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Centre Number	Candidate Number	Name

CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

COMBINED SCIENCE **0653/02**

Paper 2

October/November 2003

1 hour

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 in the spaces provided on the Question Paper.
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.

Answer **all** questions.
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.
A copy of the Periodic Table is printed on page 16.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

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1	
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9	
Total	

This document consists of **15** printed pages and **1** blank pages.

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1 Windfarms are areas of land containing many wind turbines. Four thousand wind t can produce the same power as one coal-fired power station.

(a) **(i)** State the main energy change that takes place in a wind turbine.

..... energy ⟶ ..... energy [1]

(ii) Complete the sequence of energy changes in a coal-fired power station.

..... energy	⟶	heat energy	⟶	kinetic energy	⟶	..... energy

[2]

(b) Wind power is said to be a renewable source of energy.

Explain what the term *renewable* means.

.....

.....[1]

(c) Nuclear fission is used to produce electricity in nuclear power stations. The Sun's energy is produced by nuclear fusion.

Explain the difference between nuclear fission and nuclear fusion.

.....

.....

.....[2]

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2 A boy went to his doctor because he felt tired all the time.

His doctor took a sample of his blood. The doctor tested the blood. She found that the boy did not have enough red blood cells.

The doctor told the boy that he was suffering from anaemia. She explained to the boy that he should eat more iron in his diet.

(a) **(i)** What do red blood cells do?

.....

.....[1]

(ii) Explain why not having enough red blood cells made the boy feel tired.

.....

.....

.....[2]

(b) **(i)** Explain why eating more iron would help the boy to increase the number of red blood cells in his body.

.....

.....

.....[2]

(ii) The boy asked his doctor to tell him which kinds of foods he should eat, in order to get more iron. Name **two** foods that she might have suggested.

.....[2]

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3 **(a)** **(i)** The formula of chlorine molecules is Cl_2.

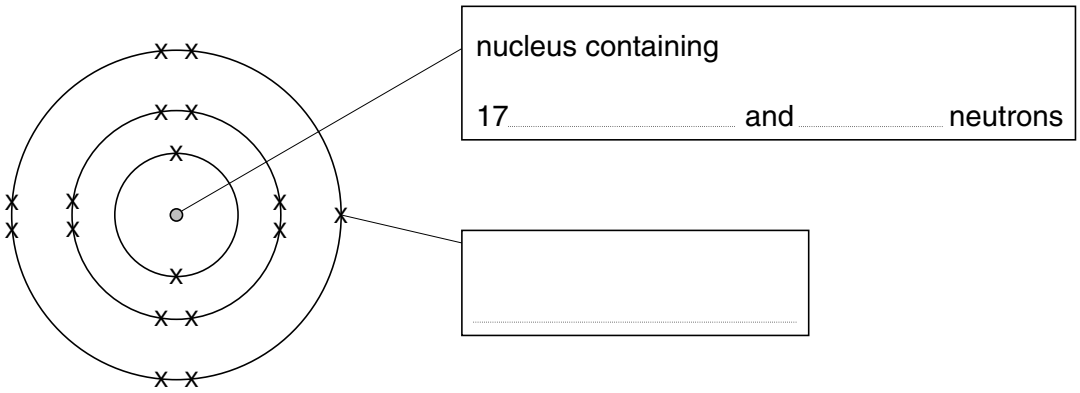
Explain what this formula means.

.....

.....[1]

(ii) An atom of chlorine has a proton number of 17 and a nucleon number of 35.

A diagram of this chlorine atom is shown in Fig. 3.1.
Complete the labelling of the diagram.



[3]

Fig. 3.1

(b) Explain why chlorine is sometimes used to treat drinking water before it is supplied to homes.

.....

.....

.....[2]

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4 Fig. 4.1 shows an electrical device.

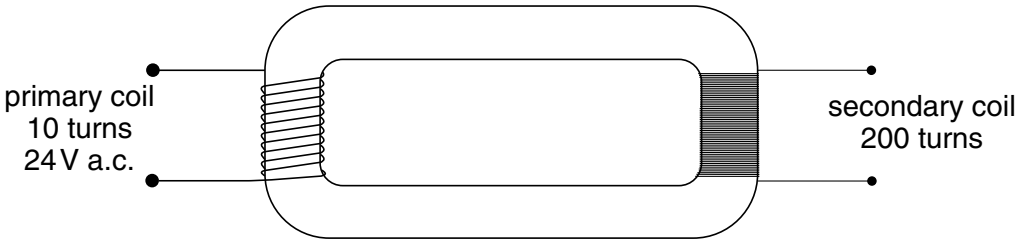

Fig. 4.1

(a) Name this device.

.....[1]

(b) Calculate the output voltage. Show your working and state any formula that you use.

formula

working

..... volts [2]

(c) Electricity is transmitted for long distances through cables.
Why does the voltage need to be high for transmission over long distances?

.....

.....

.....[2]

(d) An electricity supply is 240 V a.c. The frequency of the electricity supply is 50 Hz. Explain the meaning of the following terms.

(i) *a.c.* .....

.....[2]

(ii) *Hz* .....

.....[1]

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5 The words on the left in Fig. 5.1 are ecological terms.

(a) Match each word with its definition by drawing a line between them. One has been done for you.

ecosystem	all living organisms in a habitat
community	all the organisms of one species in a habitat
consumer	living organisms and their environment
population	an organism that feeds on other organisms

Fig. 5.1

[2]

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(b) A student investigated the population of snails in a wood. She collected 50 sna measured the shell length of each one. She also recorded the number of stripes on shells.

Fig. 5.2 shows the graphs that she drew to display her results.

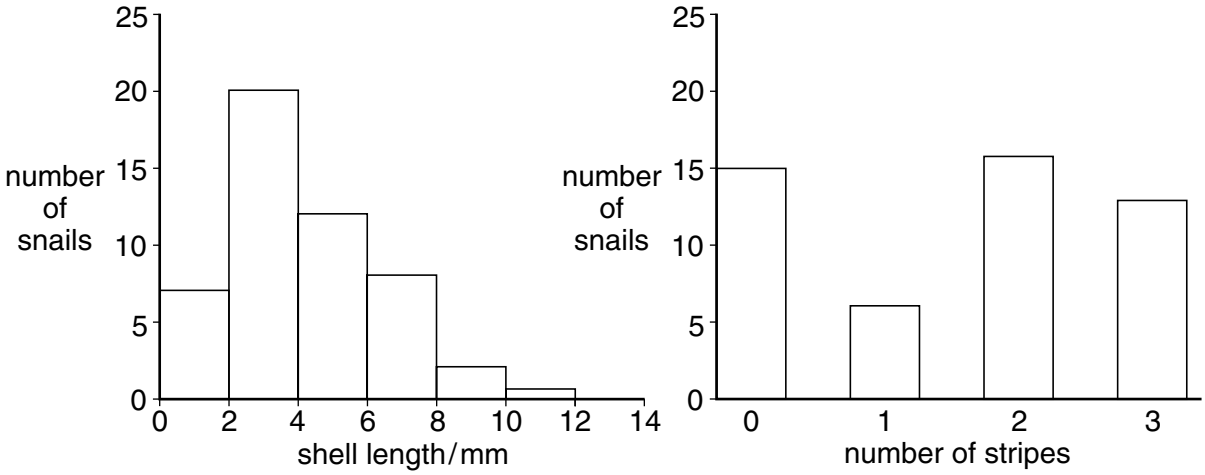

Fig. 5.2

(i) The student thought that the variation in the length of the snail shells could be caused by their environment.

Suggest **one** environmental factor that could cause the variation in the length of the snail shells.

.....[1]

(ii) The student thought that the variation in the number of stripes was probably caused by the snails' genes.

The student was able to keep the snails for many months in order to investigate this.

What should she do, and what result should she look for?

.....

.....

.....[2]

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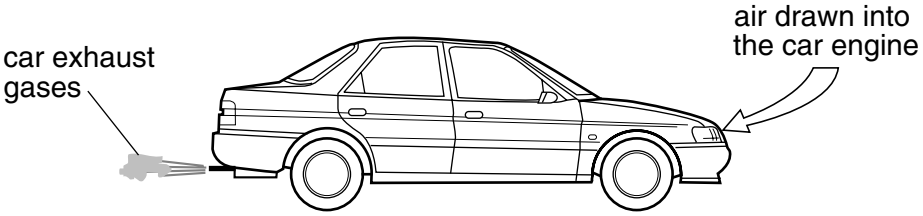
6 In a car engine, fuel containing hydrocarbons reacts with oxygen from the air. The p of this reaction enter the air with the exhaust gases.



(a) **(i)** Name the element that makes up nearly 79 % of the air.

.....[1]

(ii) The gas argon is present in air. Explain why argon does not react with the hydrocarbon fuel in the car engine.

.....

.....[1]

(iii) Explain why it is very dangerous to leave a car engine running inside a closed building.

.....

.....

.....[2]

(b) The energy needed to launch a space shuttle is released when a mixture of hydrogen and oxygen react to form the compound water.

(i) The symbolic equation for this reaction is shown below.

$$2H_2 + O_2 \rightarrow 2H_2O$$

This equation is said to be *balanced*. Explain what this means.

.....

.....[1]

(ii) Describe **one** way in which a mixture of two gaseous elements is different from a compound of the same elements.

.....

.....

.....[1]

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(c) Suggest why the use of hydrogen as a car fuel would cause less air pollution than the hydrocarbon fuels.

.....

.....

.....

.....[2]

[Question 7 can be found on page 10]

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7 Fig. 7.1 shows a racing car. It is designed to accelerate rapidly and to go very fast.

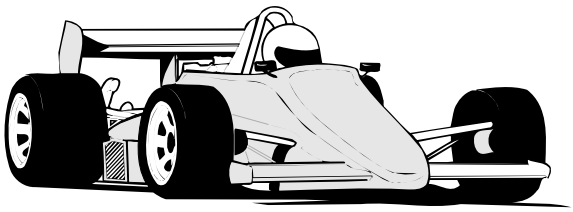

Fig. 7.1

(a) The car took 1.2 hours to complete a race of 288 kilometres.

Calculate the average speed of the car in kilometres per hour.
Show your working and state any formula that you use.

formula

working

..... km/h [2]

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(b) A speed/time graph for the car is shown in Fig. 7.2. It shows the motion of the c
a 26 second period.

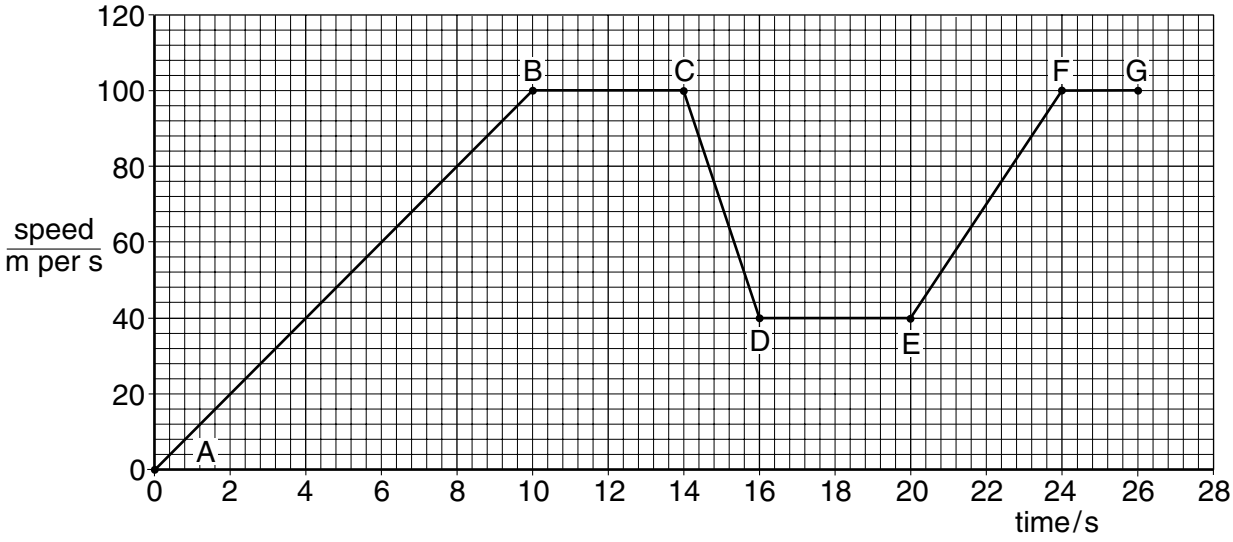

Fig. 7.2

(i) At which point is the car not moving?

.....[1]

(ii) State **one** part of the graph when the car was travelling at a constant speed. Explain your answer.

.....

.....

.....[2]

(iii) State **one** part of the graph when the car was slowing down.

.....[1]

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8 Fig. 8.1 shows the structure of the contents of the human thorax (chest).

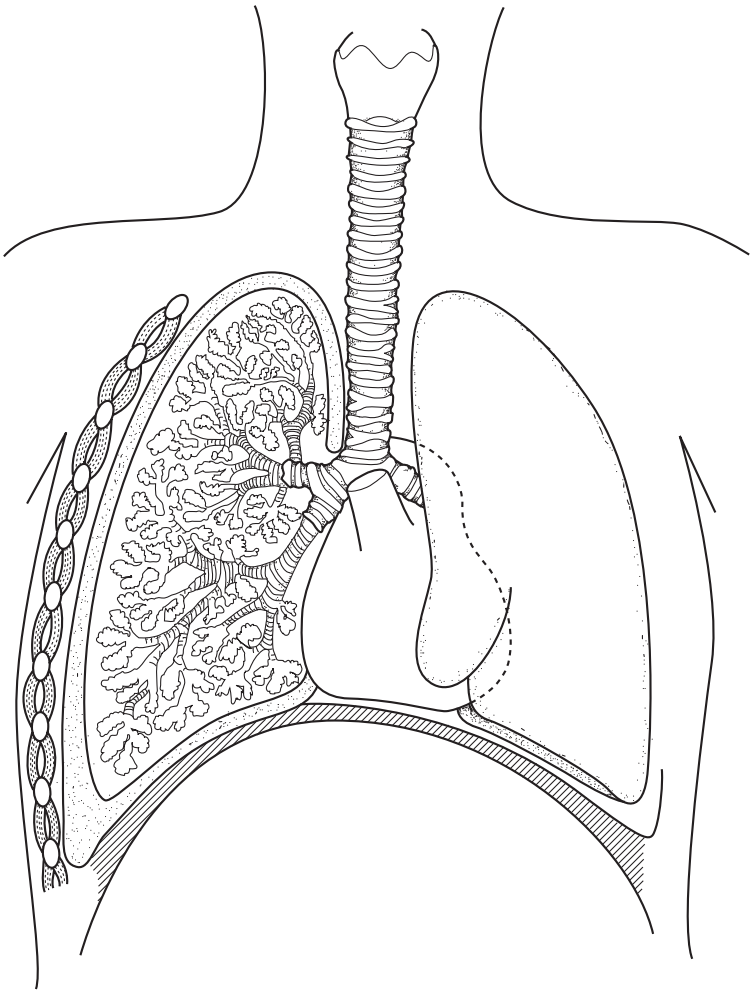

Fig. 8.1

(a) On Fig. 8.1, draw label lines to each of the following structures and label them with the appropriate **letter**.

A a pleural membrane
B a bronchus
C the place where gas exchange takes place
D the heart

[4]

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(b) The lining of the trachea contains

- goblet cells and
- cells with cilia.

(i) Describe how these cells help to keep the lungs clean.

.....

.....

.....

.....[2]

(ii) Explain how smoking can lead to the development of bronchitis.

.....

.....

.....

.....[2]

[Question 9 can be found on page 14]

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9 **(a)** Choose words from the list below to complete the passage. Each word is used once or not at all.

aluminium	**electrolyte**	**positive**
anode	**iron**	**solution**
cathode	**negative**	**sulphur**

Electrolysis is a process used in industry to make important elements such as ..... .

In electrolysis a pair of electrodes dip into a liquid called an ..... . Metal ions have a ..... charge and are attracted towards the ..... .

[4]

(b) **(i)** Describe **one** observation that would be made during the electrolysis of copper chloride solution.

.....

.....[1]

(ii) In electrolysis, compounds are split into their elements.

Complete the word chemical equation for the reaction that occurs in the electrolysis of copper chloride solution.

copper chloride → [1]

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DATA SHEET
The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 **H** Hydrogen 1										4 **He** Helium 2
7 **Li** Lithium	9 **Be** Beryllium 4											11 **B** Boron 5	12 **C** Carbon 6	14 **N** Nitrogen 7	16 **O** Oxygen 8	19 **F** Fluorine 9	20 **Ne** Neon 10
23 **Na** Sodium	24 **Mg** Magnesium 12											27 **Al** Aluminium 13	28 **Si** Silicon 14	31 **P** Phosphorus 15	32 **S** Sulphur 16	35.5 **Cl** Chlorine 17	40 **Ar** Argon 18
39 **K** otassium	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	88 **Sr** Strontium 38	89 **Y** Yttrium 39	91 **Zr** Zirconium 40	93 **Nb** Niobium 41	96 **Mo** Molybdenum 42	**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	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	**Po** Polonium 84	**At** Astatine 85	**Rn** Radon 86
Fr Francium	226 **Ra** Radium 88	227 **Ac** Actinium 89 †															

140 **Ce** Cerium 58	141 **Pr** Praseodymium 59	144 **Nd** Neodymium 60	**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	**Pa** Protactinium 91	238 **U** Uranium 92	**Np** Neptunium 93	**Pu** Plutonium 94	**Am** Americium 95	**Cm** Curium 96	**Bk** Berkelium 97	**Cf** Californium 98	**Es** Einsteinium 99	**Fm** Fermium 100	**Md** Mendelevium 101	**No** Nobelium 102	**Lr** Lawr 103

3-71 Lanthanoid series
0-103 Actinoid series

y

a
X
b

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

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

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