Centre Number	Candidate Number	Name

CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

COMBINED SCIENCE **5129/02**

Paper 2

May/June 2003

2 hours 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 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 20.

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.

For Examiner's Use	
Total	

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

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate
[Turn over

1 Fig. 1.1 represents the arrangement of atoms or molecules in four different substances, **A**, **B**, **C** and **D**.

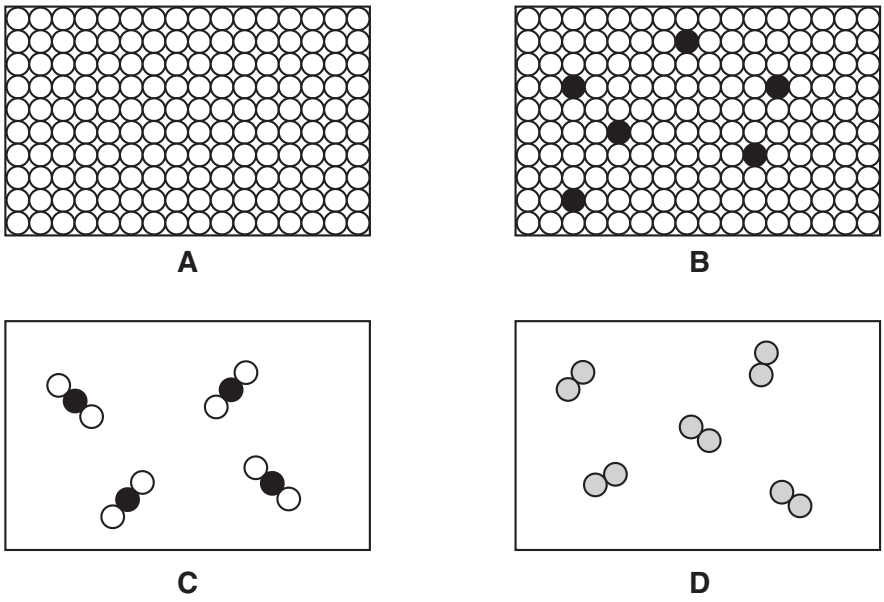

Fig. 1.1

(a) Which substance is an alloy? ..... [1]

(b) Which substance is a compound? ..... [1]

(c) Which substances are elements? ..... and ..... [1]

(d) Which substance could be carbon dioxide? ..... [1]

2 A measuring cylinder contains 80 cm^3 of water and has a total mass of 300 g.

A stone is then lowered into the cylinder. The new reading of the volume is 110 cm^3 and the total mass is 390 g.

The readings are shown in Fig. 2.1.

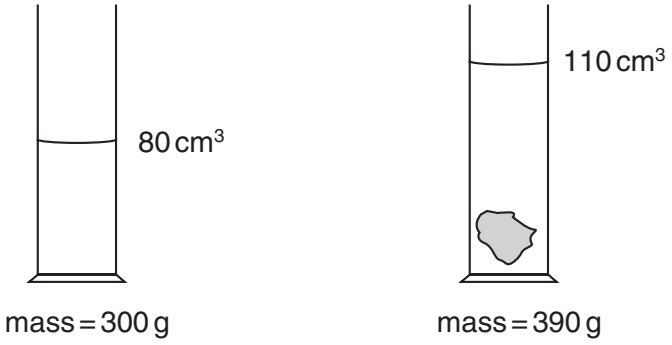

Fig. 2.1

(a) What is the mass of the stone? ..... g [1]

(b) What is the volume of the stone? ..... cm^3 [1]

(c) Use your answers to **(a)** and **(b)** to calculate the density of the stone.

[3]

[Turn over

3 **(a)** Inspired air differs from expired air.

State three differences between inspired and expired air.

1. .....

2. .....

3. ..... [3]

(b) Fig. 3.1 shows some apparatus for comparing inspired and expired air.

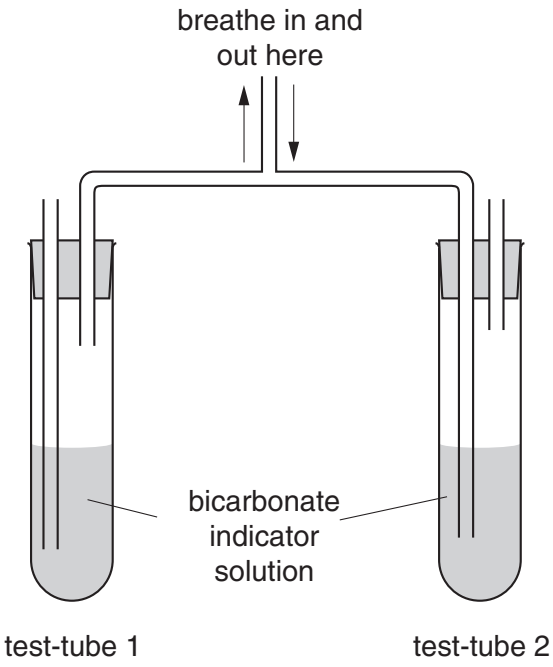

Fig. 3.1

Each test-tube contains bicarbonate indicator solution. In atmospheric air, bicarbonate indicator solution is red. In expired air it turns yellow. The reaction is reversible.

At the start of the experiment the bicarbonate indicator in both test-tubes is red. A person breathes in and out through the middle tube.

In which test-tube will the bicarbonate indicator solution go yellow?

..... [1]

(c) The yellow bicarbonate indicator solution is put into the apparatus in Fig. 3.2.

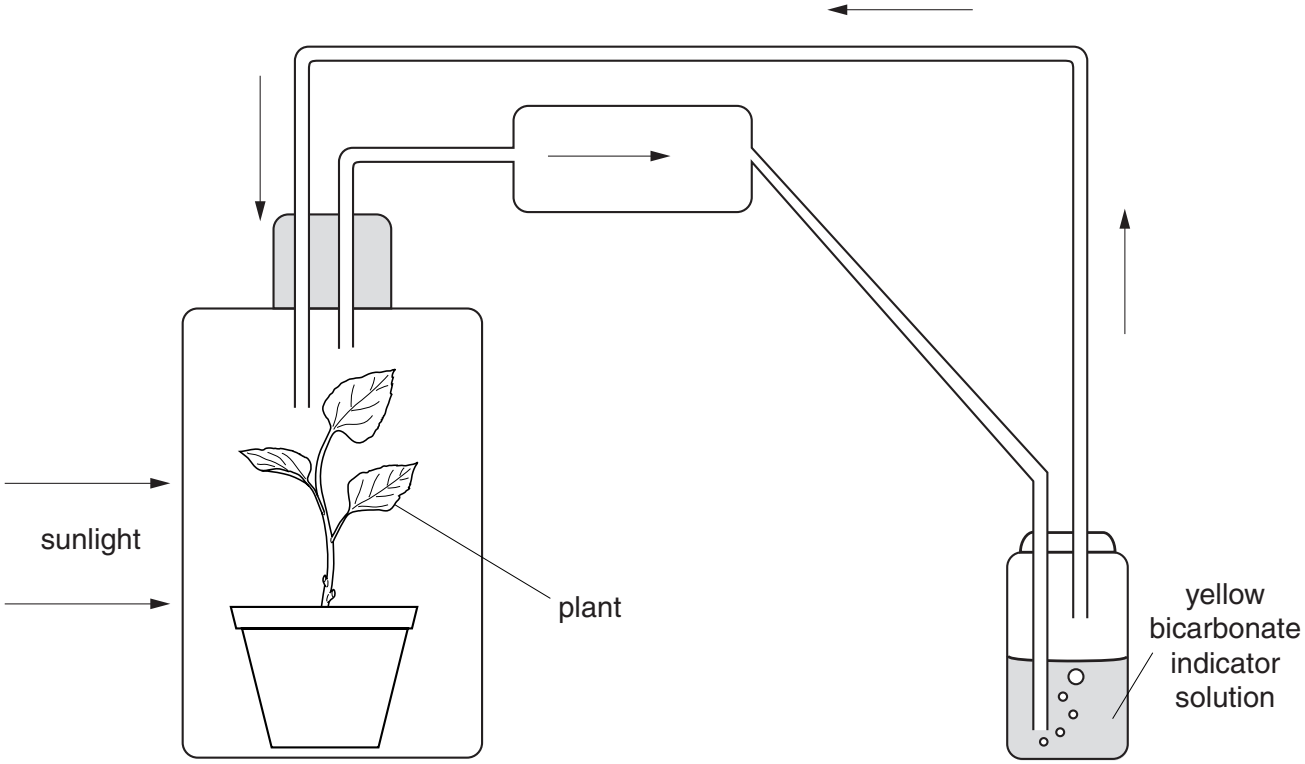

Fig. 3.2

The apparatus is left in sunlight for two hours. The yellow solution becomes red again.

(i) Suggest why the bicarbonate indicator changes colour.

.....

..... [1]

(ii) Name the process in the plant that causes the colour change.

..... [1]

(iii) State the word equation for this process taking place in the plant.

.....

..... [2]

[Turn over

4 A student investigated the reactivity of some metals. He placed small pieces of the metals copper, iron, magnesium and zinc in test-tubes containing the same volume of hydrochloric acid. The acid in each tube had the same concentration and initial temperature.

His observations are shown in Fig. 4.1.

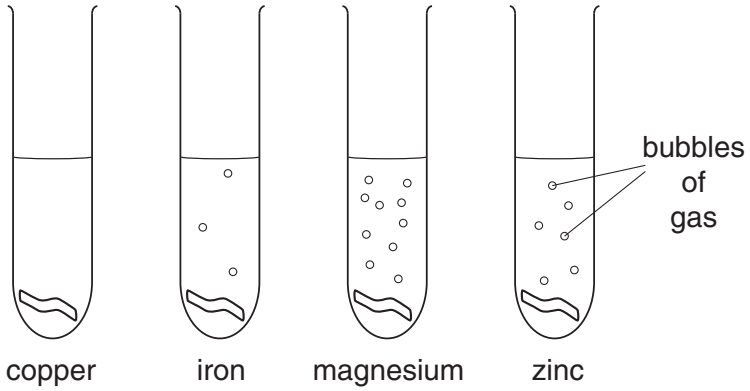

Fig. 4.1

(a) Use his observations to list the metals in order of reactivity, the most reactive metal first.

1. .....

2. .....

3. .....

4. ..... [2]

(b) Suggest why the hydrochloric acid should be the same concentration and temperature in each of the test-tubes.

..... [1]

(c) **(i)** Name the gas given off when the metals react with hydrochloric acid.

.....

(ii) State the test for this gas.

.....

.....

[2]

(d) State the name and formula of the salt formed when zinc reacts with hydrochloric acid.

name ..... formula ..... [2]

5 Fig. 5.1 shows how the displacement of particles in a wave varies with distance from the source.

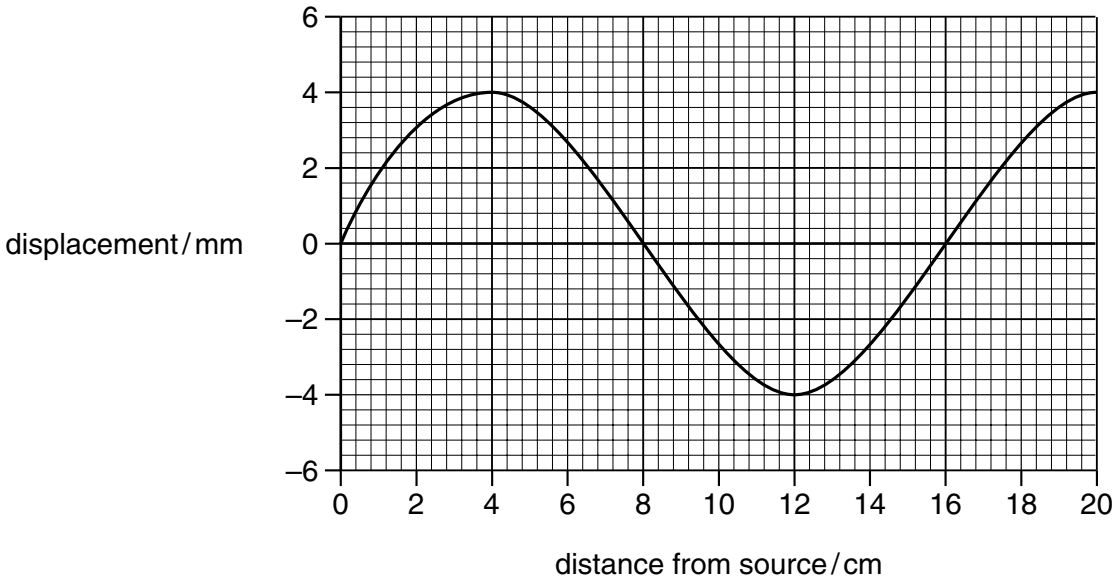

Fig. 5.1

(a) Use Fig. 5.1 to determine

(i) the wavelength,

..... cm [1]

(ii) the amplitude.

..... mm [1]

(b) The wave shown in Fig. 5.1 has a frequency of 5.0 Hz.

(i) State what is meant by *frequency*.

.....

..... [2]

(ii) Use your answer to **(a)(i)** to calculate the speed of the wave.

[3]

[Turn over

6 **(a)** **(i)** State three different uses of energy within the body.

1. .....

2. .....

3. ..... [3]

(ii) Suggest three ways in which energy can be lost from the body.

1. .....

2. .....

3. ..... [3]

(b) The recommended daily energy intake for a man aged 45 is 12 100 kJ and for a 75 year old man is 8 800 kJ.

Suggest a reason for this difference in daily energy intake.

..... [1]

7 Sulphur dioxide is produced when coal is burnt in air. Sulphur dioxide causes acid rain.

(a) Write the symbol equation for the burning of sulphur in oxygen.

..... [1]

(b) When the sulphur dioxide dissolves in rain water what happens to the pH value of the rain water?

..... [1]

(c) State two environmental problems caused by acid rain.

1. .....

2. ..... [2]

8 Fig. 8.1 shows an electric kettle. The heating element heats the water around it.

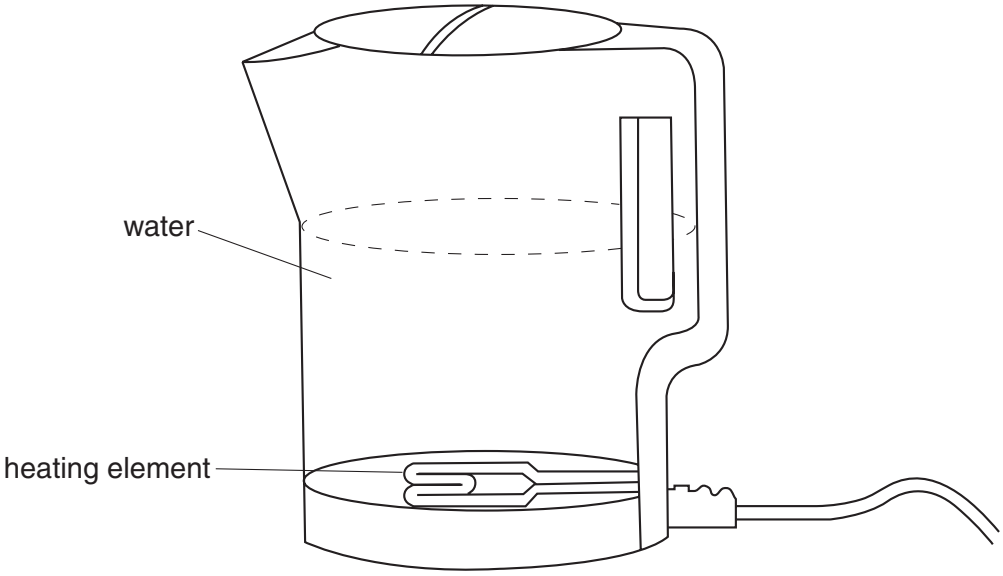

Fig. 8.1

(a) Explain, in detail, how the rest of the water in the kettle is heated by convection.

.....

.....

..... [3]

(b) Suggest two reasons why the body of the kettle is made of plastic rather than metal.

1. .....

2. ..... [2]

(c) The mains plug of the kettle has three connections. One of them is called the **live**. What are the names of the other two connections?

..... and ..... [2]

(d) The mains supply is 230 V. The current in the heating element of the kettle is 8.0 A.

Calculate the resistance of the heating element.

[2]

[Turn over

9 Fig. 9.1 shows a section through part of a green leaf.

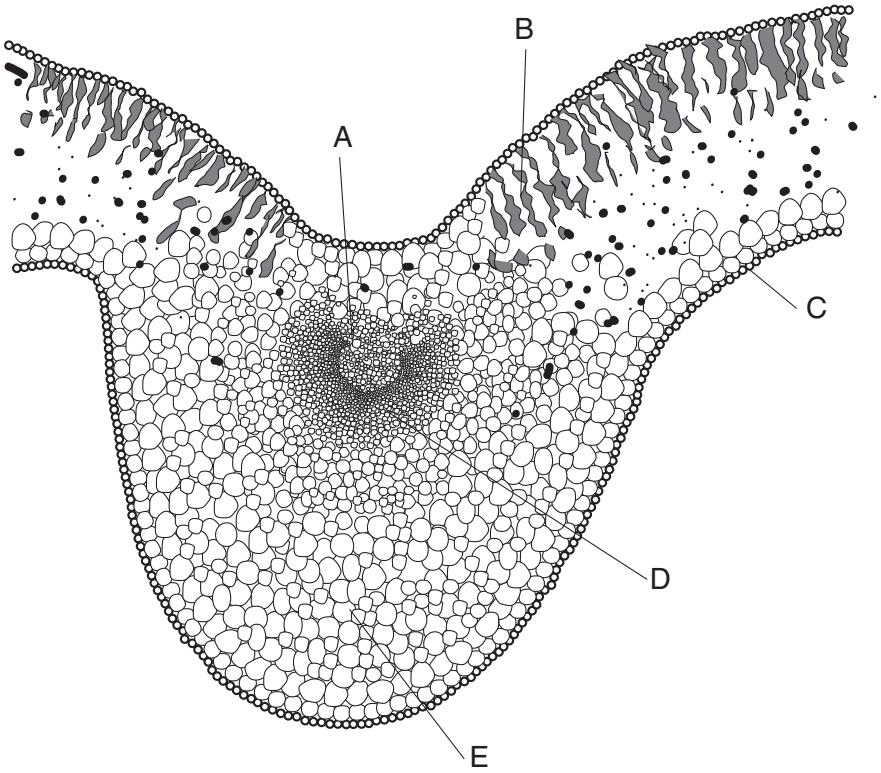

Fig. 9.1

(a) Name the tissue in which water is carried through the leaf.

..... [1]

(b) From Fig. 9.1 give

(i) the letter that identifies the tissue in **(a)**, ... [1]

(ii) the letter that identifies tissue containing chlorophyll. ..... [1]

(c) Name the process by which water is lost from the leaf.

..... [1]

10 Ethane and ethene are both hydrocarbons. They can be distinguished from each other using aqueous bromine solution.

(a) **(i)** State the colour of aqueous bromine solution.

.....

(ii) State what you would see when aqueous bromine solution is added to ethane and to ethene in separate test-tubes.

ethane .....

ethene .....
[3]

(b) Both hydrocarbons burn in oxygen. What are the products of complete combustion of the hydrocarbons?

..... and ..... [2]

11 Fig. 11.1 shows a simple electric bell. When the switch is closed the metal ball hits the gong.

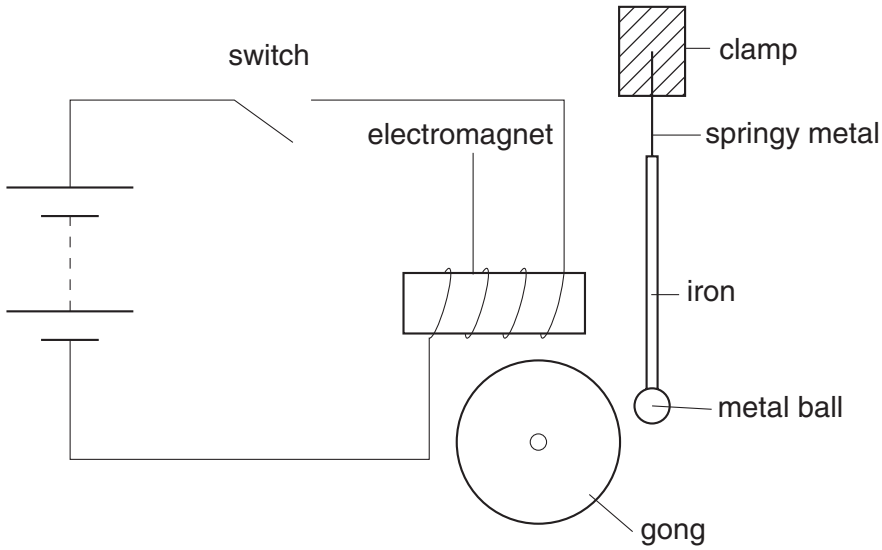

Fig. 11.1

(a) Explain why the metal ball moves when the switch is closed.

.....

.....

..... [3]

(b) What difference, if any, does it make if the cells are reversed?

..... [1]

(c) Complete the following sentence about the energy changes taking place in the cells.

The cells change …… energy into …… energy. [2]

[Turn over

12 Fig. 12.1 shows a section through a flower.

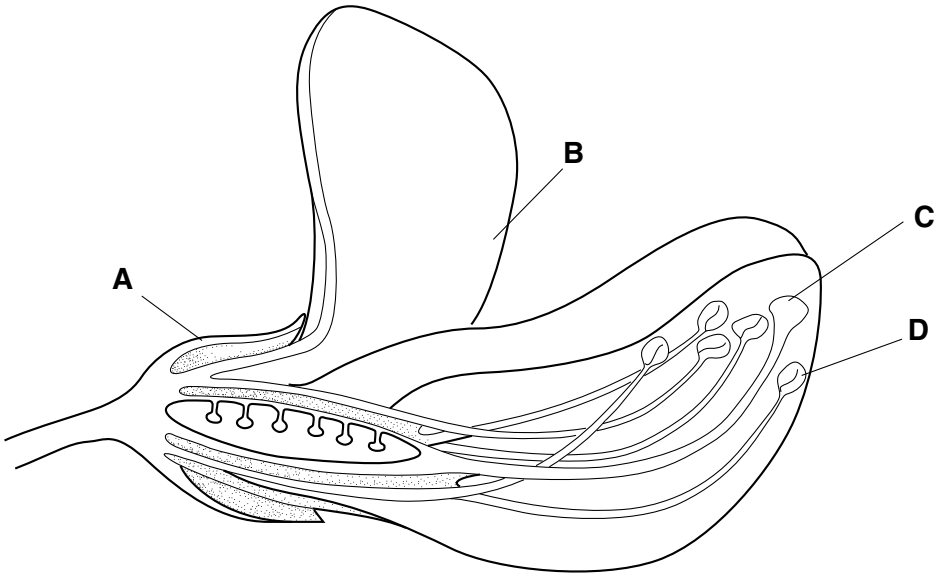

Fig. 12.1

(a) Suggest **one** use for each of the labelled parts.

A .....

B .....

C .....

D ..... [4]

(b) On Fig. 12.1, mark with a cross (**X**) a place where fertilisation occurs. [1]

(c) After fertilisation, what do the ovule and the ovary become?

The ovule becomes a ..... .

The ovary becomes a ..... . [2]

13 **(a)** Ammonia contains nitrogen and hydrogen and is represented by the formula NH_3.

Use the information from the Periodic Table to help you complete Fig. 13.1 to show the arrangement of the outer shell electrons in a molecule of ammonia.

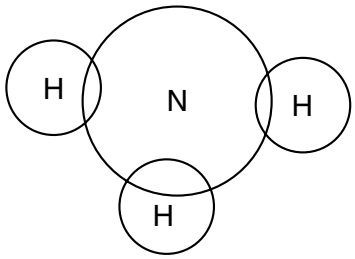

Fig. 13.1

[2]

(b) **(i)** Name the type of bonding present in ammonia.

..... [1]

(ii) Explain, in terms of particles, why the boiling point of ammonia is –34 °C.

.....

.....

..... [2]

[Turn over

14 Fig. 14.1 shows a bar magnet being pushed into a coil of wire to induce an e.m.f.

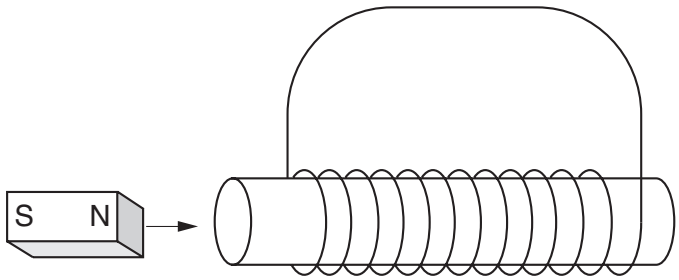

Fig. 14.1

(a) State three factors that affect the size of the induced e.m.f.

1. .....

2. .....

3. ..... [3]

(b) The induced e.m.f. produces a current through the coil.

State two ways by which the current may be reversed.

1. .....

2. ..... [2]

15 Fig. 15.1 shows some plant tissue.

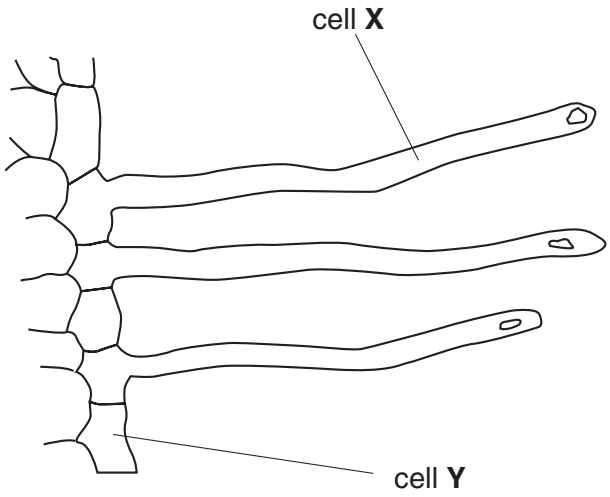

Fig. 15.1

(a) **(i)** Name the type of cell marked **X**.

..... [1]

(ii) Name the process by which water enters cell **X**.

..... [1]

(iii) Suggest why cell **X** is better at taking in water than cell **Y**.

.....

..... [1]

(b) Suggest four ways in which water is used in a plant.

1. .....

2. .....

3. .....

4. ..... [4]

[Turn over

16 An element **X** exists as two isotopes $^{28}\mathbf{X}$ and $^{30}\mathbf{X}$.

(a) What are *isotopes*?

.....

..... [2]

(b) Complete the following table.

isotope	number of protons	number of neutrons	number of electrons
$^{28}\mathbf{X}$			14
$^{30}\mathbf{X}$	14	16	

[3]

(c) How do the chemical properties of each isotope of the element compare with each other? Explain your answer.

.....

.....

..... [2]

(d) Use the Periodic Table to identify element **X**.

..... [1]

17 Ball **A** and ball **B** in Fig. 17.1 are both made of polythene.

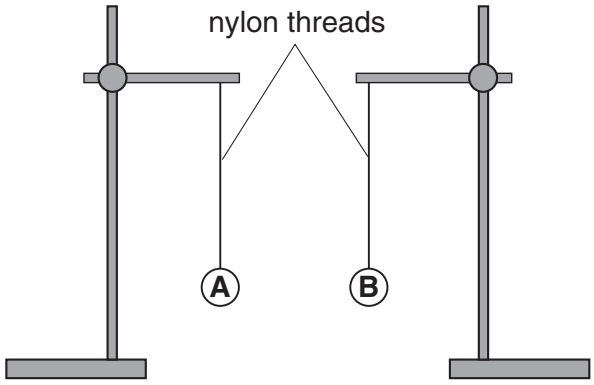

Fig. 17.1

(a) A polythene ball, initially uncharged, can be given a negative charge by rubbing it with a duster.

What type of charge does the duster gain? ..... [1]

(b) Fig. 17.2 shows the two balls after they have each been given a negative charge.

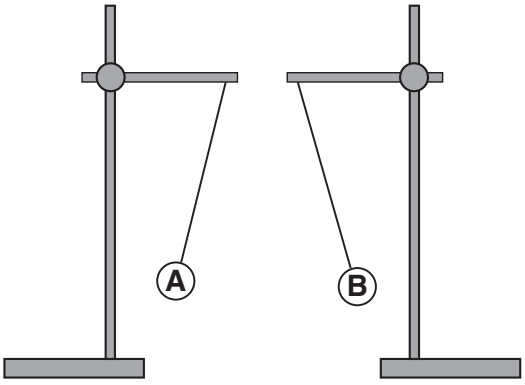

Fig. 17.2

Explain why the two balls do not hang vertically.

..... [1]

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DATA SHEET
The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
							1 H Hydrogen 1										4 He Helium 2
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
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.).