
(b)	Explain how carbon dioxide is returned to the air from the bodies of dead organisms.	
		[2]
(c)	Describe how fossil fuels are formed.	
		•••
		[2]

(d) Fig. 4.2 shows changes in the concentration of carbon dioxide in the atmosphere in the last 160 000 years.

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•

Fig. 4.2

(i)	Suggest one human activity that is causing the current increase in carbon dioxide concentration in the atmosphere.
	[1]
(ii)	Explain how the information in Fig. 4.2 suggests that human activities are not entirely to blame for increases in the concentration of carbon dioxide in the atmosphere.
	[1]
(iii)	Explain why many people are worried about this increase in carbon dioxide concentration.
	[2]

5 A space rocket is launched to the Moon.

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(a) After launch, the empty fuel tanks are released and fall back to Earth. As a tank falls, two forces act on it as shown in Fig. 5.1.

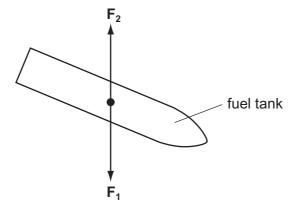


Fig. 5.1

F ₁	
F.	

.. [2]

(ii)	As it falls, the tank accelerates. What does this tell you about the two forces?	
		[1

(b) The rocket travels 400 000 km to the Moon in 80 hours.

Calculate the average speed of the rocket.

State the formula that you use and show your working.

formula used

working

km/h [2]

(c)		e of the astronauts on the rocket has a mass of 90 kg. The gravitational fie ength of the Moon is about one-sixth that of the Earth.	ld
	State the differences, if any, between		
	(i)	the mass of the astronaut on the Earth and on the Moon,	
			[1]
	(ii)	the weight of the astronaut on the Earth and on the Moon.	
			[1]
(d)	the	ere is no atmosphere and there are no fossil fuel deposits on the Moon. To provide energy needed to use his equipment on the Moon, the astronaut needs to use ewable energy resources.	
	Su	ggest one renewable energy resource which is naturally available on the Moon.	
			[1]

6 The apparatus in Fig. 6.1 can be used to study the reaction between potassium and oxygen.

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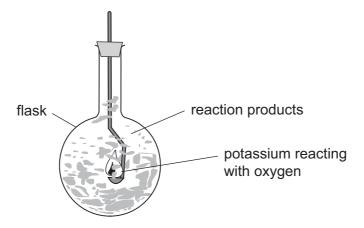


Fig. 6.1

(a)	Sug	ggest why the flask becomes warm during the reaction.	
			 [1]

(b)	One	e of the compounds formed in this reaction is potassium oxide.	
	The	e chemical formula of potassium oxide is K₂O.	
	(i)	Explain the meaning of this formula.	
			[1]
	(ii)	Potassium oxide is made of positive and negative ions.	
		Explain, in terms of protons and electrons, the difference between a positive is and a neutral atom.	on
			[2]

(c)		en the reaction in Fig. 6.1 had finished, a student added water containing Universal cator to the flask.
	Pre	dict the colour change of the Universal Indicator.
	Exp	lain your prediction.
		[2]
(d)		assium metal reacts with water to form a solution of potassium hydroxide. During reaction a gas is given off.
	(i)	Write the chemical formula of potassium hydroxide.
		[1]
	(ii)	Name the gas which is given off and describe a test for this gas.
		name of gas
		test
		[3]

7 Tuberculosis (TB) is an infectious disease caused by a bacterium. HIV/AIDS is caused by a virus.

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(a) Table 7.1 shows the percentage of people with TB and HIV/AIDS in four parts of the world in 2005.

Table 7.1

part of the world	percentage of people with TB	percentage of people with HIV/AIDS				
sub-Saharan Africa	0.51	7.2				
Southeast Asia	0.35	1.1				
Americas	0.07	0.7				
Europe	0.06	0.5				

	(i)	In which of these four parts of the world was there the largest percentage of peopl with TB?	е
			1]
	(ii)	Describe any pattern that seems to link the percentages of people with TB an with HIV/AIDS.	d
			1]
	(iii)	The virus that causes AIDS infects white blood cells. Explain how this could be responsible for the pattern that you have described in (ii).	е
			•••
			•••
			2]
(b)		e TB bacterium usually infects cells in the lungs. Many of the cells in the alveoli ar	е
		olain how this can lead to a person feeling very tired and unable to carry ou ergetic exercise.	ıt
			•••
			21

(c)	(1)	that can be transmitted in this way.	ses	For Examiner's Use
		1		
		2	[2]	
	(ii)	How can the spread of these diseases be reduced?		
			[1]	

(a) A dentist checks the student's teeth using a dental mirror. This is shown in Fig. 8.1.

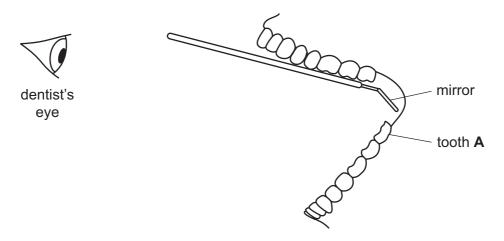


Fig. 8.1

Draw a ray of light from the back of tooth **A** to the dentist's eye to show how the dentist is able to see the back of the tooth.

On the ray, draw arrows showing the direction in which the light travels. [3]

- **(b)** A doctor tests the student's hearing and confirms that the lowest and highest frequencies the student can hear are normal for a young person.
 - (i) Suggest a value for each of these.

8

	lowest frequency		Hz	
	highest frequency		Hz	[2]
(ii)	What is meant by t	the frequency of a wave?		
				[1]
(iii)	Sound is one form	of energy.		
	Name two other fo	rms of energy.		

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2.

(c) The doctor wants to use a small torch to look down the student's throat. When he switches the torch on, it does not work.

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Fig. 8.2 shows the circuit diagram for the torch.

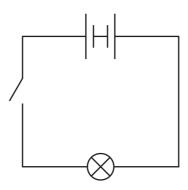


Fig. 8.2

(i)	Explain what is wrong with the torch.	
		•••••
		[1]

(ii) Draw the correct circuit diagram.

[1]

)		minium, iron, sodium and chlorine are important elements produced by the chemical ustry.								
	(a)	Use the copy of the Periodic Table on page 20 to help you to answer this question. State which of the elements above								
		(i)	is not in the same period of the Periodic Table as the other three,							
		(::\	[1]							
		(ii)	has atoms which contain 11 electrons.							
			[1]							
	(b)		minium is a metal which resists corrosion and has a relatively low density. The ength of aluminium can be improved by making it into an alloy.							
		Exp	plain why aluminium alloys are important materials for use in aircraft construction.							
			[3]							
	(c)		is produced when iron oxide reacts with carbon monoxide in a blast furnace. st iron is converted into steel.							
		(i)	The equation for the reaction between iron oxide and carbon monoxide is shown below.							
			iron oxide + carbon monoxide \rightarrow iron + carbon dioxide							
			Explain which substance has been reduced in this reaction.							
			[2]							
		(ii)	State two advantages of steel compared to iron from a blast furnace.							
			1							
			2							
	(d)	The	e chemical symbol for chlorine is C <i>l</i> .							
		Wri	te the chemical formula of a chlorine molecule. [1]							

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DATA SHEET
The Periodic Table of the Elements

	0	4 He Helium	20 Ne Neon	40 Ar Argon	84 Kr	Krypton 36	131	Xenon	94	Ru	Radon 86		175 Lu Lutetium		۲	Lawrencium 103
	NII/		19 T Fluorine 9	35.5 C1 Chlorine	80 Br	Bromine 35	127		53	Αţ	Astatine 85		173 Yb Ytterbium 70		9 N	Nobelium 102
	N		16 Oxygen	32 S Sulphur	Se	Selenium 34	128	Tellurium	76	Ро			169 Tm Thulium 69		Md	Mendelevium 101
	>		14 N Nitrogen 7	31 Phosphorus	75 As		122	Sb	000	<u>i</u>	Bismuth 83		167 Er Erbium 68		Fm	Fermium 100
	>		12 C Carbon 6	28 Si Silicon	73 Ge	Germanium 32	119	S ₽		Pb	Lead 82		165 Ho Holmium 67		Es	Einsteinium 99
	=		11 Boron 5	27 A1 Aluminium 13	70 Ga	Gallium 31	115	Indium	64	11	Thallium 81		162 Dy Dysprosium 66		Ç	Californium 98
					65 Zn	Zinc 30	112	Cadmium	201	Hg	Mercury 80		159 Tb Terbium 65		BK	Berkelium 97
					64 Cu	Copper 29	108	Ag Silver	107	Au	Gold 79		157 Gd Gadolinium 64		Cm	Curium 96
Group					59 Z	Nickel 28	106	Pd Palladium	40 10F	ፈ	Platinum 78		152 Eu Europium 63		Am	Americium 95
ģ					SS CS	Cobalt 27	103	Rhodium	192	ī	Iridium 77		Sm Samarium 62		Pu	Plutonium 94
		1 Hydrogen			56 Fe	lron 26	101	Ru thenium	44	SO	Osmium 76		Pm Promethium 61		Ν	Neptunium 93
					SS Mn	Manganese 25		Tc Technetium		Re	Rhenium 75		Neodymium 60	238	-	Uranium 92
					SZ Cr	Chromium 24	96	Molybdenum	742	>	Tungsten 74		Pr Praseodymium 59		Ра	Protactinium 91
					51	Vanadium 23	63	Niobium	1 20 7	Ta_	Tantalum 73		140 Ce Cerium	232	H	Thorium 90
					48 H	Titanium 22	91	Zirconium	40 472	Ŧ	* Hafnium		1	nic mass	loqu	nic) number
				ı	Sc Sc	Scandium 21	89	**************************************	130	La	Lanthanum 57	227 Ac Actinium	series series	a = relative atomic mass	X = atomic symbol	b = proton (atomic) number
	=		Beryllium	24 Mg Magnesium	Ca	Calcium 20	88	Strontium	30	Ba	Barium 56	226 Rad Radium	*58-71 Lanthanoid series 190-103 Actinoid series	а	× ×	٩
	_		7 Li Lithium	23 Na Sodium	® ¥	Potassium 19	85	Rubidium	122	S	Caesium 55	Fr Francium 87	*58-71 L		Key	Ω

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

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