UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

* 6 7 6 8 4 4 9 4 1 *

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.

For Examiner's Use	
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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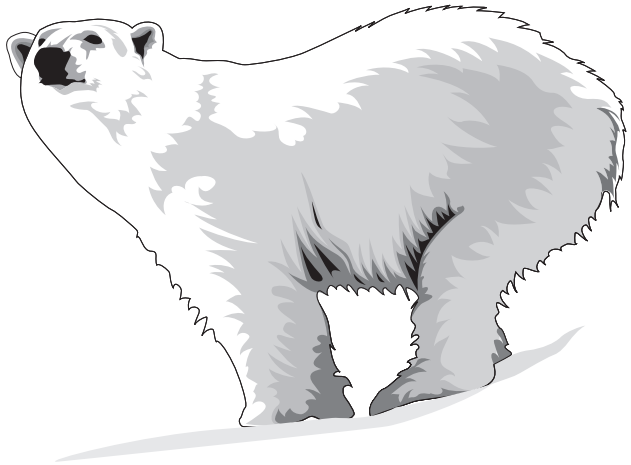
For Examiner's Use

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]

[Turn over

For Examiner's Use

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

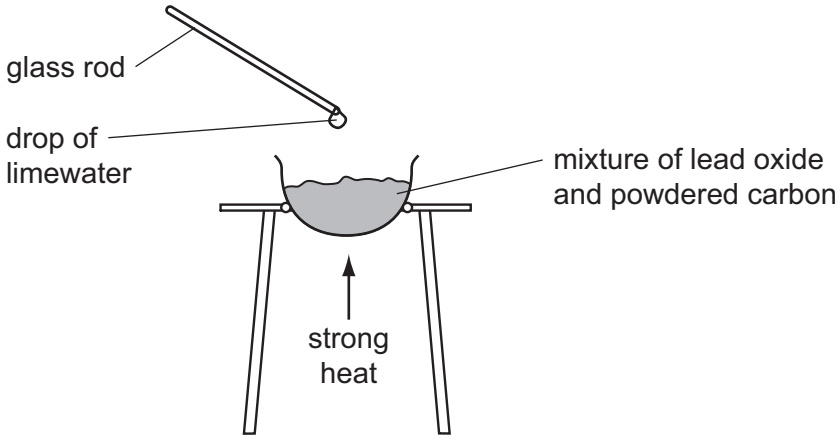


Fig. 2.1

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]

For Examiner's Use

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

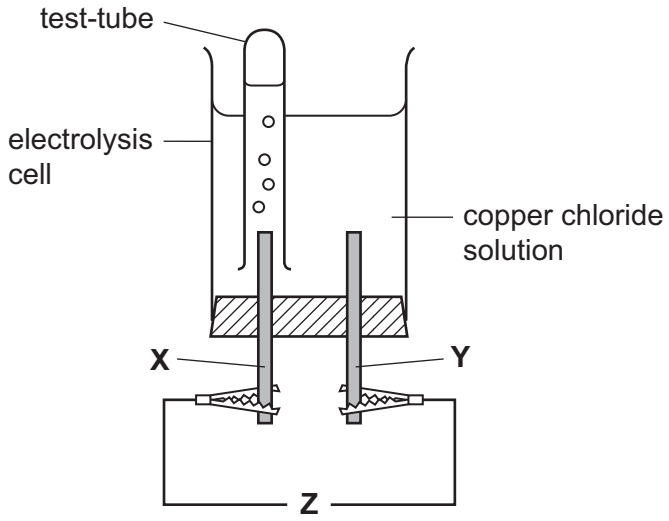


Fig. 2.2

(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]

For Examiner's Use

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.

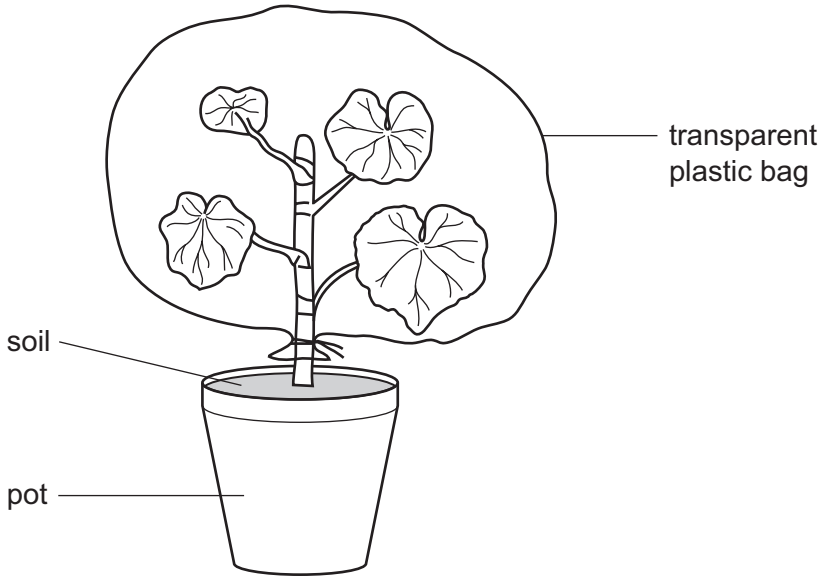


Fig. 3.1

(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]

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

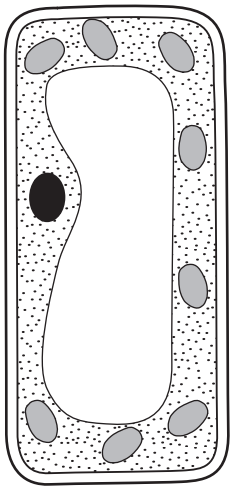


Fig. 3.2

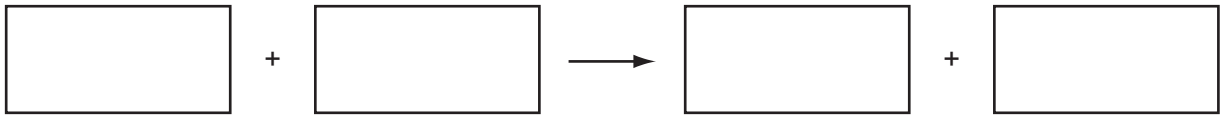
(i) On the diagram of the cell in Fig. 3.2, label and name **two** structures that would **not** be present in an animal cell. [2]

(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.



[2]

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

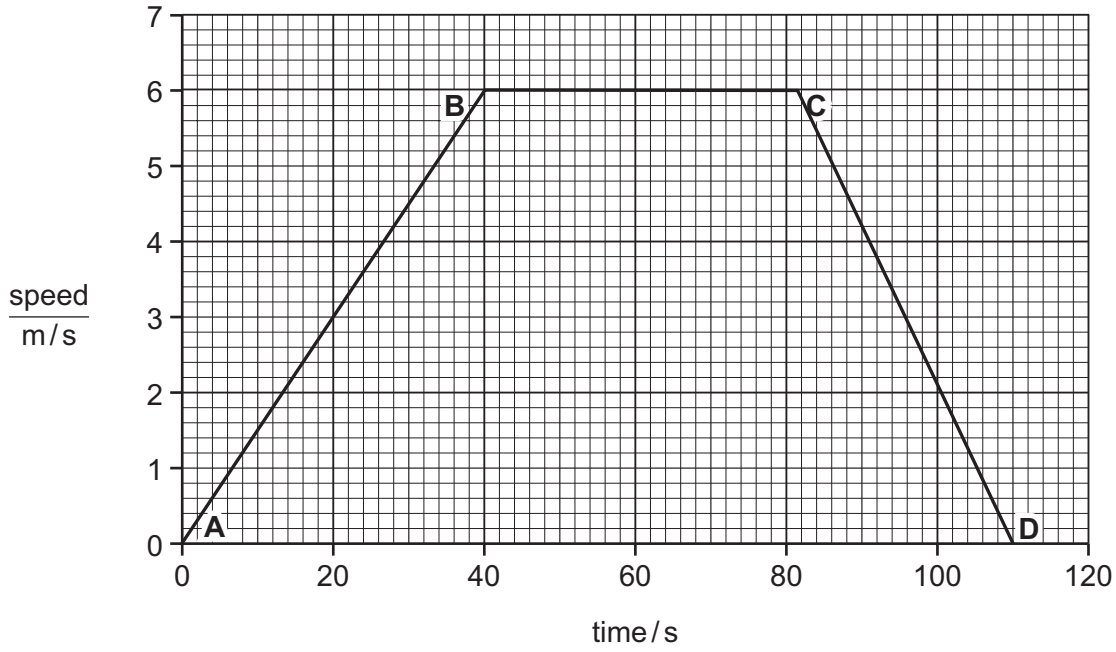


Fig. 4.1

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]

For Examiner's Use

(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]

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

For Examiner's Use

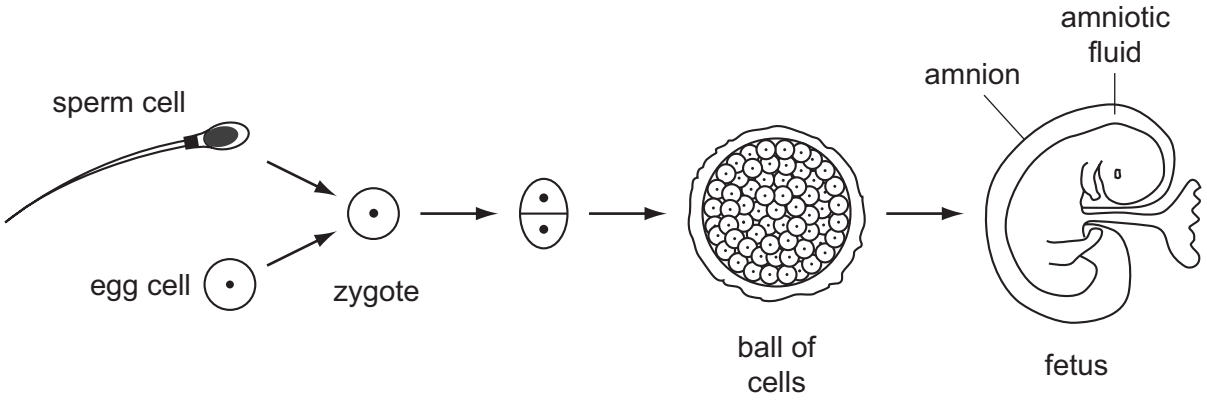


Fig. 5.1

(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]

(d) The fetus develops in the uterus.

For Examiner's Use

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]

For Examiner's Use

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.

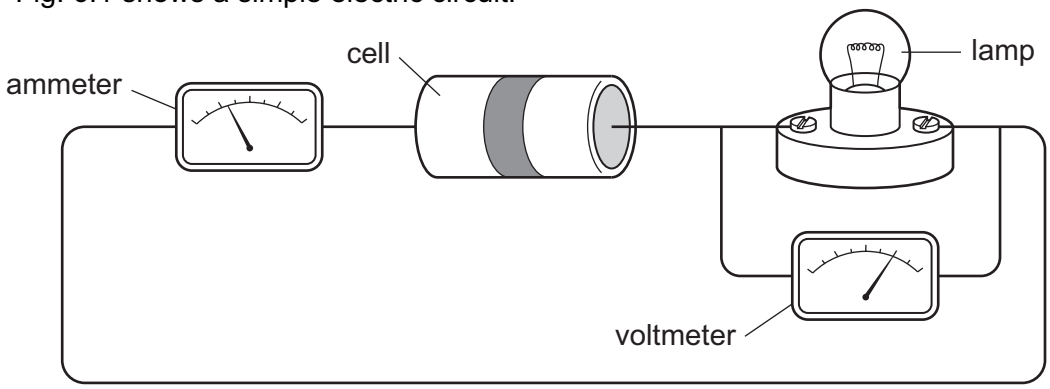


Fig. 6.1

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

[3]

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

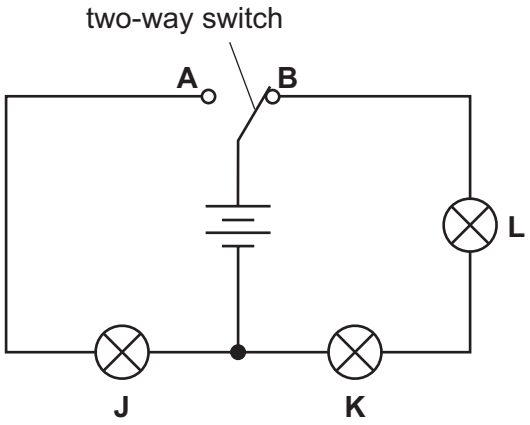


Fig. 6.2

(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.

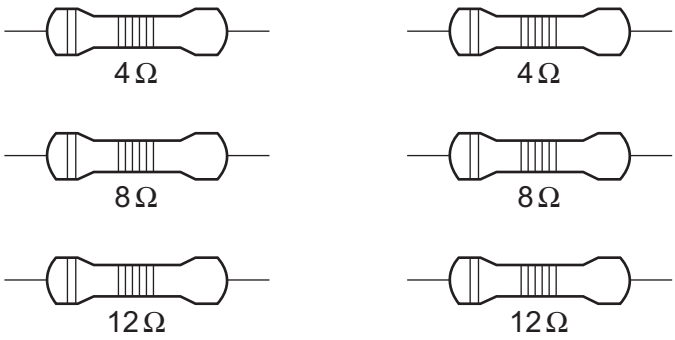


Fig. 6.3

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

.....

..... [1]

For Examiner's Use

(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.

For Examiner's Use

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]

For Examiner's Use

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

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

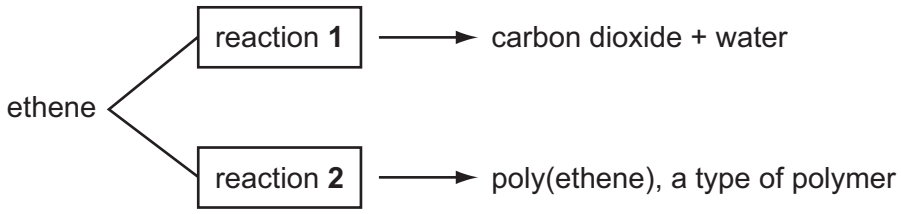

Fig. 7.2

(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]

For Examiner's Use

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.

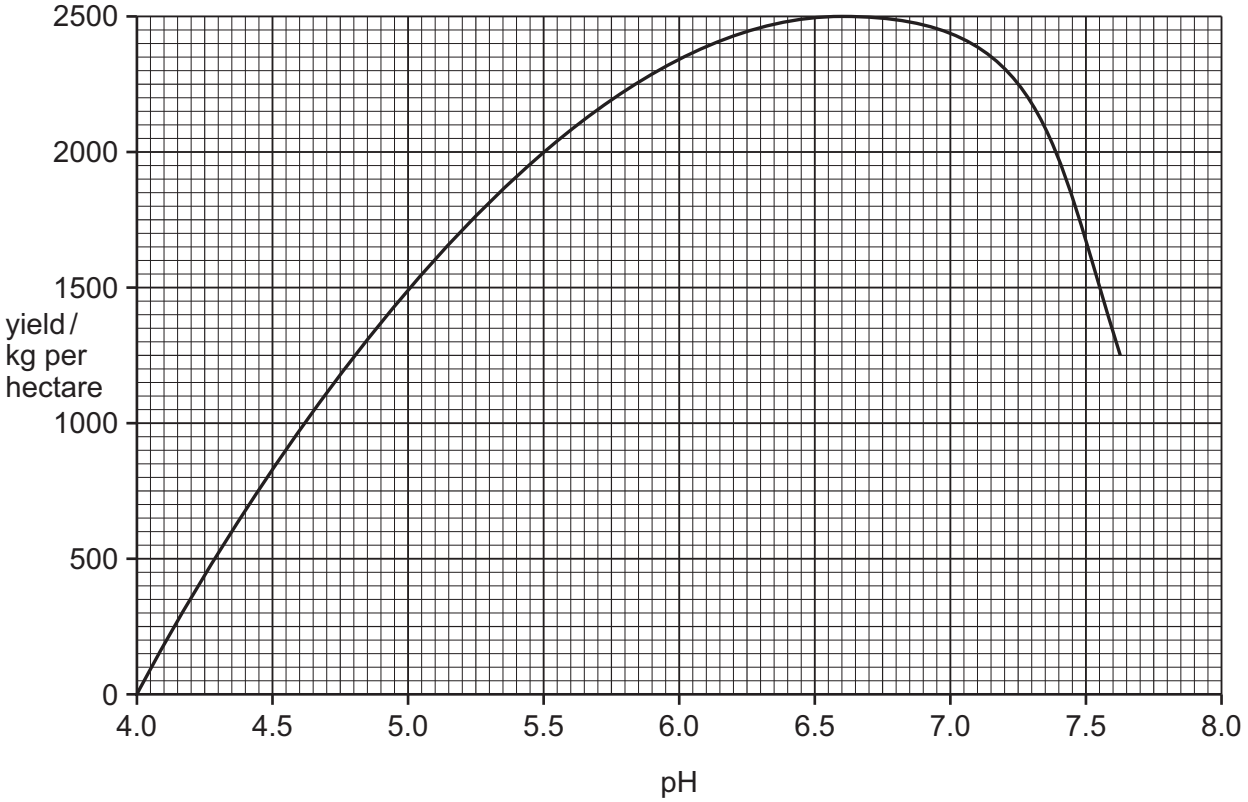

Fig. 8.1

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]

For Examiner's Use

(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]

For Examiner's Use

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]

For Examiner's Use

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]

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

For Examiner's Use

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**

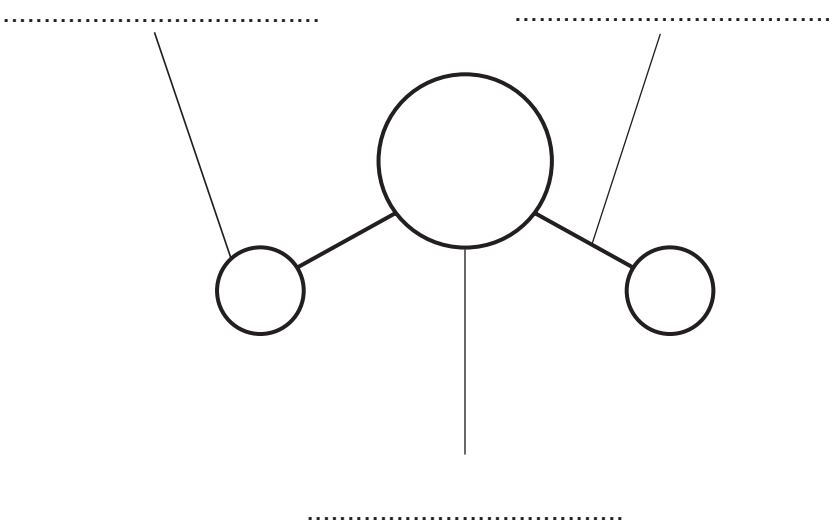

Fig. 10.1

[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	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.).