UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

3172895510

COMBINED SCIENCE **0653/02**

Paper 2 (Core) **October/November 2008**

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 Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total	

This document consists of **18** printed pages and **2** blank pages.

1 Fig. 1.1 shows a food web.

For Examiner's Use

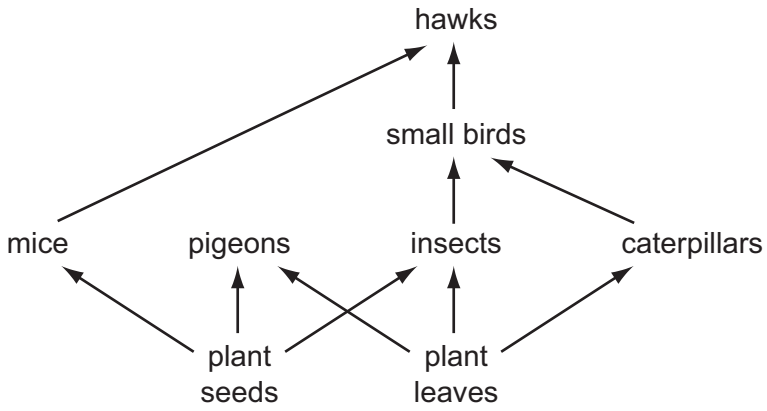

Fig. 1.1

(a) (i) State what the arrows in Fig. 1.1 represent.

.....[1]

(ii) State the numbers of different producers and consumers named in this food web.

producers .....

consumers ..... [1]

(iii) No decomposers are shown in the food web.

Which organisms in the web provide food for decomposers?

.....[1]

For Examiner's Use

(b) The plant seeds that a mouse eats are digested in its alimentary canal.

(i) Explain what digestion is, and why digestion is necessary.

.....

.....

..... [2]

(ii) State **two** ways by which food is digested in the alimentary canal.

1 .....

2 ..... [2]

(c) When an insect respires, it releases carbon dioxide into the air.

Describe how this carbon dioxide could become part of a glucose molecule in a plant leaf.

.....

.....

..... [2]

For Examiner's Use

2 **(a)** An inflatable ball is floating on the sea without moving.

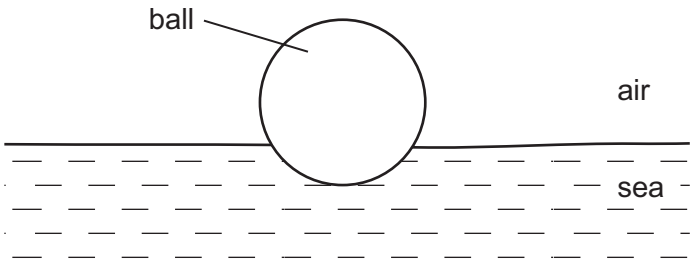

Fig. 2.1

(i) On Fig. 2.1 draw arrows to represent the two forces acting. Label each force with its name. [2]

(ii) Are these two forces balanced or unbalanced?

Explain your answer.

.....

..... [1]

(b) Three waves reach a nearby beach in ten seconds.

State the frequency of the waves.

..... Hz [1]

(c) The power of the waves can be used as a renewable source of energy.

(i) Suggest how the motion of the waves could be converted into electrical energy.

.....

.....

..... [2]

(ii) Suggest **one** other renewable source for generating electricity.

..... [1]

(d) People on the beach are exposed to many forms of electromagnetic radiation.

Which type of electromagnetic radiation causes the skin to tan?

..... [1]

(e) Someone has left a glass bottle on the beach. The curved glass acts like a lens focussing the sun's rays.

Complete the light rays on Fig. 2.2 to show what happens to rays of light after they have passed through a convex lens.

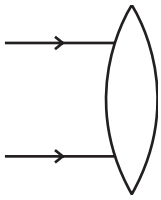

Fig. 2.2

[2]

For Examiner's Use

3 **(a)** Fig. 3.1 shows two cars **A** and **B**.

Car **A** produces exhaust gases which appear black. The exhaust gases from car **B** cannot be seen. Both cars have engines which use diesel (gas oil) which is a hydrocarbon fuel.

car **A** car **B**

Fig. 3.1

(i) Name the raw material from which hydrocarbon fuels like diesel are obtained.

..... [1]

(ii) Gasoline (petrol) is another liquid hydrocarbon fuel used in cars.
Gasoline and diesel are obtained by the process of fractional distillation.

State **one** difference between the properties of diesel and of gasoline which allows them to be separated by fractional distillation.

.....

..... [1]

(iii) Name **two** compounds which are produced when hydrocarbons undergo complete combustion.

1 .....

2 ..... [2]

(iv) Describe briefly how exhaust gases are thought to be contributing to climate changes.

.....

.....

..... [2]

(b) The energy needed to move cars is provided by the combustion of the fuel. Air must be supplied to the engine for this combustion to occur.

Fig. 3.2 shows a bar chart of the main gases in a sample of dry air.

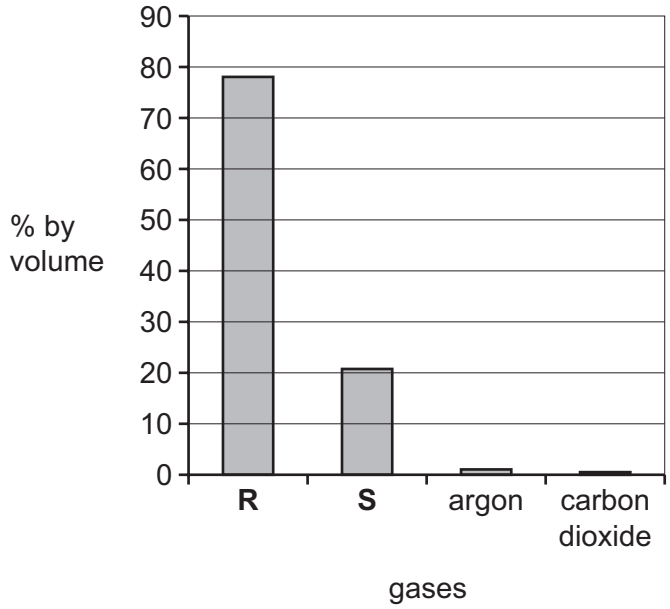

Fig. 3.2

(i) Name gases **R** and **S** in Fig. 3.2.

gas **R** .....

gas **S** ..... [2]

(ii) Air contains small amounts of the gases argon and carbon monoxide. The amount of argon is typically much greater than that of the toxic gas carbon monoxide.

Explain why the argon in air is not harmful to humans.

.....

.....

..... [2]

[Turn over

For Examiner's Use

4 A girl is competing in a 100 m race.

(a) (i) The girl completes the race in 14.4 seconds.

Calculate her average speed.

State the formula that you use and show your working.

formula

working

..... m / s [2]

(ii) During the first three seconds of the race the girl runs with constant acceleration from a speed of 0 m / s to a speed of 5 m / s.

Calculate her acceleration.

State the formula that you use and show your working.

formula

working

..... m/s^2 [2]

(b) The girl then competes in the high jump.

Just before she reaches the bar she begins to move upwards.

Describe the energy changes that take place between the girl taking off and landing after the jump.

.....

.....

..... [3]

For Examiner's Use

5 This article appeared in a newspaper in Pakistan in 2006.

> Many more people in Pakistan and India are developing diabetes. This is an illness where the regulation of blood glucose does not work properly.
>
> Doctors think that the increase in diabetes is happening because people are eating more fast food. Where they used to eat a lot of rice and lentils, they are now eating more fried foods and greasy take-aways.
>
> As well as increasing the risk of diabetes, this diet is causing an increase in obesity. This also increases the risk of heart disease.

(a) (i) Name the hormone that is produced when the blood glucose level rises, and which helps to bring it back down to normal.

..... [1]

(ii) Name the gland that secretes this hormone.

..... [1]

(iii) Describe how the hormone reduces the amount of glucose in the blood.

.....

.....

..... [2]

(b) (i) Suggest why eating foods containing a lot of fat, rather than eating lentils and rice, can lead to a person becoming overweight.

.....

.....

..... [2]

(ii) An overweight person has an increased risk that a blockage will occur in a coronary artery.

Explain how a blockage in a coronary artery could cause a heart attack.

.....

.....

..... [2]

For Examiner's Use

6 The chemical symbols for two elements are shown below.

$$^{24}_{12}\mathrm{Mg} \qquad ^{16}_{8}\mathrm{O}$$

These symbols represent one atom of each element.

(a) (i) Name the **three** smaller particles which make up these atoms.

.....

[1]

(ii) What do the numbers 12 and 24 indicate about the structure of one atom of magnesium?

.....

.....

[2]

(b) A student used the apparatus in Fig. 6.1 to burn magnesium in air.

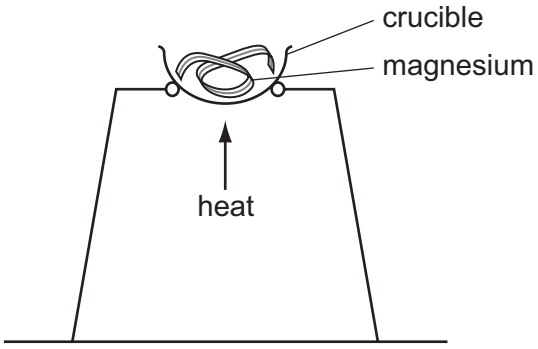

Fig. 6.1

As a result of the reaction, the piece of magnesium changed into a white solid.

The balanced equation for the reaction is shown below.

$$2Mg + O_2 \rightarrow 2MgO$$

(i) Write the **word** equation for this reaction.

.....

[1]

(ii) Write the name or formula of the substance shown above in the equation which contains ionic bonds.

Explain your answer briefly.

substance .....

explanation .....

.....

[2]

(c) The student then added some magnesium to some dilute sulphuric acid contained in test-tube **A**. He also added some of the white solid produced by the reaction in **(b)** to some dilute sulphuric acid in test-tube **B** as shown in Fig. 6.2.

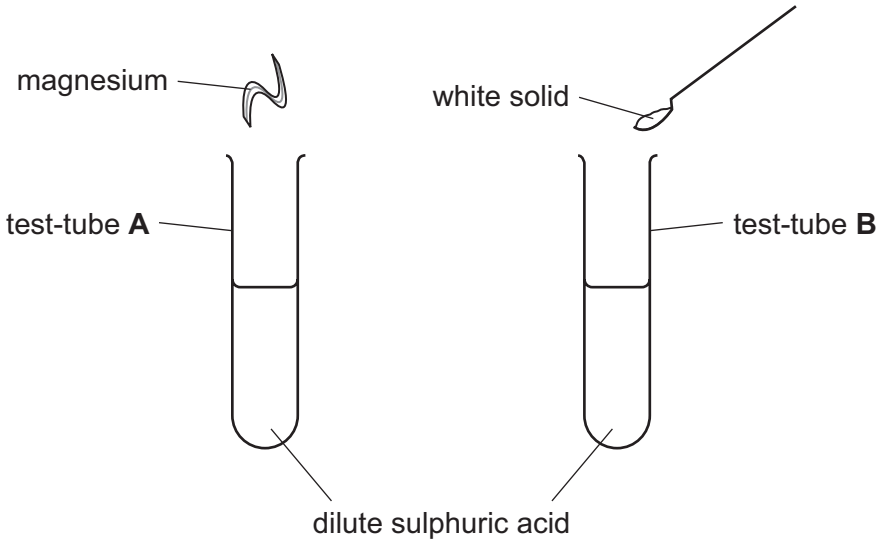

Fig. 6.2

At the end of the reactions a colourless solution remained in both test tubes.

(i) One of the reactions in Fig. 6.2 produced a gas.

In which test-tube, **A** or **B**, were gas bubbles observed?

Explain your answer.

test-tube .....

explanation .....

..... [2]

(ii) The formula of the gas produced in **(i)** is H_2.

State and explain whether this gas is an element or a compound.

.....

..... [1]

(iii) After the reactions had finished, both test-tubes contained the same compounds. One of these was water.

Name the other compound present in both tubes.

..... [1]

[Turn over

For Examiner's Use

7 **(a)** The radioactive emissions from a sample of radon–220 were investigated. The radiation emitted was measured every hour for 10 hours.

State the apparatus needed for this.

..... [1]

(b) Radon is a gas that emits alpha radiation.

Explain why alpha radiation is dangerous to human beings.

.....

.....

..... [2]

(c) Radioactivity can be useful to humans. Apart from the generation of electricity, describe **one** use of radioactivity.

.....

.....

..... [2]

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Please turn over for Question 8

For Examiner's Use

8 Fig. 8.1 shows part of the male reproductive system.

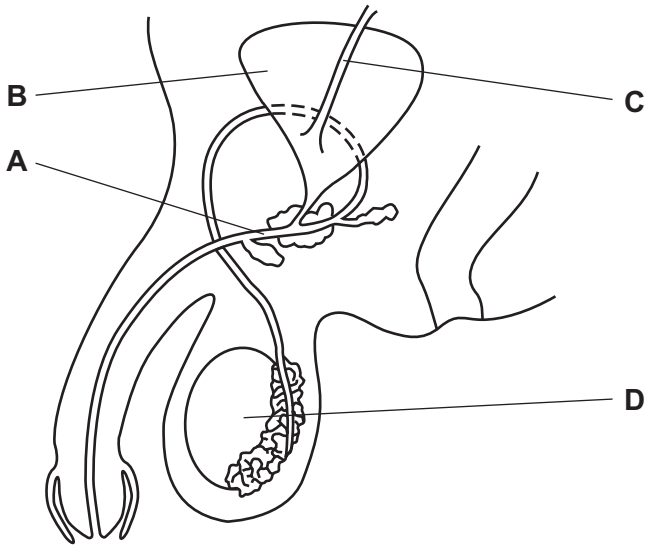

Fig. 8.1

(a) Give the letter of each of these parts.

(i) where sperm are made .....

(ii) where urine is stored .....

(iii) the ureter .....

(iv) the urethra ..... [4]

(b) On Fig. 8.1, write the letter **X** to show the part of the reproductive system which is cut or tied when a man has a sterilisation operation. [1]

(c) Fig. 8.2 shows a sperm.

For Examiner's Use

Fig. 8.2

(i) On Fig. 8.2, name and label **two** structures that are found in all animal cells. [2]

(ii) Describe **two** ways in which a sperm is adapted for its function.

1 .....

.....

2 .....

..... [2]

For Examiner's Use

9 **(a)** Fig. 9.1 shows part of the Periodic Table. The letters are not the chemical symbols of elements.

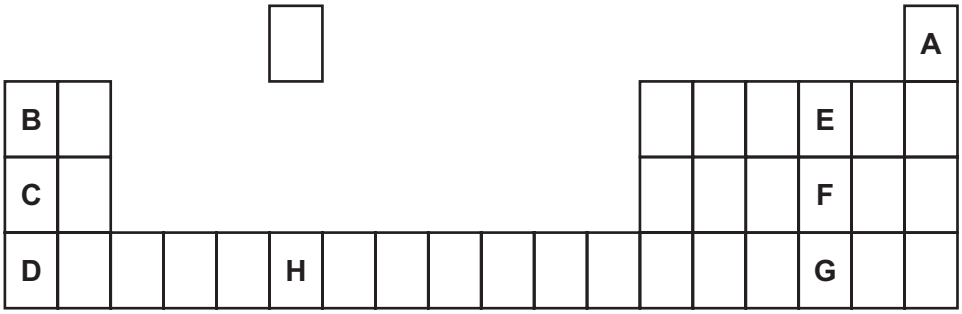

Fig. 9.1

Choose **one** of the letters from **A** to **H**, which shows

an element whose atoms have only one electron shell,

..... [1]

an element in the same period as element **D**.

..... [1]

(b) Calcium carbonate, $CaCO_3$, is an important compound used in many industries.

A student used the apparatus in Fig. 9.2 to investigate what happens when calcium carbonate is heated strongly.

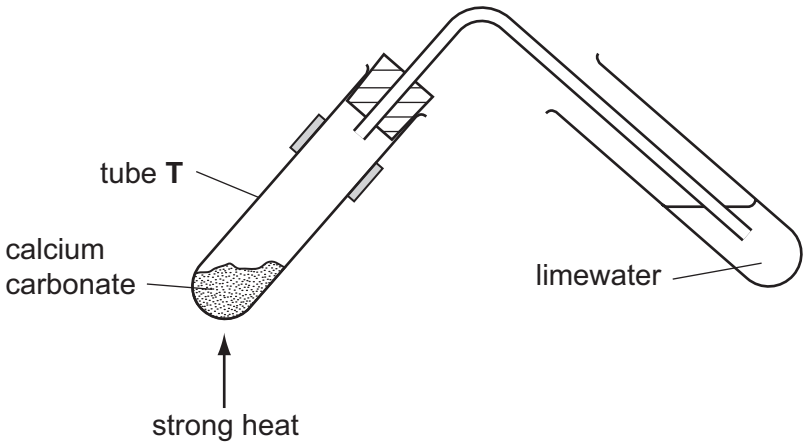

Fig. 9.2

During the experiment many gas bubbles passed through the limewater, which turned cloudy. A white solid remained in tube **T** after the student stopped heating.

(i) Complete the word equation for the reaction.

calcium carbonate → calcium oxide + ... [1]

(ii) State the type of chemical reaction that occurs when calcium carbonate is heated strongly.

.....

[1]

(iii) Describe how the student could test the solid which remained in tube **T** to find out if all the calcium carbonate had reacted.

.....

.....

.....

.....

[3]

[Turn over

For Examiner's Use

10 (a) (i) The diagram in Fig. 10.1 shows a circuit with a two-way switch, **S**.

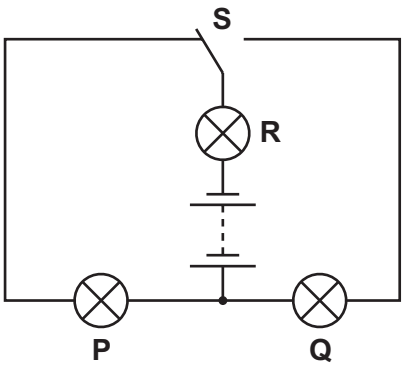

Fig. 10.1

Complete the table below to show if each lamp is on or off when switch **S** is in the position shown.

Write 'on' or 'off' for each lamp.

lamp	on or off
P	
Q	
R	

[2]

(ii) Name the component in the circuit which provides the energy for the circuit.

..... [1]

(b) A student has three resistors as shown in Fig. 10.2.

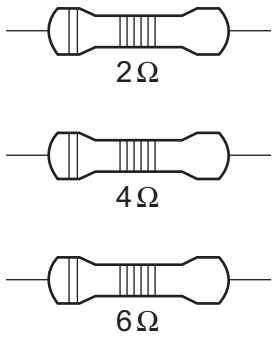

Fig. 10.2

Explain how he can combine **two** of these resistors to get a total resistance of 10 ohms.

.....

..... [2]

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DATA SHEET
The Periodic Table of the Elements

Group																	
I	II									III	IV	V	VI	VII	0
															4 He Helium 2
					1 H Hydrogen 1										
7 Li Lithium 3	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 11	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 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	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	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	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 Lawrencium 103

*58-71 Lanthanoid series
†90-103 Actinoid series

Key

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

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