



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

CANDIDATE  
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**COMBINED SCIENCE**

**0653/23**

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**

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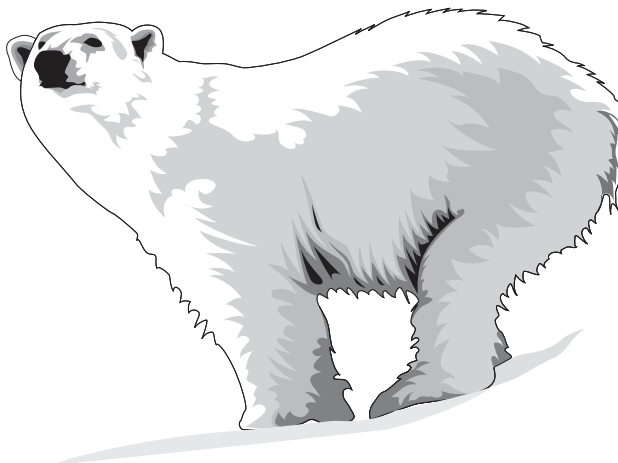
This document consists of **21** printed pages and **3** blank pages.





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

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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]

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

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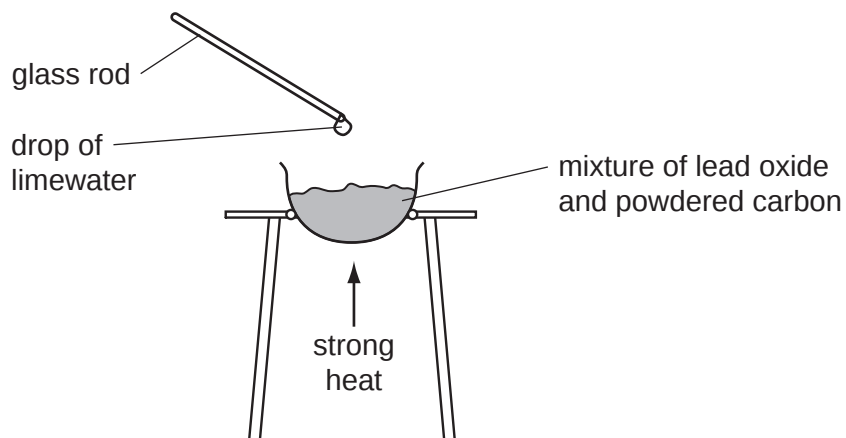


Fig. 2.1

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]

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

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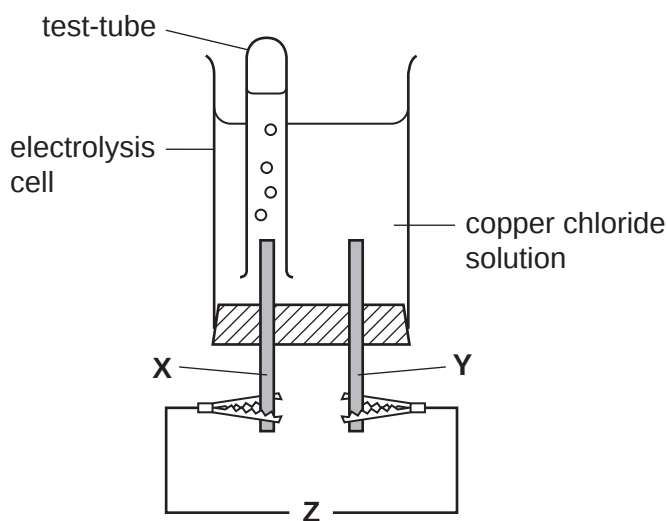


Fig. 2.2

- (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.

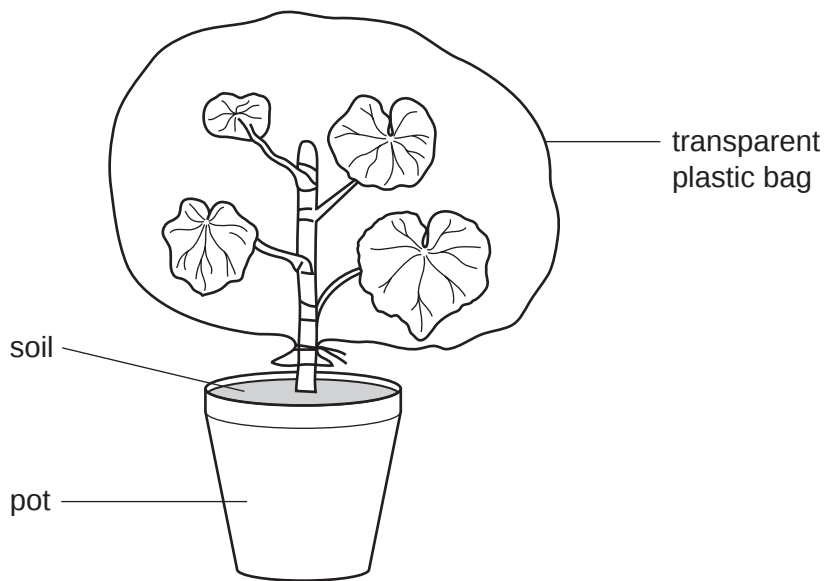
gas .....

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

.....

..... [2]

- 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.

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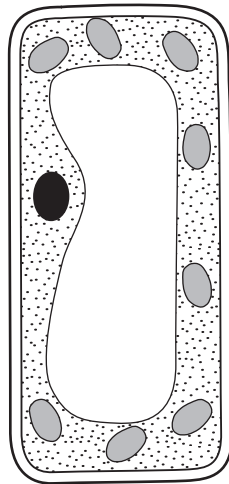


Fig. 3.2

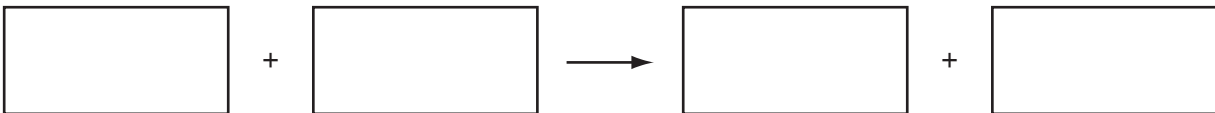
(i) On the diagram of the cell in Fig. 3.2, label and name **two** structures that would **not** be present in an animal cell. [2]

(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.

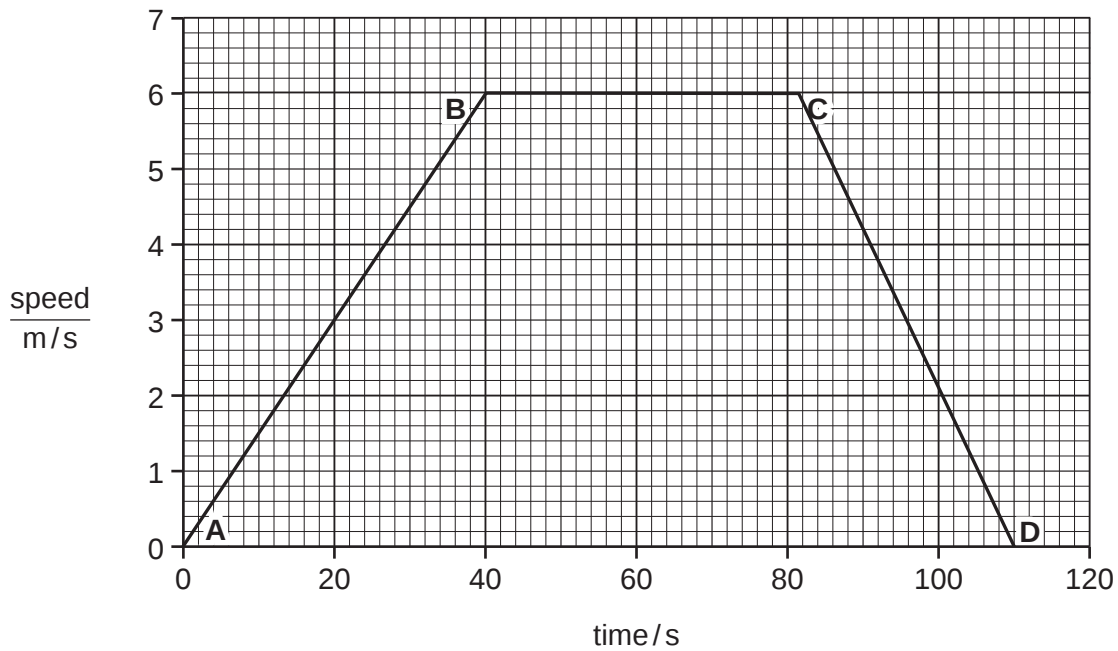


Fig. 4.1

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]

- (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.

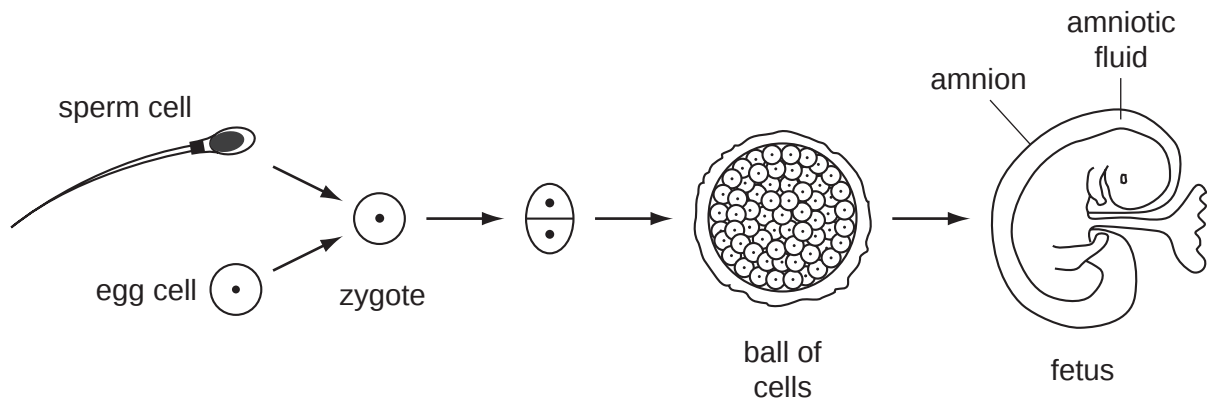
formula used

working

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..... J [2]

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



**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.

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.

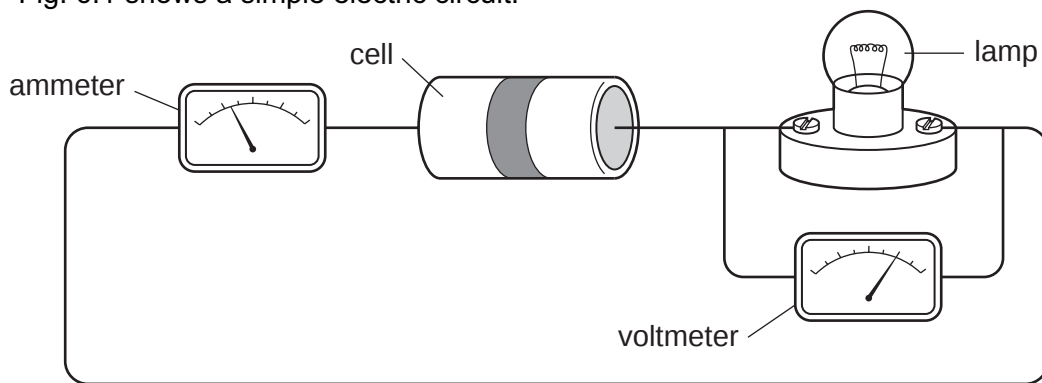


Fig. 6.1

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.

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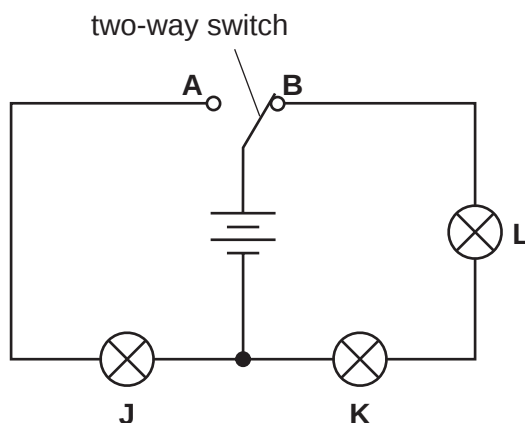


Fig. 6.2

(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.

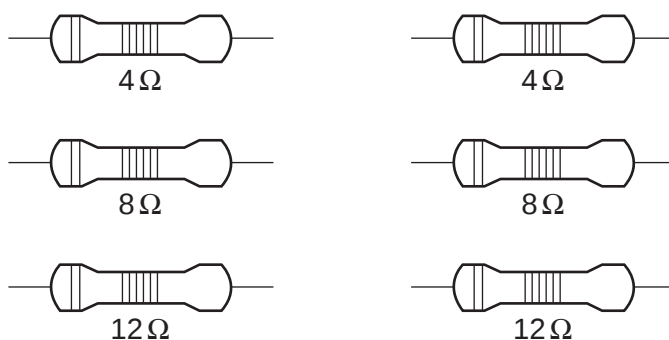


Fig.6.3

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

.....  
.....

[1]

(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.



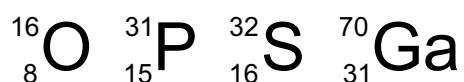
[2]

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**Please turn over for Question 7.**

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



- (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]

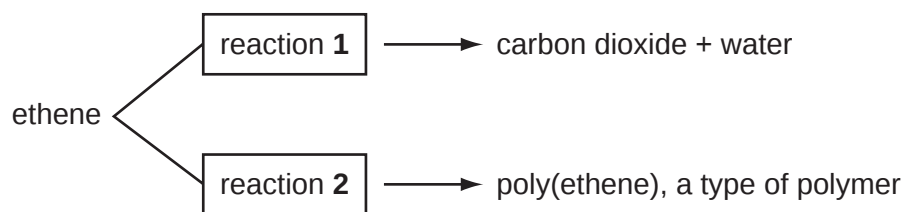
- (ii) Suggest an element from the third period of the Periodic Table which reacts **safely** with hydrochloric acid to produce hydrogen gas.

..... [1]

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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.

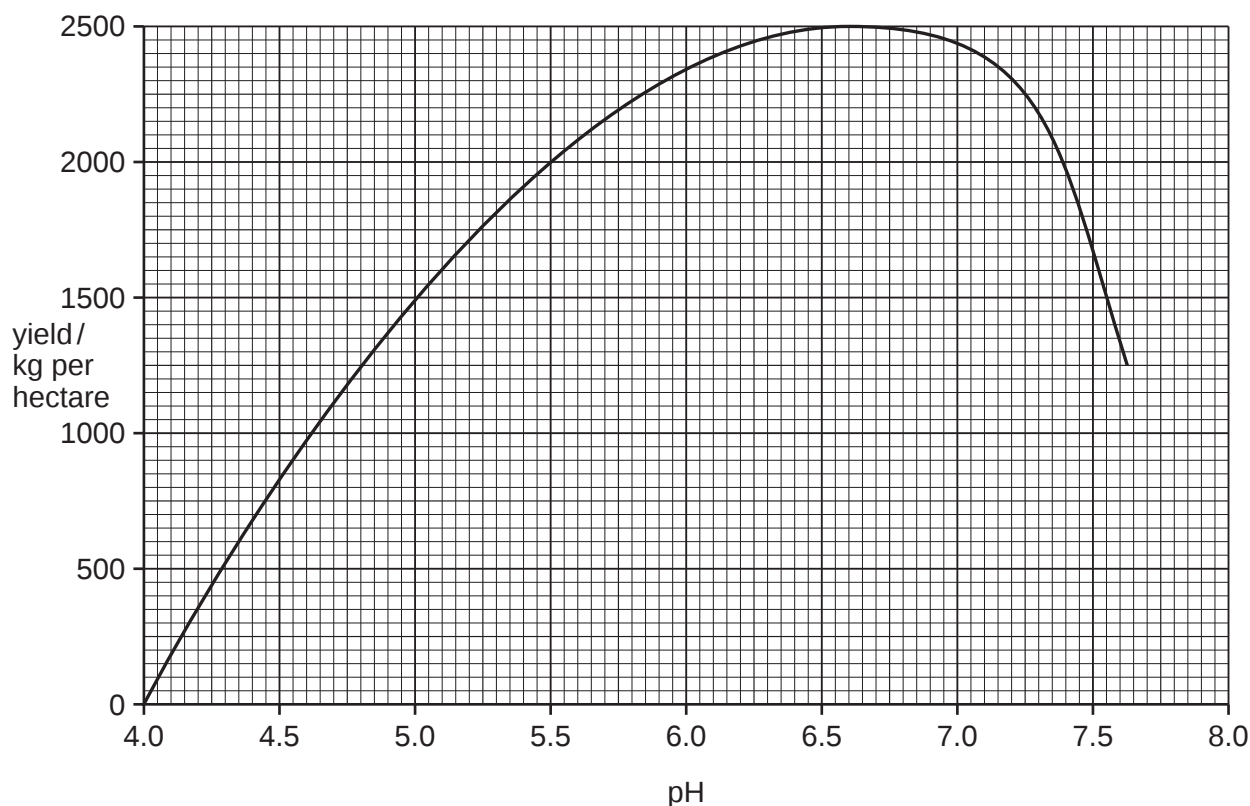
.....  
 ..... [1]

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

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- (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]

- (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]

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

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**Table 9.1**

|       | <b>description</b> | <b>charge</b> | <b>range in air</b> | <b>ionising ability</b> |
|-------|--------------------|---------------|---------------------|-------------------------|
| 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]

**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,  $\text{H}_2\text{O}$ .

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

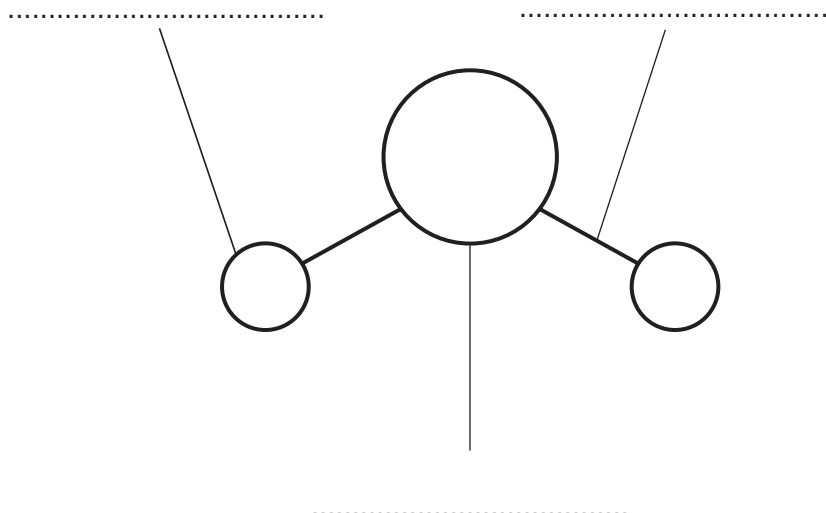


Fig. 10.1

[3]

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**DATA SHEET**  
**The Periodic Table of the Elements**

| Group                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |  |  |  |  |  |  |  |  |  |  |     |    |   |    |     |   |  |  |  |  |  |  |  |  |  |  |
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| <div> <div>1<br/>H<br/>Hydrogen</div> <div> <div>9<br/>Be<br/>Beryllium</div> <div>23<br/>Na<br/>Sodium</div> <div>39<br/>K<br/>Potassium</div> <div>87<br/>Fr<br/>Francium</div> </div> <div> <div>4<br/>Li<br/>Lithium</div> <div>11<br/>Mg<br/>Magnesium</div> <div>20<br/>Ca<br/>Calcium</div> <div>56<br/>Ba<br/>Barium</div> <div>88<br/>Ra<br/>Radium</div> </div> <div> <div>5<br/>B<br/>Boron</div> <div>13<br/>Al<br/>Aluminium</div> <div>31<br/>Ga<br/>Gallium</div> <div>81<br/>Tl<br/>Thallium</div> </div> <div> <div>6<br/>C<br/>Carbon</div> <div>14<br/>Si<br/>Silicon</div> <div>32<br/>Ge<br/>Germanium</div> <div>82<br/>Pb<br/>Lead</div> </div> <div> <div>7<br/>N<br/>Nitrogen</div> <div>15<br/>P<br/>Phosphorus</div> <div>33<br/>As<br/>Arsenic</div> <div>83<br/>Bi<br/>Bismuth</div> </div> <div> <div>8<br/>O<br/>Oxygen</div> <div>16<br/>S<br/>Sulfur</div> <div>34<br/>Se<br/>Selenium</div> <div>84<br/>Kr<br/>Krypton</div> </div> <div> <div>9<br/>F<br/>Fluorine</div> <div>17<br/>Cl<br/>Chlorine</div> <div>35<br/>Br<br/>Bromine</div> <div>85<br/>At<br/>Astatine</div> </div> <div> <div>10<br/>Ne<br/>Neon</div> <div>18<br/>Ar<br/>Argon</div> <div>36<br/>Kr<br/>Krypton</div> <div>86<br/>Rn<br/>Radon</div> </div> </div> |    |  |  |  |  |  |  |  |  |  |  |     |    |   |    |     |   |  |  |  |  |  |  |  |  |  |  |
| <div> <div>158-71 Lanthanoid series</div> <div>† 90-103 Actinoid series</div> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |    |  |  |  |  |  |  |  |  |  |  |     |    |   |    |     |   |  |  |  |  |  |  |  |  |  |  |

|                          |                   |                            |
|--------------------------|-------------------|----------------------------|
| a                        | X                 | b                          |
| Key                      |                   |                            |
| a = relative atomic mass | X = 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.).

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