UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6768449417

COMBINED SCIENCE **0653/22**

Paper 2 (Core) **October/November 2010**

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 24.

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	
10	
Total	

This document consists of **21** printed pages and **3** blank pages.

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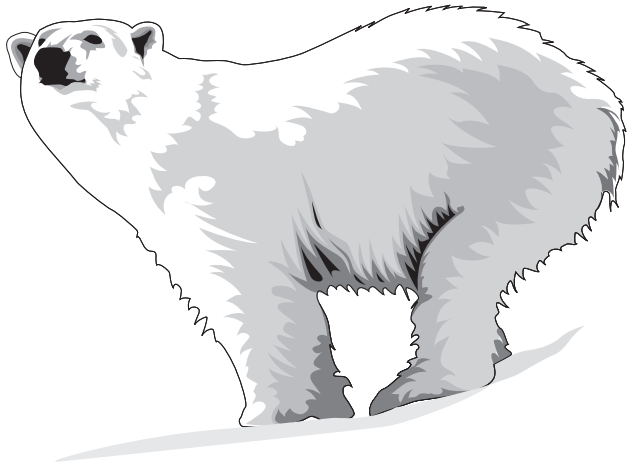
1 **(a)** Polar bears live in the cold, arctic region. They have thick, white fur.



Describe how fur keeps a polar bear warm.

.....

.....

..... [2]

(b) **(i)** Above the arctic region the ozone layer is decreasing, allowing more ultraviolet radiation, which can cause chemical changes, to reach the surface of the Earth.

State **one** danger to human beings of being exposed to large quantities of ultraviolet radiation.

..... [1]

(ii) Ultraviolet radiation is part of the electromagnetic spectrum.

Name **one** other radiation which is part of the electromagnetic spectrum and state a use of this radiation.

name .....

use ..... [2]

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2 **(a)** The apparatus shown in Fig. 2.1 can be used to react lead oxide and carbon.

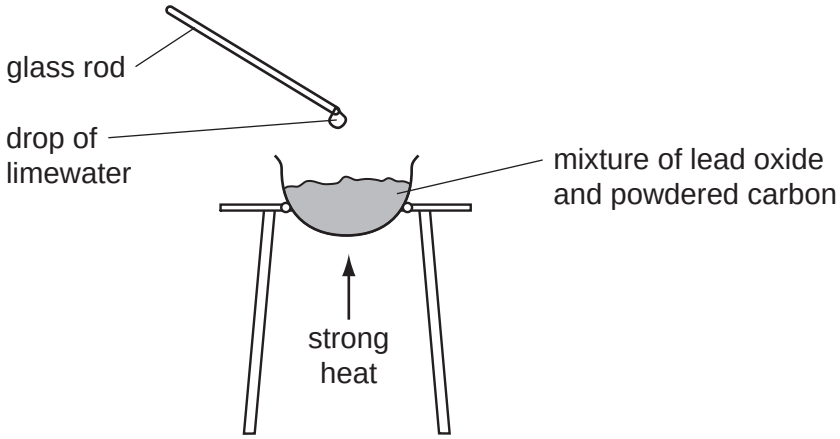

Fig. 2.1

When the mixture is heated, molten metal is formed in the container and the drop of lime water on the end of the glass rod becomes cloudy.

(i) Suggest the **word** equation for the reaction between lead oxide and carbon. Do **not** write a symbolic equation.

..... [2]

(ii) State **one** substance, shown in your equation in **(i)**, which is a compound.

Explain why this substance is described as a compound and **not** as an element.

substance .....

explanation .....

.....

..... [3]

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(b) Fig. 2.2 shows some of the apparatus used in the electrolysis of copper chloride solution.

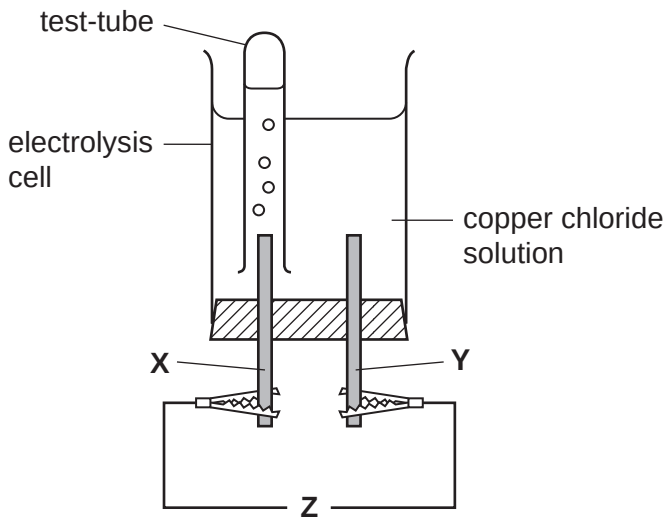

Fig. 2.2

(i) What is missing from position **Z** in Fig. 2.2?

..... [1]

(ii) Name the gas which collects in the test-tube, and explain whether electrode **X** is the anode or the cathode.

gas .....

Electrode **X** is the ..... because .....

.....

..... [2]

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3 A healthy plant growing in a pot was watered and placed in a sunny window. A transparent plastic bag was placed over the plant, as shown in Fig. 3.1.

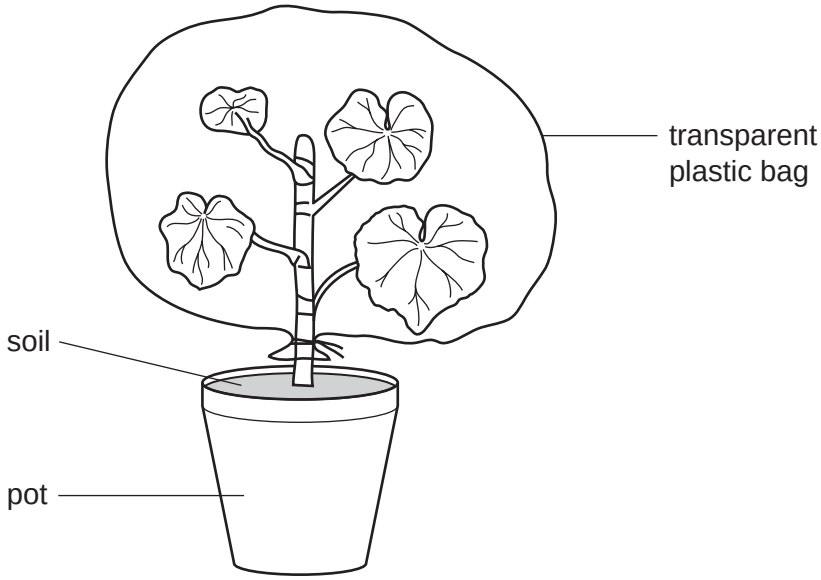

Fig. 3.1

(a) The temperature near the window fell overnight. The next morning, small droplets of liquid water were visible on the inside of the plastic bag.

(i) Name the process by which plant leaves lose water vapour.

..... [1]

(ii) Name the small holes in the leaf through which the water vapour is lost.

..... [1]

(iii) Explain why the water formed droplets of liquid on the plastic bag.

.....

.....

..... [2]

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(b) Fig. 3.2 shows a cell from the plant leaf.

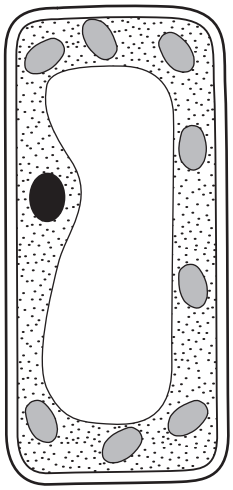


Fig. 3.2

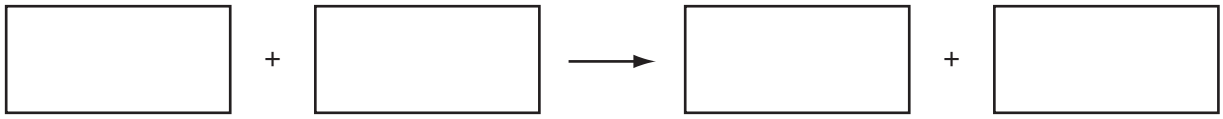
(i) On the diagram of the cell in Fig. 3.2, label and name **two** structures that would **not** be present in an animal cell. [2]

(ii) Name the part of the leaf in which this cell could be found.

..... [1]

(iii) The cell in Fig. 3.2 can photosynthesise.

Write the word equation for photosynthesis.



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4 **(a)** Fig. 4.1 shows the speed-time graph for a train.

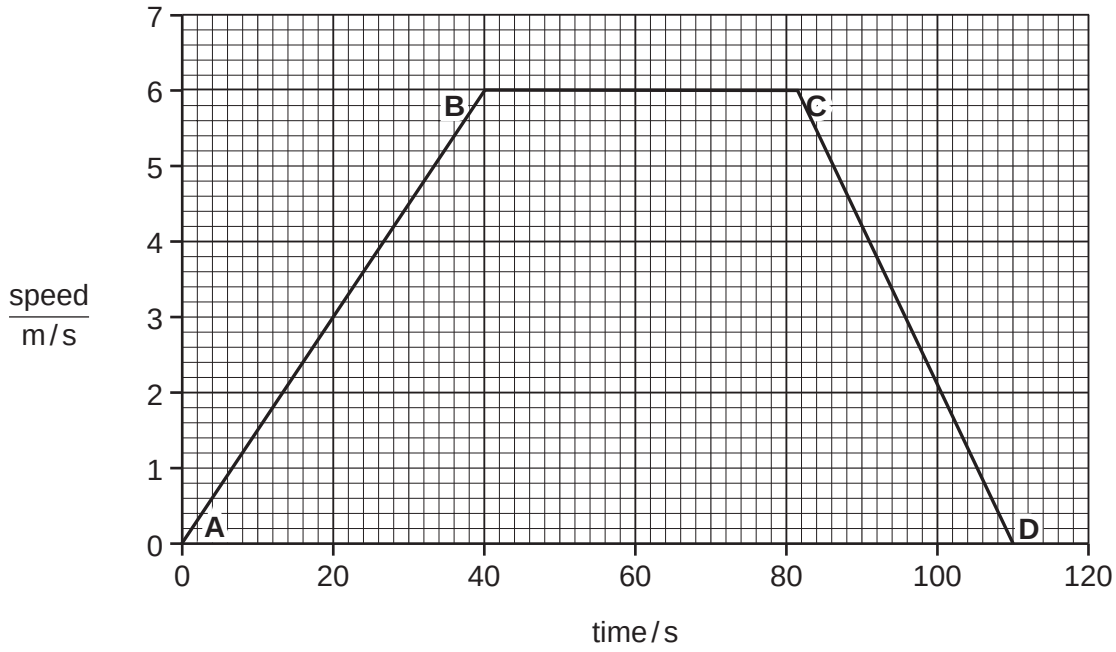

Fig. 4.1

The brakes are applied at **C**. Calculate how long it takes the train to stop.

.....s [1]

(b) Another train, on a journey lasting 10 minutes, travelled at a constant speed of 9 m/s.

(i) Show that the distance travelled by the train during this journey was 5400 m.

State the formula that you use and show your working.

formula used

working

[2]

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(ii) The average force needed for the train to maintain the speed of 9 m / s was 10 000 N.

Calculate the work done by the train over 10 minutes.

State the formula that you use and show your working.

formula used

working

..... J [2]

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5 Fig. 5.1 shows some stages in the formation of a human fetus.

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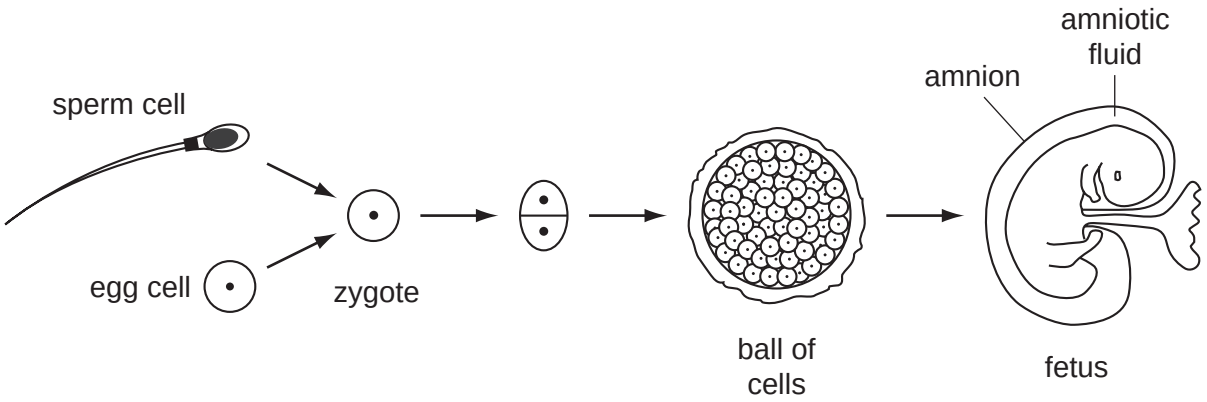

Fig. 5.1

(a) Most human cells contain 46 chromosomes, but egg cells and sperm cells contain only 23 chromosomes each.

Suggest a reason for this.

.....

..... [1]

(b) Name the part of the reproductive system in which each of these events takes place.

(i) Eggs are produced. ..... [1]

(ii) Fertilisation. ..... [1]

(c) Describe the function of the amnion.

.....

.....

..... [2]

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(d) The fetus develops in the uterus.

It is attached to the uterus by the umbilical cord and placenta.

It obtains nutrients from its mother's blood, through the placenta.

Suggest why a pregnant woman should have more iron and calcium in her diet than when she is not pregnant.

iron .....

.....

calcium .....

..... [3]

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6 **(a)** Electrical equipment can be dangerous, especially when it is handled with wet hands.

Explain why you are quite likely to be electrocuted if you handle an electrical device with wet hands rather than dry hands.

.....

..... [1]

(b) Fig. 6.1 shows a simple electric circuit.

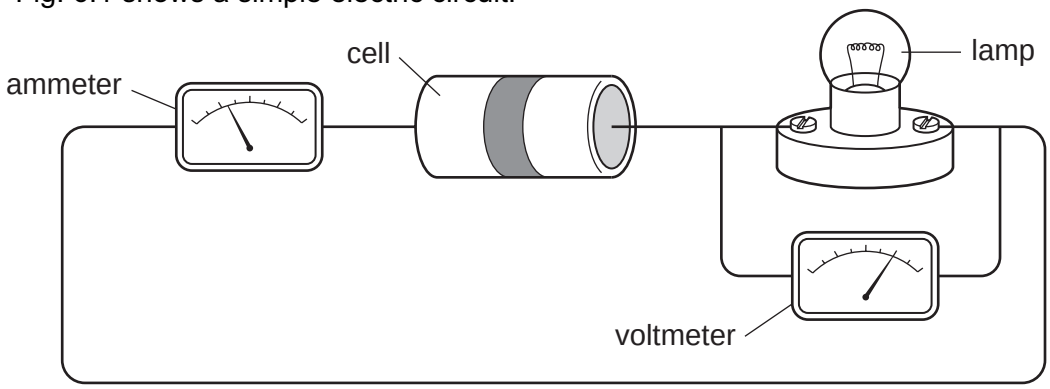

Fig. 6.1

Draw the circuit diagram for the circuit in Fig. 6.1 using the correct symbols.

[3]

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(c) Fig. 6.2 shows a circuit built by a student.

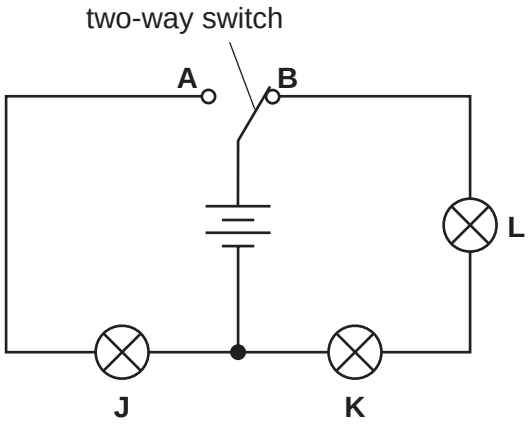

Fig. 6.2

(i) The switch is at position **B**.

Which lamps will be lit? ..... [1]

(ii) The switch is then moved to position **A**.

What happens to lamps **J**, **K** and **L**?

lamp **J** .....

lamp **K** .....

lamp **L** ..... [2]

(d) The student has six resistors as shown in Fig. 6.3.

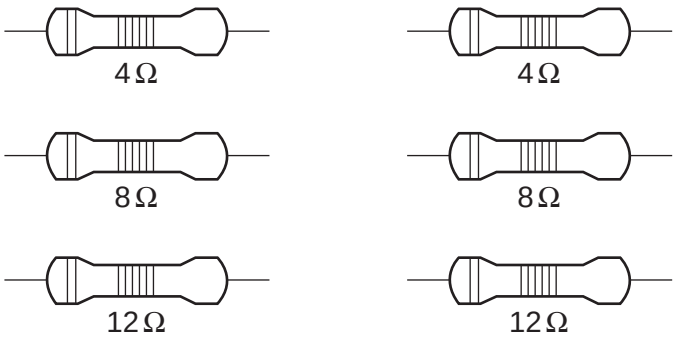

Fig. 6.3

Describe how he can combine **two** of these resistors to get a total resistance of 20 ohms.

.....

..... [1]

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(e) Power stations produce electricity.

Six stages in the production of electricity at a coal-fired power station are shown below.

A electricity produced

B coal burned

C steam produced

D turbine driven by steam

E turbine turns generator

F water boils

Using the letters **A** to **F**, list the stages in the correct order in the boxes below. Two have been done for you.

[2]

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Please turn over for Question 7.

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7 **(a)** The chemical symbols for the atoms shown below include proton (atomic) numbers and nucleon (mass) numbers.

$$^{16}_{8}O \quad ^{31}_{15}P \quad ^{32}_{16}S \quad ^{70}_{31}Ga$$

(i) State which of these symbols represent atoms of elements in the same **group** of the Periodic Table

..... [1]

(ii) Complete Table 7.1 which shows the names and the numbers of protons and neutrons in two of the atoms shown above.

Table 7.1

element name	protons	neutrons
oxygen		
	15	16

[2]

(b) Chlorine and hydrogen combine to form hydrogen chloride which dissolves in water to produce hydrochloric acid.

(i) Suggest a substance which reacts with hydrochloric acid to form the salt, copper chloride.

..... [1]

(ii) Suggest an element from the third period of the Periodic Table which reacts **safely** with hydrochloric acid to produce hydrogen gas.

..... [1]

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(c) Ethene is a gaseous compound of carbon and hydrogen.

Fig. 7.2 shows two different chemical reactions, **1** and **2**, involving ethene.

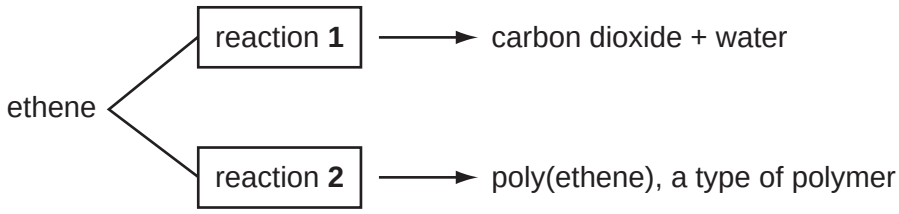

Fig. 7.2

(i) For reactions **1** and **2**, deduce the type of chemical reaction which occurs.

reaction **1** .....

reaction **2** ..... [2]

(ii) For reaction **2**, describe briefly what happens to the molecules of ethene during the reaction.

.....

..... [1]

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8 Soya beans are an important crop in many tropical and subtropical countries, because they contain a lot of protein.

(a) Fig. 8.1 shows how the yield of soya beans is affected by the pH of the soil in which they are grown.

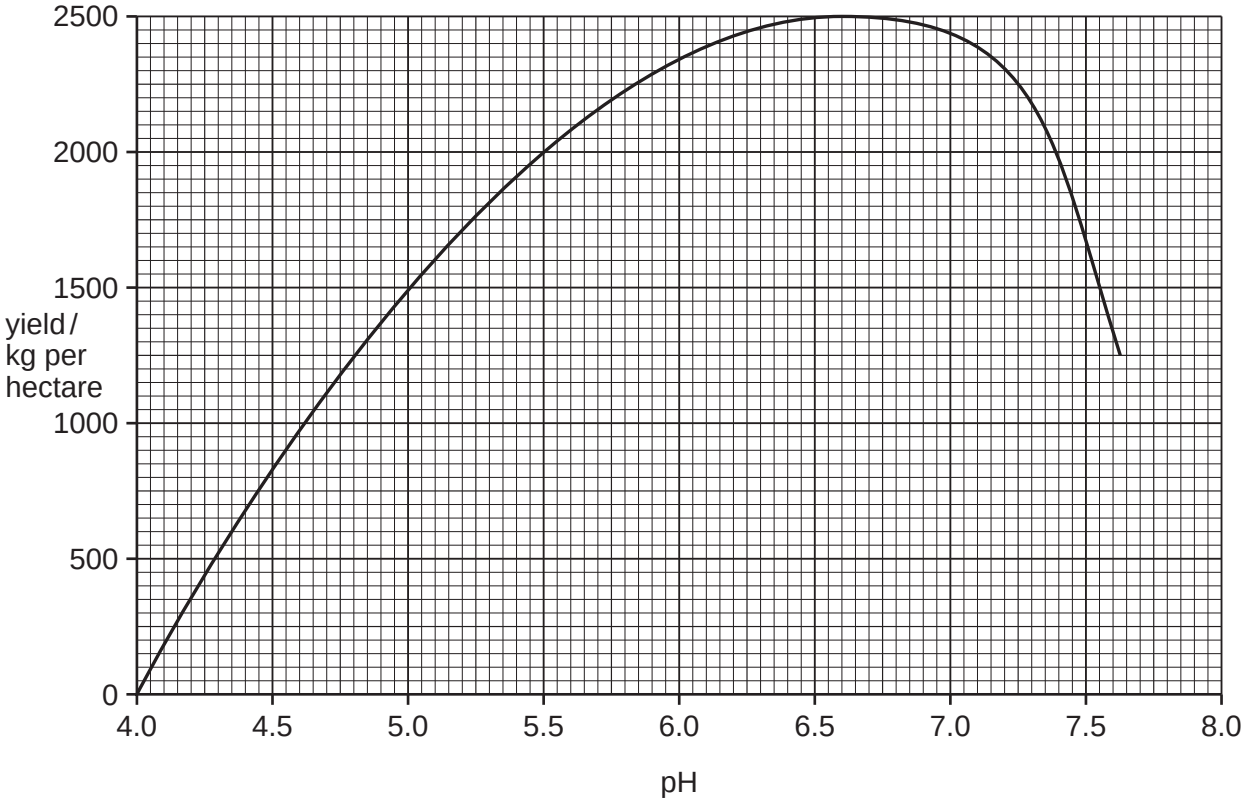

Fig. 8.1

A farmer grows soya beans in a field where the soil has a pH of 5.5.

(i) What yield of beans could he get from his crop?

.....kg per hectare [1]

(ii) State the pH range in which soya beans grow best.

between ..... and ..... [1]

(iii) The farmer decides to add calcium carbonate to the soil in his field.

Explain why this would help him to achieve a higher yield of soya beans.

.....

.....

..... [2]

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(b) The field is on a steep slope.

Describe **two** things the farmer could do to reduce the risk of soil erosion.

1 .....

.....

2 .....

..... [2]

(c) Soya beans are seeds. They grow after the flowers on the soya plants have been pollinated.

(i) Soya flowers often have violet-coloured petals.

Suggest how soya flowers are pollinated.

..... [1]

(ii) Explain why soya beans only grow after the flowers have been pollinated.

.....

.....

..... [2]

(iii) Describe how you would test a soya bean seed for protein. State the result you would expect.

test .....

.....

result ..... [2]

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9 **(a)** Complete Table 9.1 to show the properties of alpha, beta and gamma radiations.

Table 9.1

	description	charge	range in air	ionising ability
alpha		positive	5 cm	very strong
beta	electron		50 cm	
gamma	wave		many kilometres	weak

[4]

(b) Many people have smoke detectors in their houses.

Smoke detectors contain a radioactive source which emits alpha radiation.

Explain why the alpha radiation from the smoke detector is not dangerous to people living in the house.

.....

.....

..... [1]

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10 In many countries, river water is collected and treated to make it safe for humans to drink.

(a) State and explain which **two** of the processes shown below are used to treat river water so that it becomes safe to drink.

adding chlorine **chromatography** **evaporation** **filtration**

first process .....

explanation

.....

second process .....

explanation .....

..... [4]

(b) Sulfur dioxide is a gaseous compound which is released into the air when fossil fuels containing sulfur compounds are burned.

(i) Describe how sulfur dioxide gas could cause pollution of water in rivers and lakes.

.....

.....

.....

..... [3]

(ii) Suggest **one** way in which sulfur dioxide emissions into the atmosphere are being reduced.

.....

..... [1]

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(c) Fig. 10.1 shows a diagram of a water molecule, H_2O.

Choose words or phrases from the following list to complete the labelling of the diagram.

covalent bond	**hydrogen atom**	**ionic bond**
nucleus	**oxygen atom**	**proton**

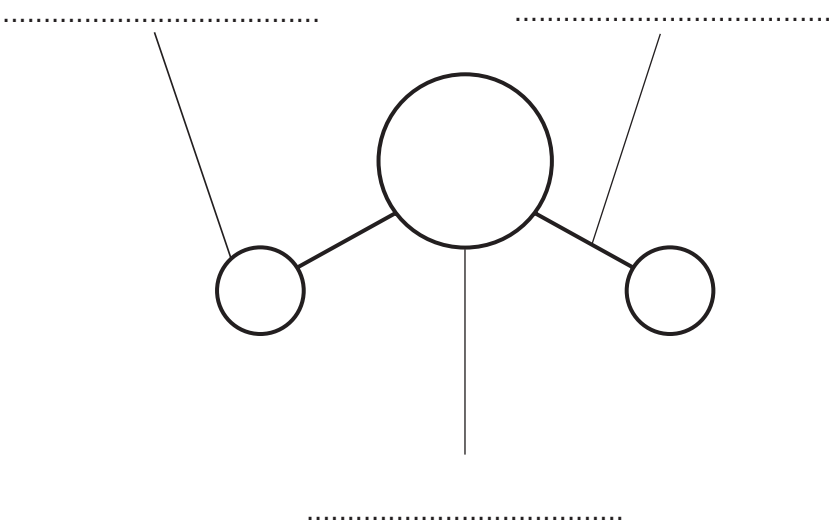

Fig. 10.1

[3]

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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 Sulfur 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 = 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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