

Centre Number	Candidate Number	Name
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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.

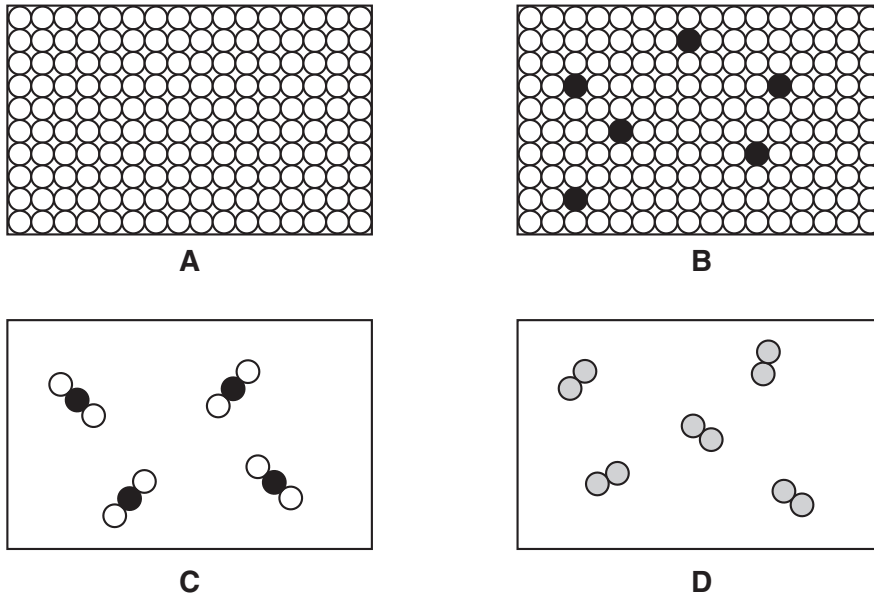
If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

For Examiner's Use	
<b>Total</b>	

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

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



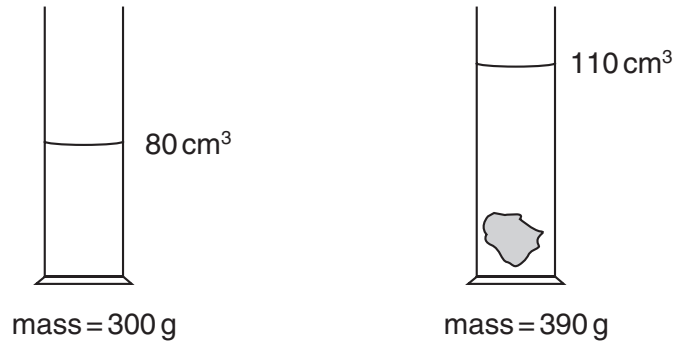
**Fig. 1.1**

- (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  $80 \text{ cm}^3$  of water and has a total mass of  $300 \text{ g}$ .

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

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? .....  $\text{cm}^3$  [1]
- (c) Use your answers to (a) and (b) to calculate the density of the stone.

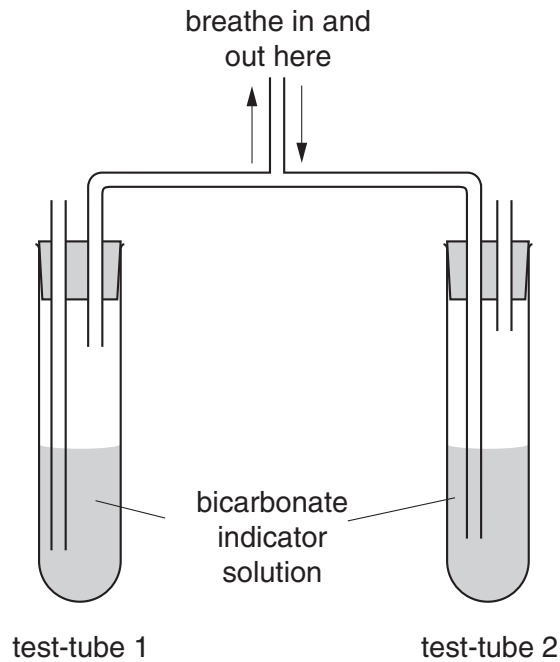
[3]

- 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**

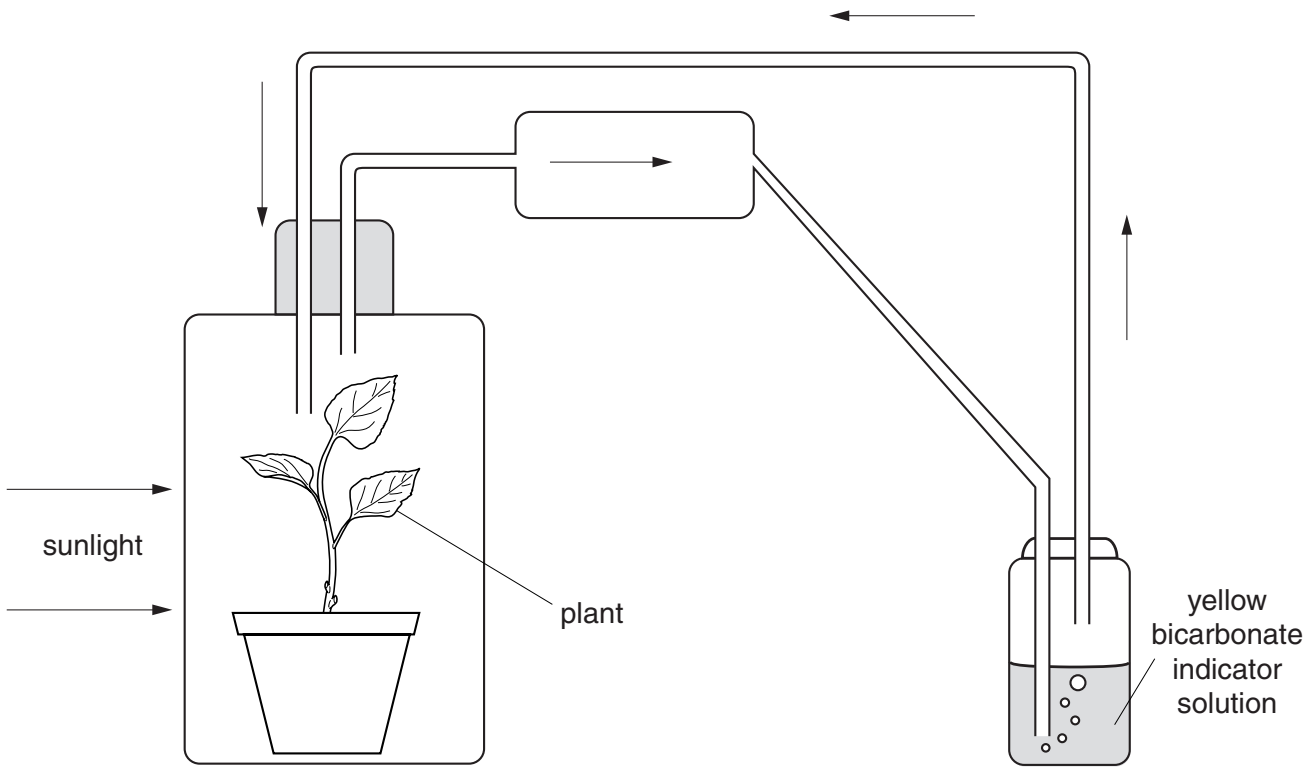
Each test-tube contains bicarbonate indicator solution. In atmospheric air, bicarbonate indicator solution is red. In expired air it turns yellow. The reaction is reversible.

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]

- 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.

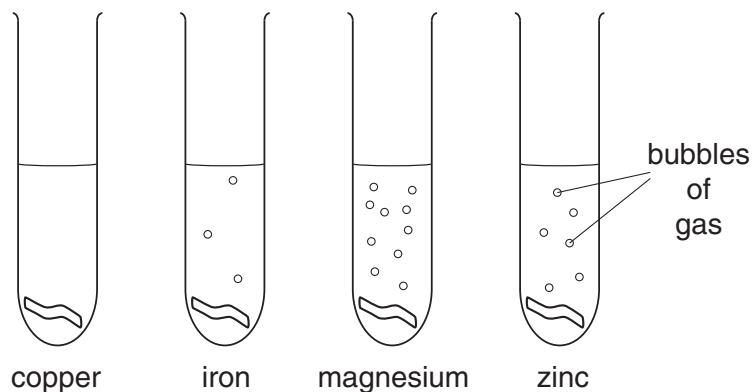


Fig. 4.1

- (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.

.....

.....

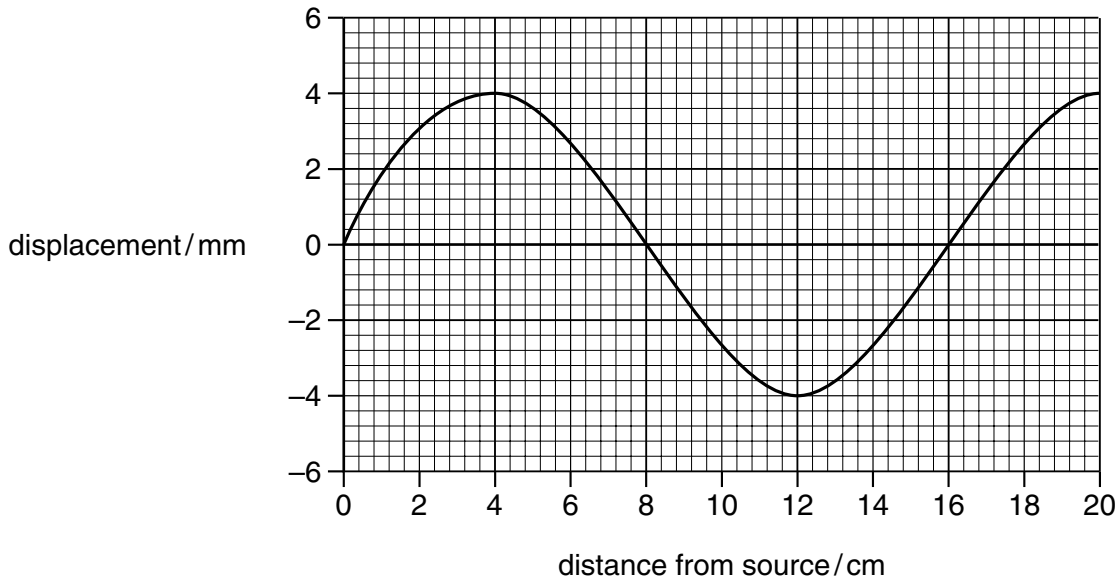
[2]

- (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]

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.

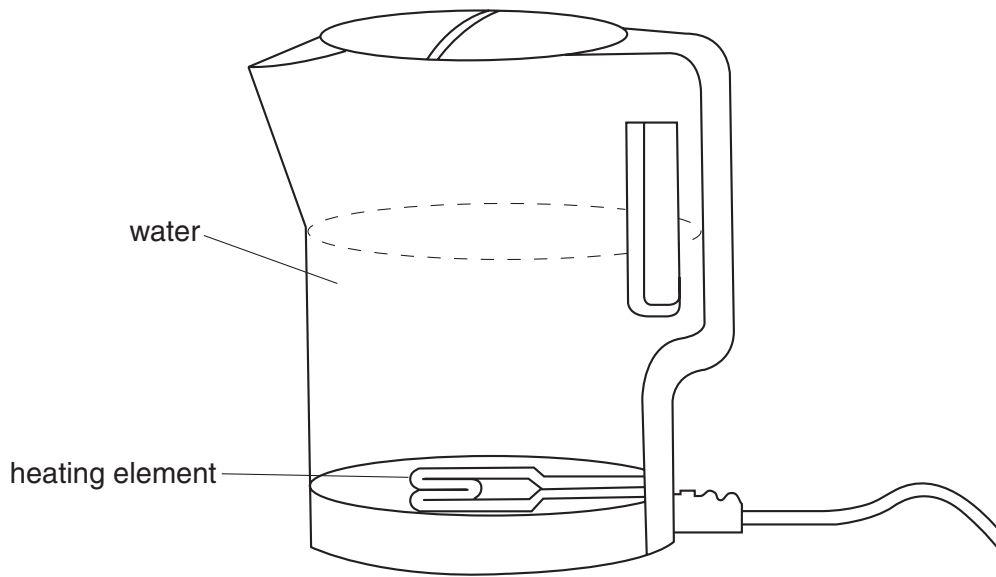


Fig. 8.1

(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?

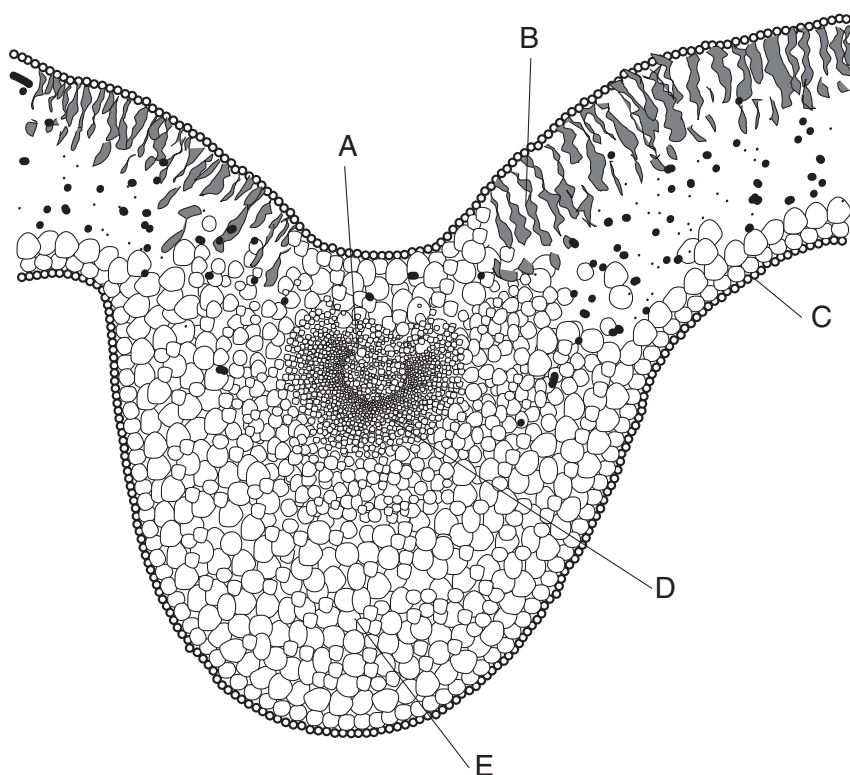
..... and ..... [2]

(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]

- 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.

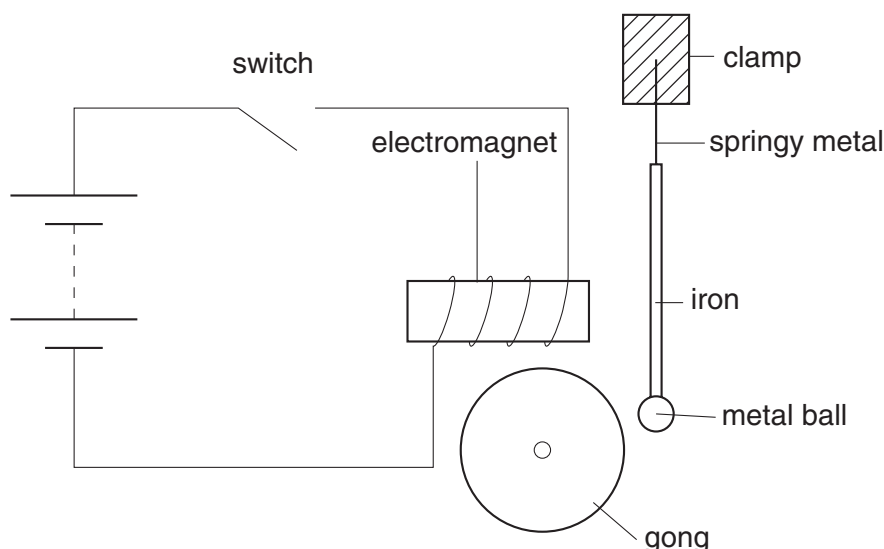


Fig. 11.1

(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]

12 Fig. 12.1 shows a section through a flower.

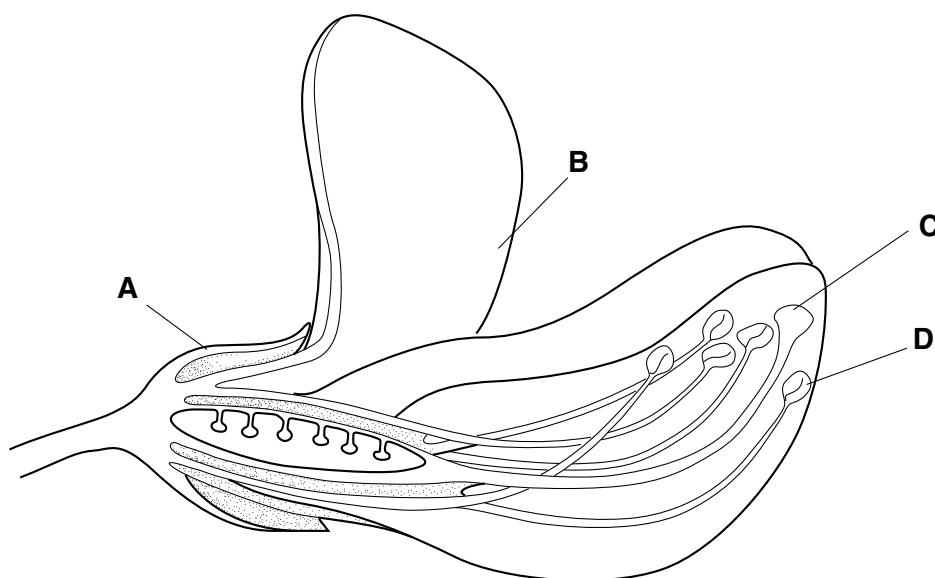


Fig. 12.1

(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  $\text{NH}_3$ .

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.

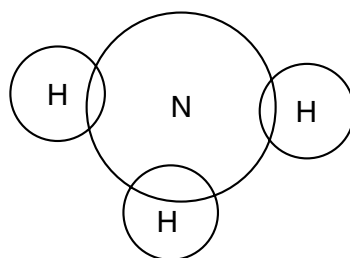


Fig. 13.1

[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  $-34^\circ\text{C}$ .

.....

.....

..... [2]

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

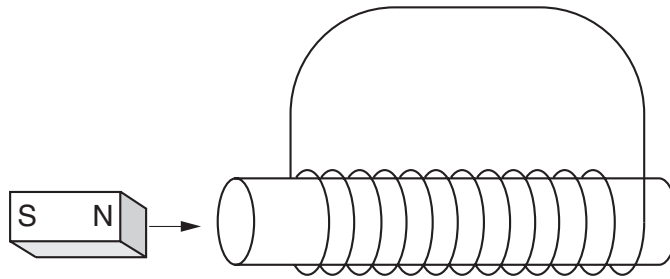


Fig. 14.1

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

- 1. .... [3]
- 2. ....
- 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.

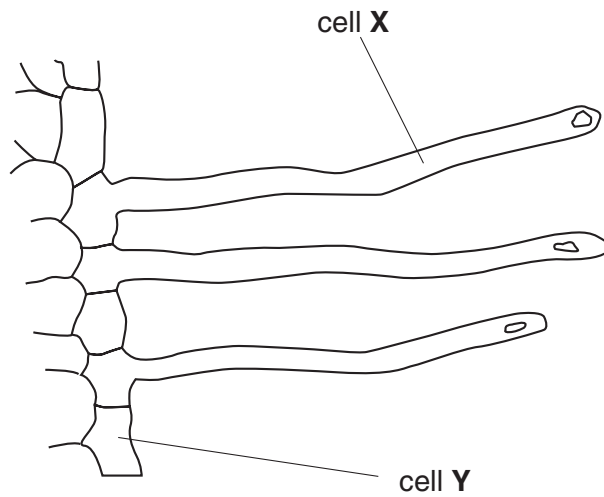


Fig. 15.1

(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]

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

(a) What are *isotopes*?

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

(b) Complete the following table.

isotope	number of protons	number of neutrons	number of electrons
$^{28}\text{X}$			14
$^{30}\text{X}$	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.

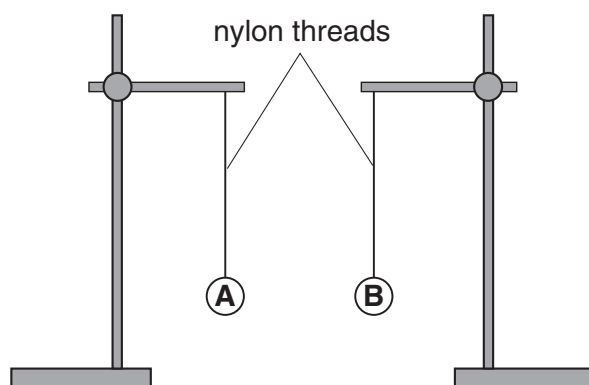


Fig. 17.1

- (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.

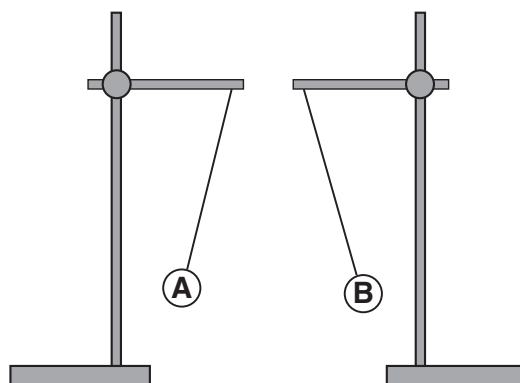


Fig. 17.2

Explain why the two balls do not hang vertically.

..... [1]





# DATA SHEET

## The Periodic Table of the Elements

		Group																																																																									
I	II	III	IV	V	VI	VII	O																																																																				
7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">1 <b>H</b> Hydrogen 1</div> </div>										4 <b>He</b> Helium 2																																																															
23 <b>Na</b> Sodium 11	24 <b>Mg</b> Magnesium 12											11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	14 <b>Si</b> Silicon 14	15 <b>P</b> Phosphorus 15	16 <b>S</b> Sulphur 16	17 <b>Cl</b> Chlorine 17	18 <b>Ar</b> Argon 18	19 <b>F</b> Fluorine 9	20 <b>Ne</b> Neon 10																																																							
39 <b>K</b> Potassium 19	40 <b>Ca</b> Calcium 20	27 <b>Al</b> Aluminium 13	28 <b>Si</b> Silicon 14	31 <b>P</b> Phosphorus 15	32 <b>S</b> Sulphur 16	35.5 <b>Cl</b> Chlorine 17	40 <b>Ar</b> Argon 18	49 <b>K</b> Potassium 19	50 <b>Ca</b> Calcium 20	51 <b>Sc</b> Scandium 21	52 <b>Ti</b> Titanium 22	53 <b>V</b> Vanadium 23	54 <b>Cr</b> Chromium 24	55 <b>Mn</b> Manganese 25	56 <b>Fe</b> Iron 26	57 <b>Co</b> Cobalt 27	58 <b>Ni</b> Nickel 28	59 <b>Cu</b> Copper 29	60 <b>Zn</b> Zinc 30	65 <b>Ga</b> Gallium 31	66 <b>Ge</b> Germanium 32	67 <b>As</b> Arsenic 33	68 <b>Se</b> Selenium 34	69 <b>Br</b> Bromine 35	70 <b>Kr</b> Krypton 36	71 <b>Rb</b> Rubidium 37	72 <b>Sr</b> Strontium 38	73 <b>Y</b> Yttrium 39	74 <b>Zr</b> Zirconium 40	75 <b>Nb</b> Niobium 41	76 <b>Mo</b> Molybdenum 42	77 <b>Tc</b> Technetium 43	78 <b>Ru</b> Ruthenium 44	79 <b>Rh</b> Rhodium 45	80 <b>Pd</b> Palladium 46	81 <b>Ag</b> Silver 47	82 <b>Cd</b> Cadmium 48	83 <b>In</b> Indium 49	84 <b>Sn</b> Tin 50	85 <b>Sb</b> Antimony 51	86 <b>Te</b> Tellurium 52	87 <b>I</b> Iodine 53	88 <b>Xe</b> Xenon 54	89 <b>La</b> Lanthanum 57	90 <b>Ce</b> Cerium 58	91 <b>Pr</b> Praseodymium 59	92 <b>Nd</b> Neodymium 60	93 <b>Pm</b> Promethium 61	94 <b>Sm</b> Samarium 62	95 <b>Eu</b> Europium 63	96 <b>Gd</b> Gadolinium 64	97 <b>Tb</b> Terbium 65	98 <b>Dy</b> Dysprosium 66	99 <b>Ho</b> Holmium 67	100 <b>Er</b> Erbium 68	101 <b>Tm</b> Thulium 69	102 <b>Yb</b> Ytterbium 70	103 <b>Lu</b> Lutetium 71	104 <b>Fr</b> Francium 87	105 <b>Ra</b> Radium 88	106 <b>Ac</b> Actinium 89	107 <b>Th</b> Thorium 90	108 <b>Pa</b> Protactinium 91	109 <b>U</b> Uranium 92	110 <b>Np</b> Neptunium 93	111 <b>Pu</b> Plutonium 94	112 <b>Am</b> Americium 95	113 <b>Cm</b> Curium 96	114 <b>Bk</b> Berkelium 97	115 <b>Cf</b> Californium 98	116 <b>Es</b> Einsteinium 99	117 <b>Fm</b> Fermium 100	118 <b>Md</b> Mendelevium 101	119 <b>No</b> Nobelium 102	120 <b>Lr</b> Lawrencium 103
133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56	181 <b>Ta</b> Tantalum 73	182 <b>W</b> Tungsten 74	183 <b>Re</b> Rhenium 75	184 <b>Os</b> Osmium 76	186 <b>Ir</b> Iridium 77	187 <b>Pt</b> Platinum 78	188 <b>Au</b> Gold 79	189 <b>Hg</b> Mercury 80	190 <b>Tl</b> Thallium 81	191 <b>Pb</b> Lead 82	192 <b>Bi</b> Bismuth 83	193 <b>Po</b> Polonium 84	194 <b>At</b> Astatine 85	195 <b>Rn</b> Radon 86	226 <b>Ra</b> Radium 88	227 <b>Ac</b> Actinium 89	228 <b>Th</b> Thorium 90	229 <b>Pa</b> Protactinium 91	230 <b>U</b> Uranium 92	231 <b>Np</b> Neptunium 93	232 <b>Pu</b> Plutonium 94	233 <b>Am</b> Americium 95	234 <b>Cm</b> Curium 96	235 <b>Bk</b> Berkelium 97	236 <b>Cf</b> Californium 98	237 <b>Es</b> Einsteinium 99	238 <b>Fm</b> Fermium 100	239 <b>Md</b> Mendelevium 101	240 <b>No</b> Nobelium 102	241 <b>Lr</b> Lawrencium 103																																												

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

**Key**

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

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