**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**
International General Certificate of Secondary Education

| CANDIDATE NAME | |
|---|---|

| CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | |
|---|---|---|---|---|---|---|---|---|---|

**COMBINED SCIENCE** 0653/02

Paper 2 (Core)                                           **May/June 2009**

**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 | |
| **Total** | |

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

**UNIVERSITY** *of* **CAMBRIDGE**
International Examinations

**[Turn over**

**1** Fig. 1.1 shows a section through a tooth.



A

B

C

**Fig. 1.1**

**(a)** Name parts **A, B** and **C**.

A .................................................................

B .................................................................

C ................................................................. [3]

**(b)** Explain how teeth help with digestion.

.........................................................................................................................................

.........................................................................................................................................

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

**(c)** Name **one** mineral and **one** vitamin that are essential for the growth of strong teeth and bones.

mineral .................................................................

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

2 **(a)** A student investigated how a change in potential difference across a lamp affec...
current flowing through it.

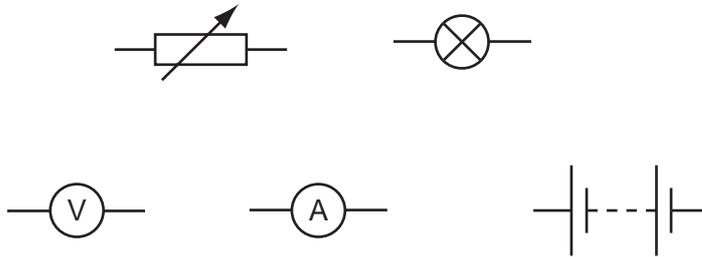She used wires to connect the components shown in Fig. 2.1 to make a circuit.

**Fig. 2.1**

**(i)** Using the correct symbols from Fig. 2.1, draw a diagram to show the circuit she used.

[3]

**(ii)** Explain why the variable resistor is included in the circuit.

......................................................................................................................................

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

**(iii)** Her results are shown in Table 2.1.

**Table 2.1**

| potential difference across lamp / V | current through lamp / A | resistance of lamp filament / Ω |
|---|---|---|
| 4 | 1.2 | 3.3 |
| 8 | 1.5 | |
| 12 | 1.7 | 7.1 |

Complete the table by calculating the missing resistance and writing your answer in the empty box.

State the formula that you use and show your working.

formula

working

[2]

For
*iner's*

**(b)** Electricity can kill.
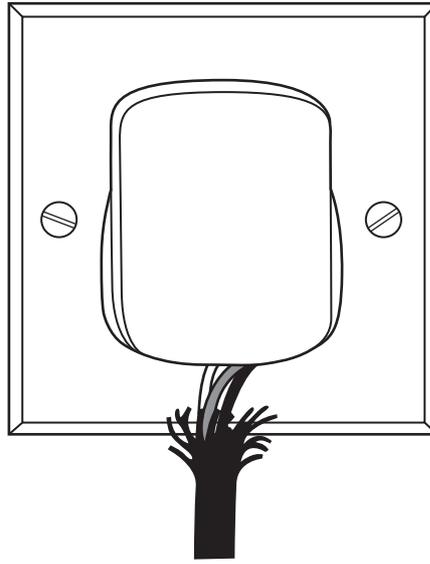
Identify and explain the electrical hazard shown in Fig. 2.2.



**Fig. 2.2**

........................................................................................................................................................

........................................................................................................................................................

........................................................................................................................................................

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

**3** **(a)** The names of six elements are shown below.

| carbon | chlorine | cobalt | neon | silicon | sodium |

Choose the element from the list

which is the least reactive, ........................................................

which is used to sterilise drinking water, ........................................................

which is a metal that forms coloured compounds. ........................................ [3]

**(b)** Fig. 3.1 shows a diagram of an atom.
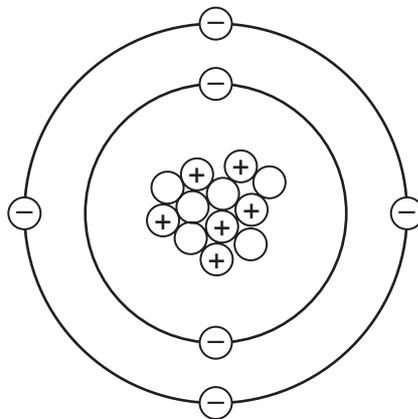


**Fig. 3.1**

**(i)** State the nucleon number (mass number) of the atom shown in Fig. 3.1.

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

**(ii)** State the name of the element made of atoms like the one in Fig. 3.1.

Explain your answer briefly.

element ........................................................................................................

explanation ....................................................................................................

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

**(c)** Fig. 3.2 shows a test for a gas which is produced when a solid element **A** rea[...]
solution **B**.
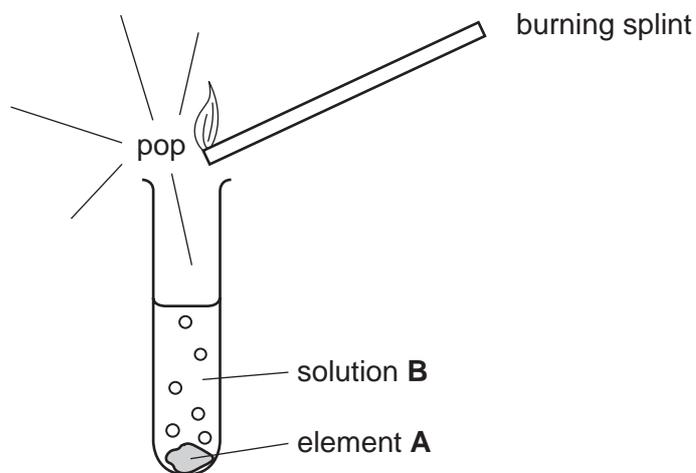


**Fig. 3.2**

Name the gas produced in this reaction, and suggest the names of element **A** and
solution **B**.

gas ...................................................................

element **A** ...................................................................

solution **B** ................................................................... [3]

**4** Fig. 4.1 shows an arum lily.

Arum lilies have flowers that are pollinated by insects.

There are many tiny flowers on a stalk, inside a large white structure called a spathe.



flowers on stalk

leaf

spathe
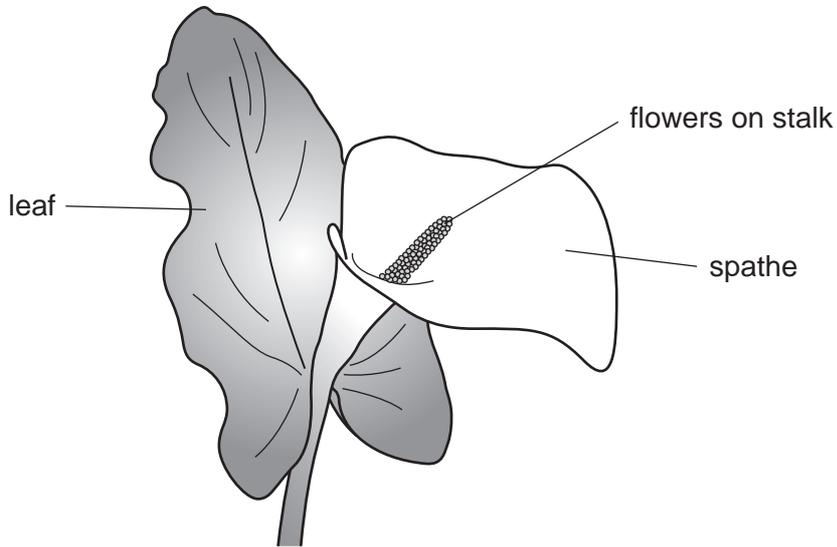
**Fig. 4.1**

**(a) (i)** Name the part of the flower in which pollen is made.

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

**(ii)** What does a pollen grain contain?

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

**(iii)** Explain the meaning of the term *pollination*.

........................................................................................................................

........................................................................................................................

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

**(b)** Arum lilies produce heat energy to raise the temperature of the flowers. This h[...] attract insects to the flowers. They use respiration to do this.

A researcher investigated whether there was a relationship between the temperature of the flowers inside an arum lily spathe and the rate of oxygen use.

He took 15 arum lilies, and measured the temperature and rate of oxygen use for each one.
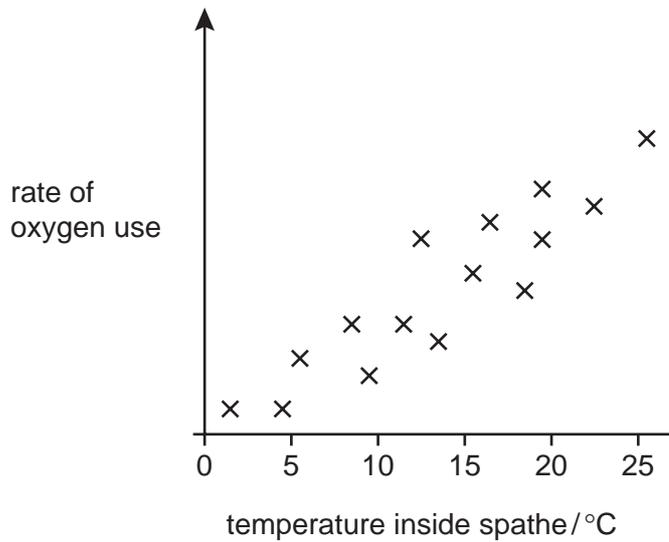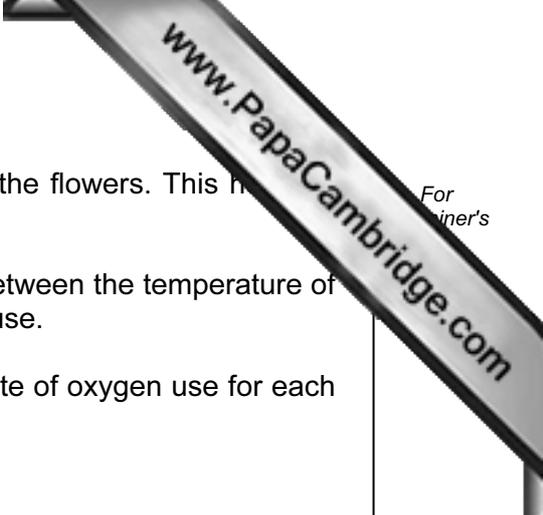
Fig. 4.2 shows his results.



rate of
oxygen use

temperature inside spathe/°C

**Fig. 4.2**

(i) Describe the relationship between the temperature inside the spathe and the rate of oxygen use by the arum lily.

.................................................................................................................................

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

(ii) Explain the reasons for the relationship you have described.

.................................................................................................................................

.................................................................................................................................

.................................................................................................................................

.................................................................................................................................

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

---

**(c)** The fuel that the arum lilies use to produce the heat energy is glucose.

Describe how the lilies obtain a supply of glucose.

.......................................................................................................................................

.......................................................................................................................................

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

**(d)** The leaves of arum lilies contain palisade cells, which are typical plant cells containing chloroplasts.

Complete the diagram of a palisade cell. Include these structures in your labels.

| | | |
|---|---|---|
| **cell membrane** | **cell wall** | **chloroplast** |
| **cytoplasm** | **nucleus** | **vacuole** |

[4]

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**Please turn over for Question 5.**

For
iner's

5    The Vikings, who lived in Scandinavia about 1200 years ago, sailed in boats
     longships across the sea to Britain.

     **(a) (i)**   They travelled 900 km in 150 hours.

               Calculate their average speed for this journey.

               State the formula that you use and show your working.

                    formula

                    working

                                                    ............................... km / h      [2]

     **(ii)**   At one stage on their journey they were travelling at 7.2 km / h.

            Calculate their speed in m / s.

            Show your working.

                                                   ............................... m / s      [1]

     **(b)**  A longship was moving at constant speed. The diagram shows four forces acting on it.
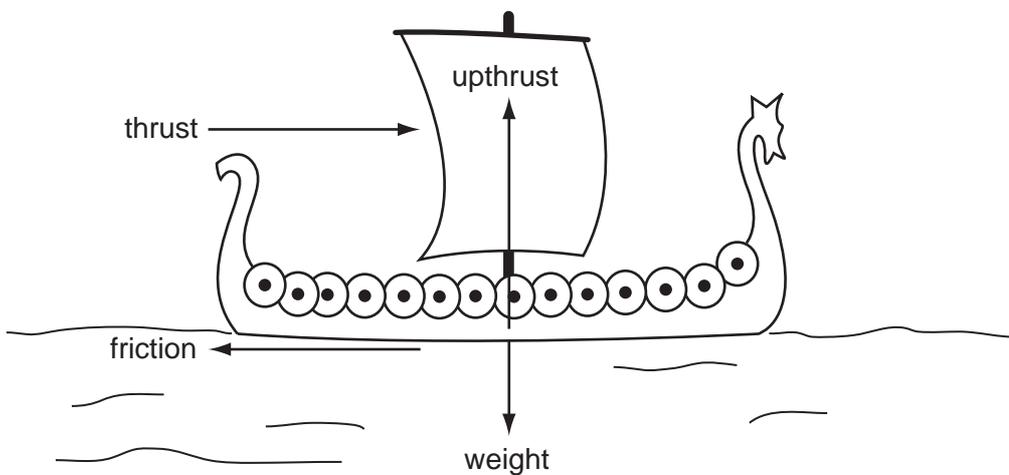


     Name **two** forces which must be equal in size.

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

**(c)** The Vikings used animal furs to make clothes to keep them warm.

Explain in terms of conduction and convection how fur clothes would have kept the Vikings warm.

.......................................................................................................................................

.......................................................................................................................................

.......................................................................................................................................

....................................................................................................................... [3]

**(d)** The volume of the wood used to construct the longship was $9\,m^3$.

If the density of the wood was $800\,kg/m^3$, calculate the mass of the wood used.

State the formula that you use and show your working.

formula

working

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

**(e)** The major energy source used to propel the longship was the wind. Wind is a renewable energy source.

**(i)** Name **one** other renewable energy source.

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

**(ii)** Name **one** non–renewable energy source.

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

**6** **(a)** Fig. 6.1 shows industrial apparatus used for the fractional distillation of pe~~~~ (crude oil).

fraction

range of
boiling points

P

70–190 °C

250–340 °C

Q

R

below 30 °C

S

190–250 °C

hot petroleum →
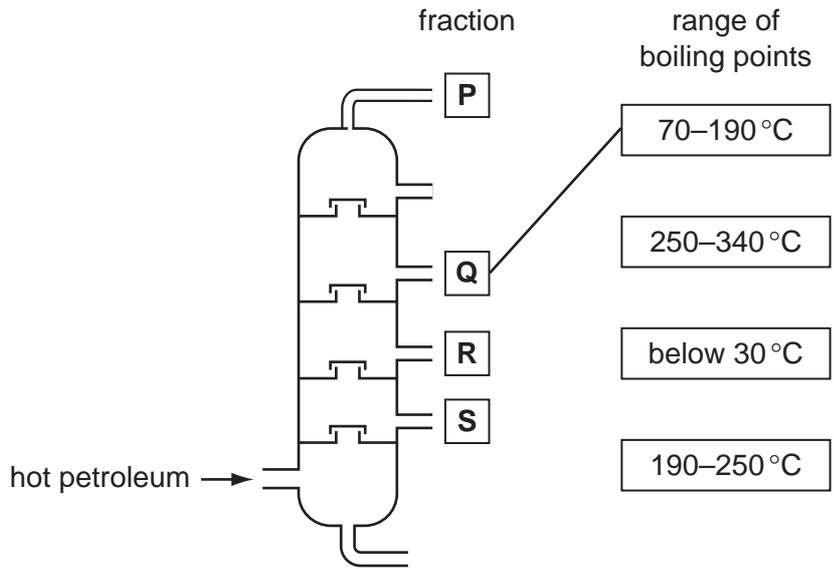
**Fig. 6.1**

Draw lines on Fig. 6.1 connecting the fractions, **P**, **Q**, **R** and **S** to the correct boiling point range. The line for fraction **Q** has been drawn for you.                              [2]

**(b)** Plastics and steel are both used to make buckets.
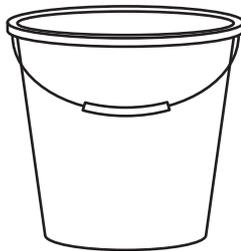
bucket

**Fig. 6.2**

**(i)** Suggest **one** reason why plastics are suitable materials from which to make buckets.

.................................................................................................................................

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

For
iner's

(ii) Buckets made from steel must be protected from rusting.

Name the element and the compound which react with mild steel to form rust.

element ...................................................

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

(iii) Describe briefly **one** suitable method of protecting a steel bucket from rusting.

...................................................................................................................................

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

(iv) Name the element which is oxidised when rust forms.

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

(v) Name the alloy from which cutlery is made.



cutlery

**Fig. 6.3**

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

For
iner's

**7** Read the following description of a food web.

- Ants collect leaves from trees and take them into their nests.

- A fungus grows on the leaves and breaks them down.

- The ants eat the leaves, and also the fungus.

- Small birds eat the ants, and hawks eat the small birds.

- Pangolins eat only ants.
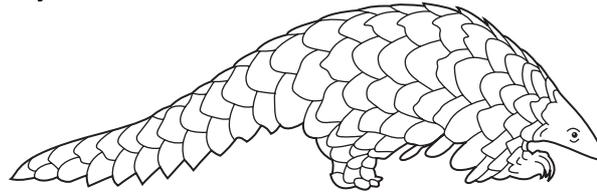
a pangolin

**Fig. 7.1**

**(a)** In the space below, complete a food web that includes all of the organisms described in Fig. 7.1.

leaves

[3]

For
miner's
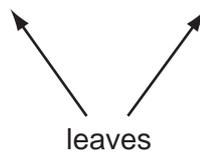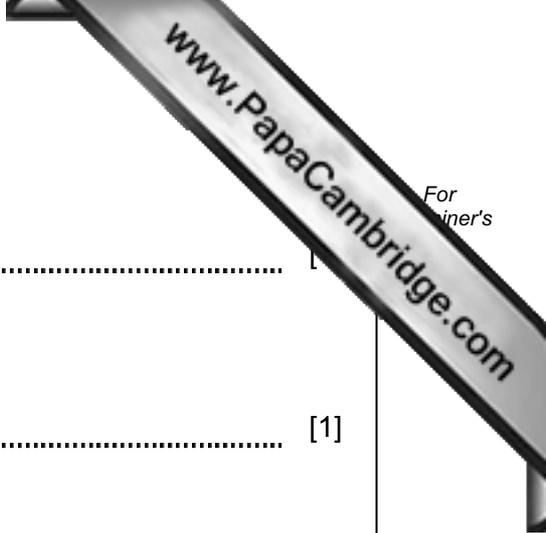
**(b) (i)** Name the producer in this food web.

........................................................................ [

**(ii)** Name a decomposer in this food web.

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

**(c)** Pangolins are becoming rare in some parts of the world.

Use the information in Fig. 7.1, and your own knowledge, to explain why it is important to prevent deforestation if we want to conserve pangolins.

...............................................................................................................................

...............................................................................................................................

...............................................................................................................................

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

8  **(a)**  A hotel has a lift (elevator). It moves through a vertical height of 3 m betwee~~n~~
floor.
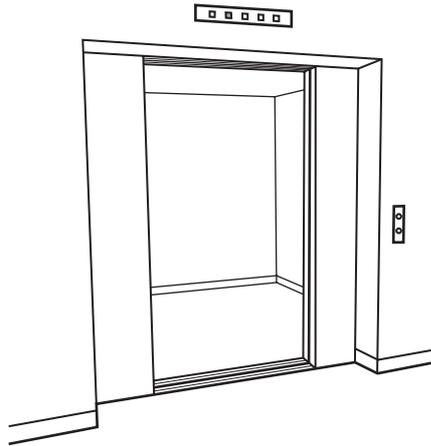


**Fig. 8.1**

**(i)**  A passenger travels in the lift. The passenger has a mass of 80 kg and weighs
800 N. The mass of the empty lift is 1200 kg.

Calculate the total weight of the passenger and lift.

Show your working.

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

**(ii)**  Calculate the work done when the lift and passenger move up three floors, from
Floor 1 to Floor 4.

State the formula that you use and show your working.

formula

working

................................. J          [2]
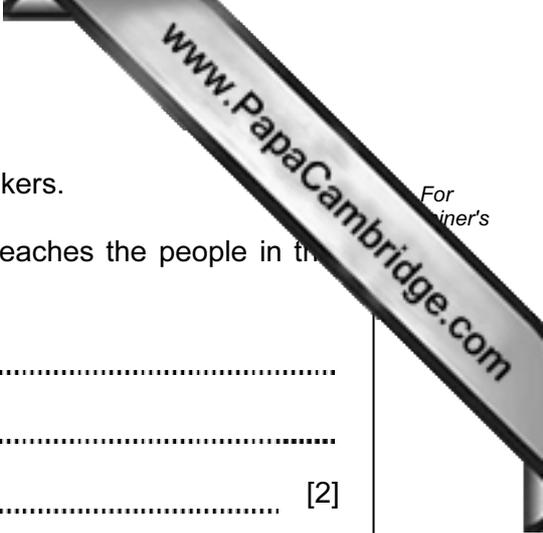
**(b)** **(i)** In the restaurant, music is being played through loudspeakers.

Explain how the sound coming from the loudspeakers reaches the people in the restaurant.

................................................................................................................................

................................................................................................................................

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

**(ii)** The amplitude of the sound waves is increased.

What effect will this have on the sounds heard by the people in the restaurant?

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

9   Fig. 9.1 shows the main steps in a method used by a student to make salts.

In separate experiments the student reacted the carbonate of a metal and the oxide of a metal with dilute sulfuric acid.
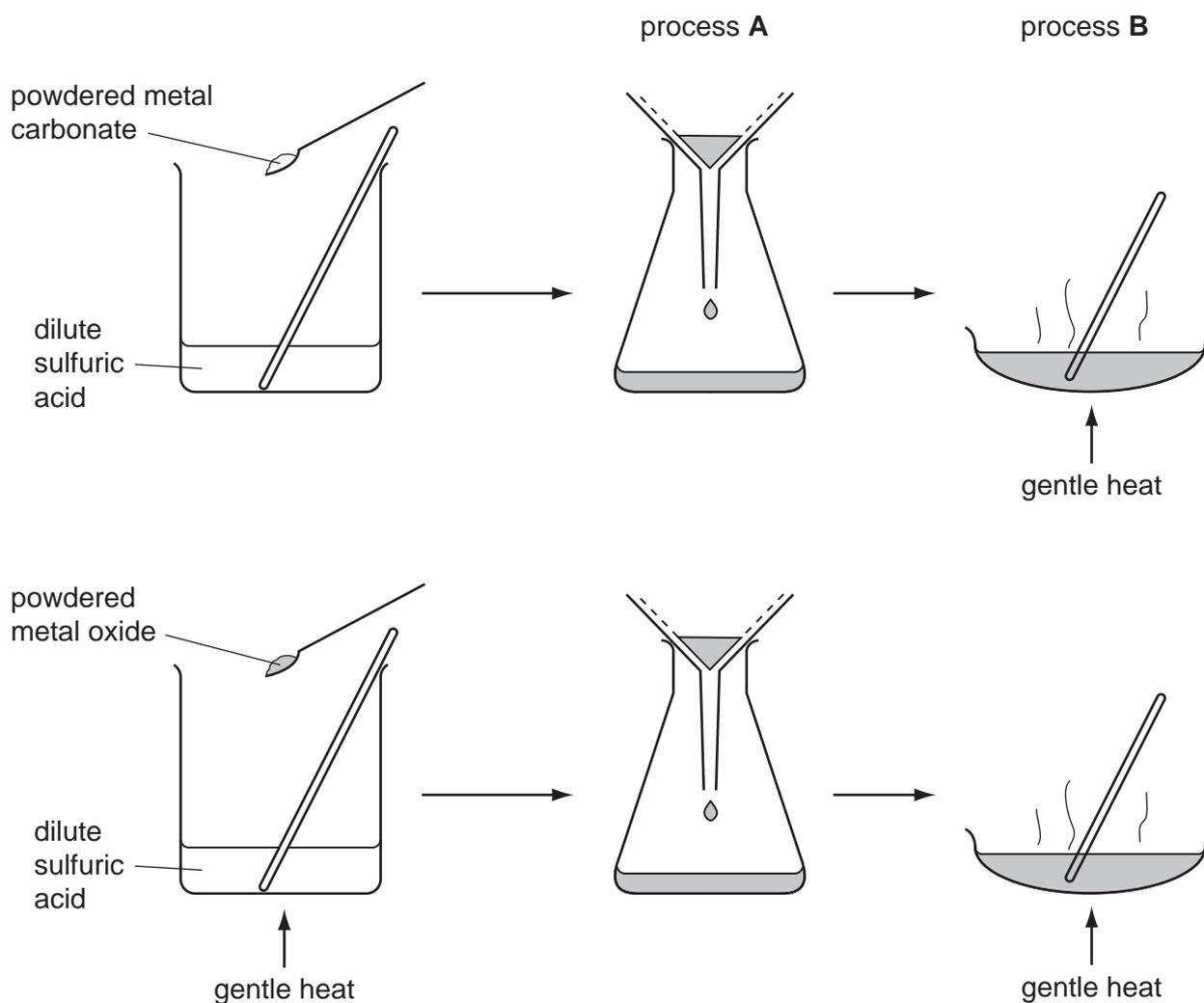


**Fig. 9.1**

(a)  Name processes **A** and **B** shown in Fig. 9.1.

process **A**   ...............................................................

process **B**   ...............................................................                    [2]

(b)  Suggest and explain why the student used **powdered** solids in the reactions with dilute sulfuric acid.

...........................................................................................................................

...........................................................................................................................

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

**(c) (i)** Name the salt which is produced when zinc oxide reacts with dilute sulfuric a...

........................................................ [

**(ii)** Complete the word equation for the reaction of copper carbonate with sulfuric acid.

| copper carbonate | + | sulfuric acid | → | | + | | + | |
|---|---|---|---|---|---|---|---|---|

[2]
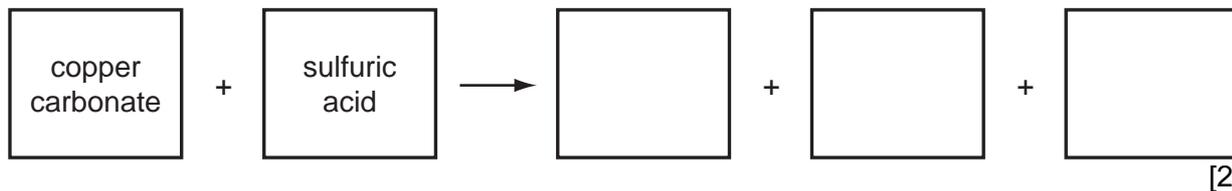
**(d) (i)** The salt calcium chloride is made when calcium oxide reacts with hydrochloric acid. The symbolic equation for this reaction is shown below.

$$CaO \quad + \quad HCl \quad \rightarrow \quad CaCl_2 \quad + \quad H_2O$$

Explain whether or not this equation is balanced.

........................................................................................................................

........................................................................................................................

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

**(ii)** A student reacted calcium oxide with hydrochloric acid using the apparatus shown in Fig. 9.2.



thermometer

hydrochloric acid

calcium oxide
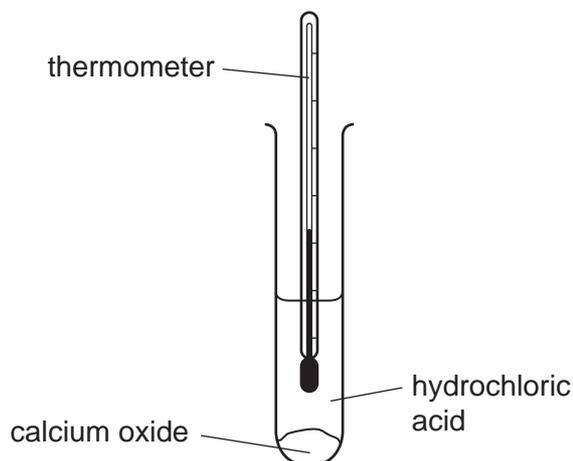
**Fig. 9.2**

The student noticed that the temperature of the mixture increased.

Explain this observation.

........................................................................................................................

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

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# DATA SHEET
## The Periodic Table of the Elements



The volume of one mole of any gas is 24 dm$^3$ at room temperature and pressure (r.t.p.).

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

Key

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