

Centre Number	Candidate Number	Name
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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

COMBINED SCIENCE

0653/02

Paper 2 Core

May/June 2006

1 hour 15 minutes

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

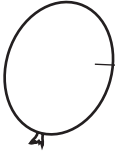
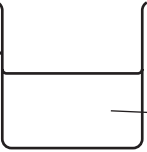
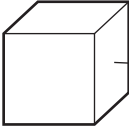
Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
You may use a pencil for any diagrams, graphs, tables or rough working.
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 Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

- 1 (a) Each box below contains a description of a solid, a liquid or a gas.

Join each box to the correct diagram. One has been done for you.

It takes up the shape of its container and has a constant volume.		gas
The particles form a regular arrangement.		liquid
The particles are widely spaced out.		
The particles are kept in place and only vibrate.		solid

[2]

- (b) A student sets up the apparatus shown in Fig. 1.1.
He wants to use this apparatus to detect thermal radiation.

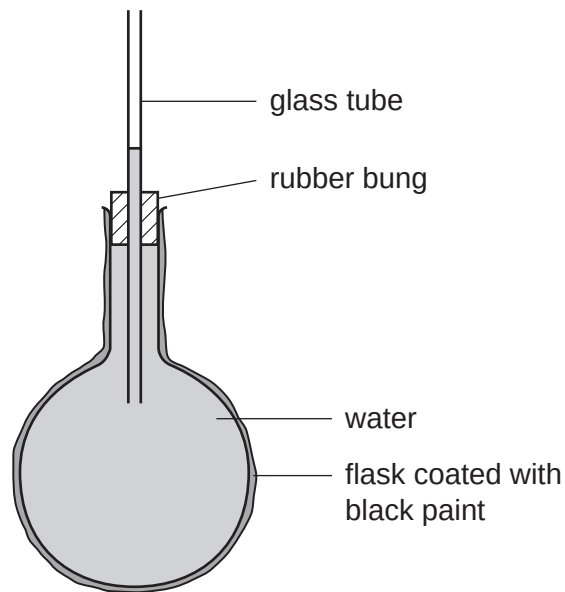


Fig. 1.1

- (i) Describe what the student would observe when the flask coated with black paint is exposed to a source of thermal radiation.

.....
..... [1]

- (ii) Explain the observation in (i) in terms of water particles.

.....
.....
.....
.....
..... [3]

- (iii) Suggest why the flask is coated with black paint.

..... [1]

- 2 Fig. 2.1 shows a fetus developing in the uterus.

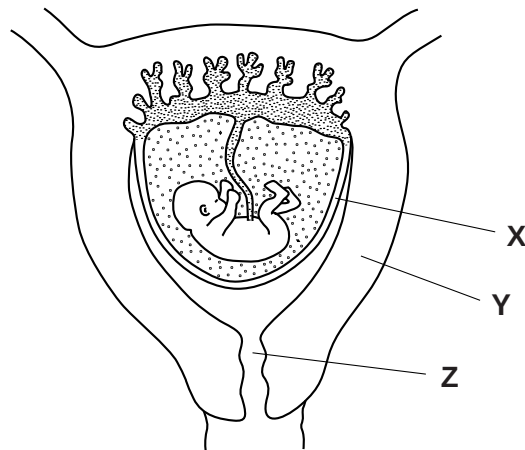


Fig. 2.1

- (a) Name the parts labelled **X**, **Y** and **Z**.

X

Y

Z [3]

- (b) Describe how the fetus obtains oxygen.

.....

 [3]

- (c) Anna is planning to start a family. She smokes 6 cigarettes a day.
 Explain why Anna should give up smoking before she becomes pregnant.

.....

 [2]

- 3 (a) Table 3.1 shows some information about the elements in Group VII of the Periodic Table. Use the Periodic Table on page 20 to help you with this question.

(i) Complete the table.

Table 3.1

Period in which the element is found	symbol	physical state at 25 °C
	Cl	
	Br	
	I	

[2]

- (ii) Fluorine is the Group VII element in Period 2.
Suggest the physical state of fluorine at 25 °C.

[1]

- (b) Bromine exists as diatomic molecules, Br₂. Bromine molecules react with magnesium atoms to form magnesium bromide.

(i) State the type of chemical bonding in bromine molecules.

[1]

- (ii) The formula of magnesium bromide is MgBr₂.
Explain what is meant by this formula.

[1]

- (c) (i) State **one** element which is often added to water intended for drinking.

[1]

- (ii) Suggest and explain what might happen if the element you have named in (i) was **not** added to water intended for drinking.

[2]

- 4 (a) A radioactive tracer can be used to detect leaks in water pipes. The tracer is placed in the water flowing through the pipe and a radiation detector is used to check for radiation coming from water leaking out of the pipe.



- (i) Suggest a suitable instrument for detecting the radiation.

..... [1]

- (ii) State two precautions which should be taken when handling and storing the radioactive tracer.

1.
2. [2]

- (b) Beta-radiation is one form of ionising radiation.

- (i) Explain why beta-radiation is said to be *ionising*.

.....

.....

..... [2]

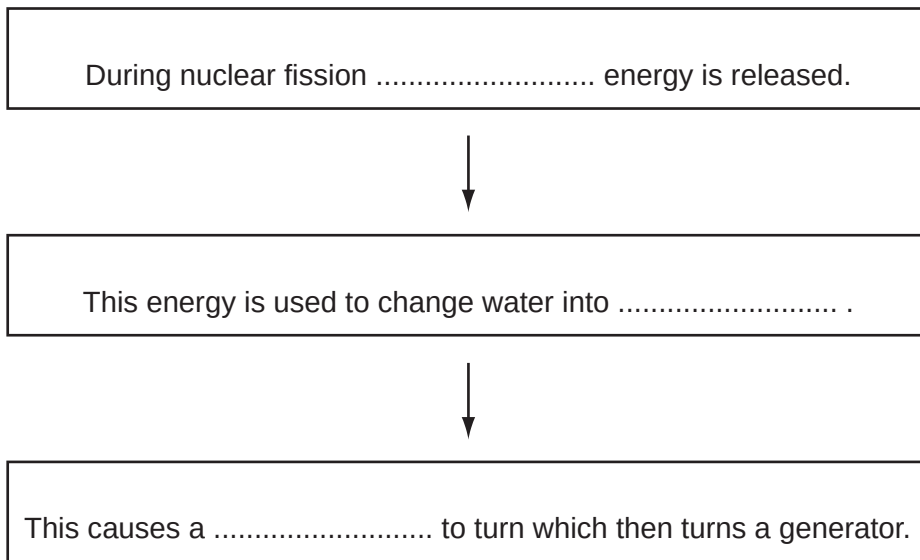
- (ii) Explain why ionising radiation can be harmful to humans.

.....

.....

..... [2]

- (c) The flow chart shows how electricity is produced in a nuclear power station. Complete the flow chart by filling in the missing words.



[3]

- (d) (i) The voltage of the electricity generated is increased using transformers for transmission through power lines to the users.

Explain why this is done.

.....

.....

..... [2]

- (ii) The electrical supply to a house is at a voltage of 220 V.
An electric kettle is plugged into the supply.
The current flowing through the heating element of the kettle is 10 A.

Calculate the resistance of the heating element.

Show your working and state the formula that you use.

formula used

working

.....ohms

[2]

5 (a) The list below contains descriptions of some different parts of cells.

- A contains genes made of DNA
- B controls what enters and leaves the cell
- C is fully permeable

Write the **letter** or **letters** of the descriptions that fit each of these parts of cells.
Each part may have one letter, two letters or no letters at all.

nucleus

cell wall

chloroplast

cell surface membrane

[3]

(b) Fig. 5.1 shows a cell from a plant root.

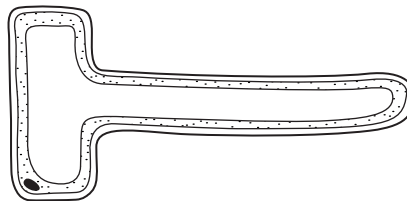


Fig. 5.1

This cell takes up water from the soil.
The water is then carried up to the leaves in the xylem vessels.

(i) Name the type of cell in Fig. 5.1.

.....

[1]

(ii) Explain how this cell is adapted for its function.

.....

[1]

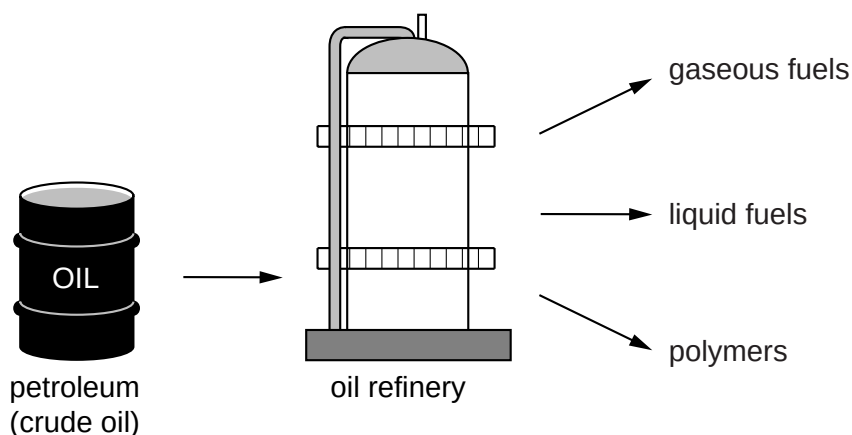
- (iii) In the leaves, a small amount of the water is used for photosynthesis.
Write the word equation for photosynthesis.

..... [2]

- (iv) What happens to most of the water after it has travelled into the leaves?

..... [1]

- 6 Petroleum (crude oil) provides many important products including fuels and polymers.



- (a) Name the **two** main elements which are always found combined together in fuels obtained from petroleum.

..... [2]

- (b) Butane is a gaseous fuel obtained from petroleum.

- (i) State **one** form of energy that is transferred to the surroundings when butane is oxidised.

..... [1]

- (ii) Name **one** product that is formed when butane is completely oxidised.

..... [1]

- (c) Table 6.1 shows the total number of atoms which are combined in molecules of three compounds **A**, **B** and **C**.

Table 6.1

compound	A	B	C
number of atoms in one molecule	60 000	11	26

Suggest and explain which one of these compounds is a polymer.

.....

 [2]

- (d) Compounds containing the element sulphur are usually removed from fuels or from petroleum. The sulphur is collected and used to make sulphuric acid.

(i) State the number of sulphur atoms in one molecule of sulphuric acid.

..... [1]

(ii) Explain why the removal of sulphur compounds from fuel reduces environmental damage.

.....
.....
.....
..... [3]

7 Fig. 7.1 shows sugar cane growing in Fiji.



Fig. 7.1

(a) In Fiji, much of the land is hilly. It often rains very hard.

With reference to Fig. 7.1, explain how the fields of sugar cane can help to reduce soil erosion.

.....

.....

..... [2]

(b) Would a field of sugar cane have a low species diversity or a high species diversity? Explain your answer.

.....

.....

..... [2]

- (c) Sugar cane is used to produce sugar, which can be used in cooking.
A man eats a cake containing sugar.

(i) Describe how the sugar is absorbed into his blood.

.....

.....

.....

..... [2]

(ii) Explain how his blood sugar level will be prevented from rising too high after he has eaten the cake.

.....

.....

.....

..... [3]

(iii) Explain why he would feel tired and ill if his blood sugar level dropped very low.

.....

.....

..... [2]

8 The element iron is extracted from iron ore, which is a rock found in the Earth's crust.

- (a) The main iron compound in iron ore is iron oxide. When iron oxide reacts with carbon monoxide, iron is produced. The word equation for this reaction is shown below.

iron oxide + carbon monoxide $\longrightarrow$ iron + carbon dioxide

- (i) State **one** difference between an element such as iron and a compound such as iron oxide.

.....

 [1]

- (ii) The reaction shown in (a) is an example of oxidation and reduction.

State and explain briefly which substance has been reduced in this reaction.

.....

 [2]

- (b) Fig. 8.1 shows a diagram of a car.

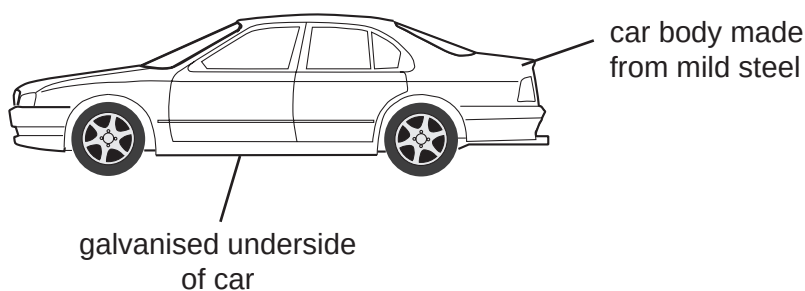


Fig. 8.1

Mild steel is an alloy containing a large amount of iron.

- (i) Name an element, other than iron, which is present in mild steel.

..... [1]

- (ii) The steel on the underside of the car is galvanised by coating it with a layer of zinc. This protects the steel from rusting.

Suggest how this prevents the steel from rusting.

.....

.....

.....

..... [3]

- (c) Fig. 8.2 shows a test-tube containing a small piece of galvanised steel reacting in sulphuric acid.

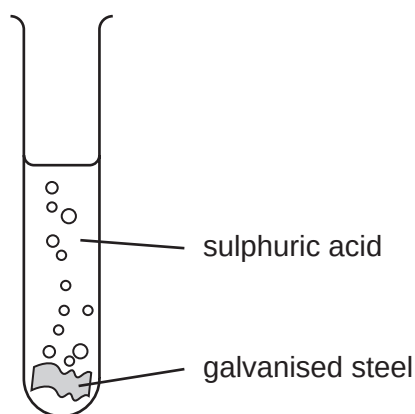


Fig. 8.2

Suggest the names of two salts which will remain in the solution in the test-tube when all of the galvanised steel has reacted.

1.
2. [2]

- 9 (a) An athlete takes part in a race. His performance is shown on the speed–time graph in Fig. 9.1.

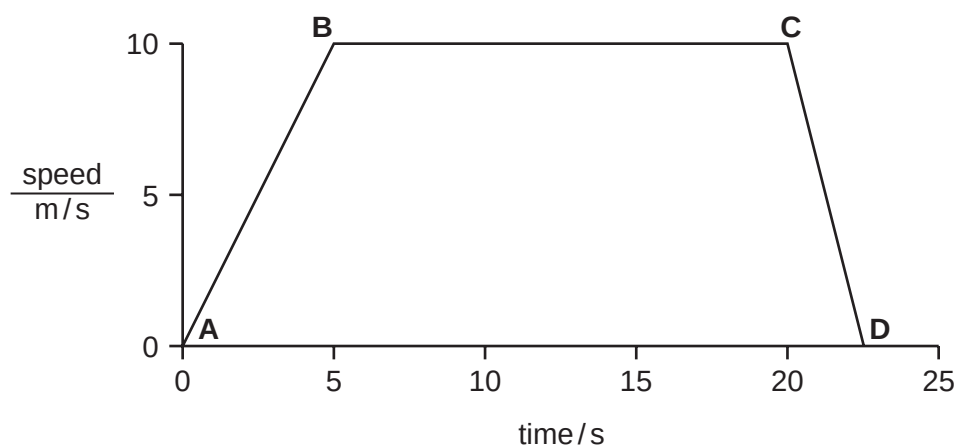


Fig. 9.1

Use the graph to describe the motion of the athlete between

- (i) A and B, ...
- (ii) B and C, ...
- (iii) C and D.

[3]

- (b) Calculate the distance travelled between 5 seconds and 20 seconds.

Show your working and state the formula that you use.

formula used

working

..... m [2]

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Question 7

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Group																								
I	II						III	IV	V	VI	VII	0												
		1 H Hydrogen																						
7 Li Lithium 3	9 Be Beryllium 4																							
23 Na Sodium 11	24 Mg Magnesium 12											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10							
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36							
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	98 Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54							
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86							
87 Fr Francium	226 Ra Radium 88	227 Ac Actinium 89																						
*58-71 Lanthanoid series																								
90-103 Actinoid series																								
											140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	145 Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
											232 Th Thorium 90	232 Pa Protactinium 91	238 U Uranium 92	238 Np Neptunium 93	244 Pu Plutonium 94	244 Am Americium 95	244 Cm Curium 96	247 Bk Berkelium 97	251 Cf Californium 98	251 Es Einsteinium 99	254 Fm Fermium 100	258 Md Mendelevium 101	259 No Nobelium 102	261 Lr Lawrencium 103
Key											a = relative atomic mass X = atomic symbol b = proton (atomic) number													
a X b																								

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

*58-71 Lanthanoid series
90-103 Actinoid series

	a	a = relative atomic mass
Key	X	X = atomic symbol
	b	b = proton (atomic) number