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.

For Examiner's Use

1 Fig. 1.1 shows a section through a tooth.

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]

For Examiner's Use

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

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

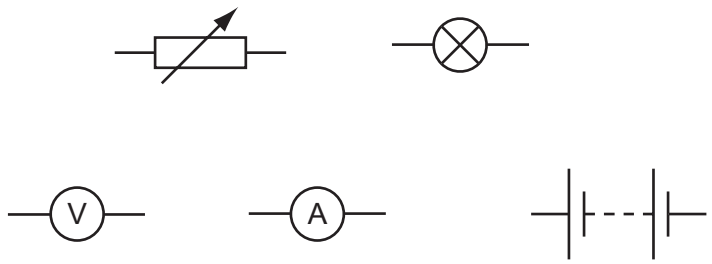


Fig. 2.1

(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]

For Examiner's Use

(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 Examiner's Use

(b) Electricity can kill.

Identify and explain the electrical hazard shown in Fig. 2.2.

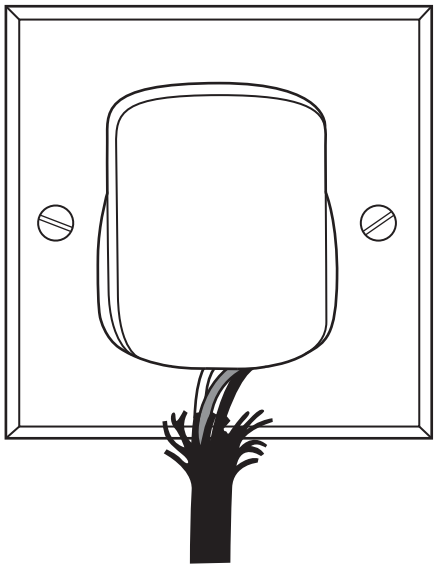


Fig. 2.2

.....

.....

.....

..... [2]

For Examiner's Use

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.

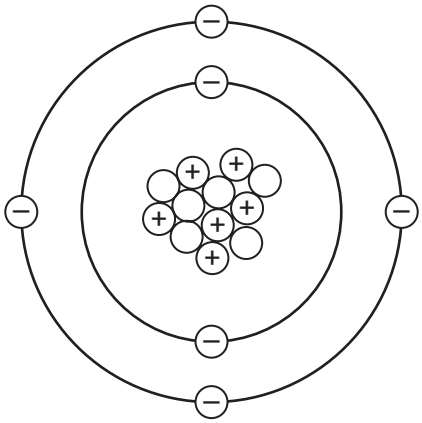


Fig. 3.1

(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]

For Examiner's Use

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

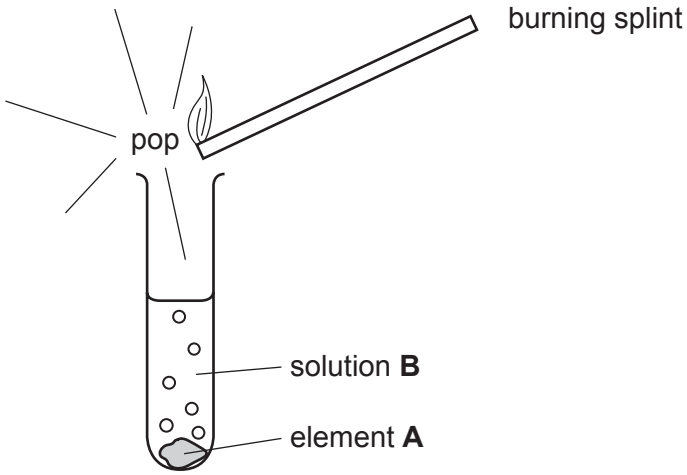


Fig. 3.2

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.

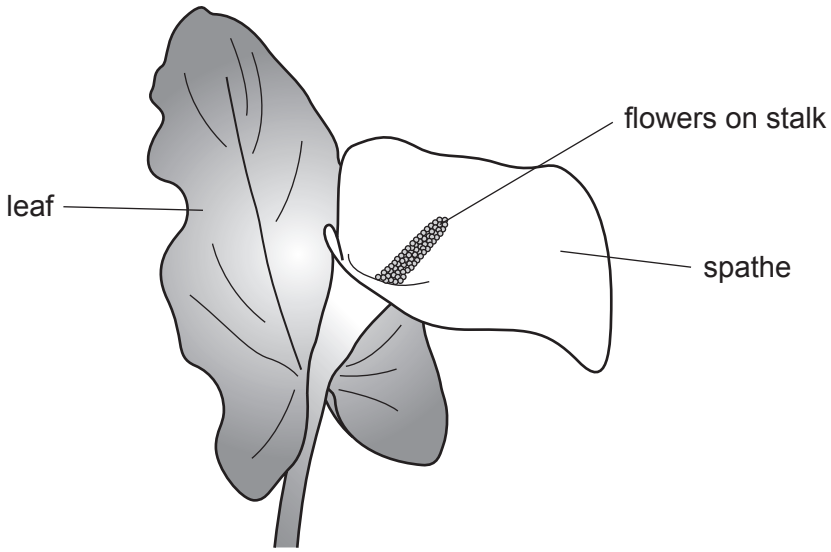


Fig. 4.1

(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]

For Examiner's Use

(b) Arum lilies produce heat energy to raise the temperature of the flowers. This helps to 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.

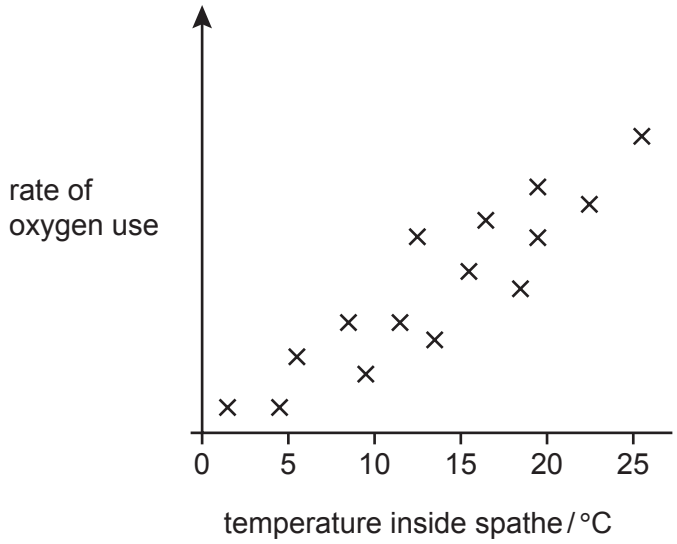


Fig. 4.2

(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.

.....

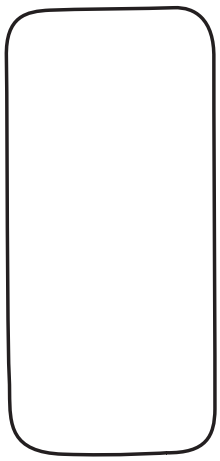
.....

..... [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.

5 The Vikings, who lived in Scandinavia about 1200 years ago, sailed in boats called 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]

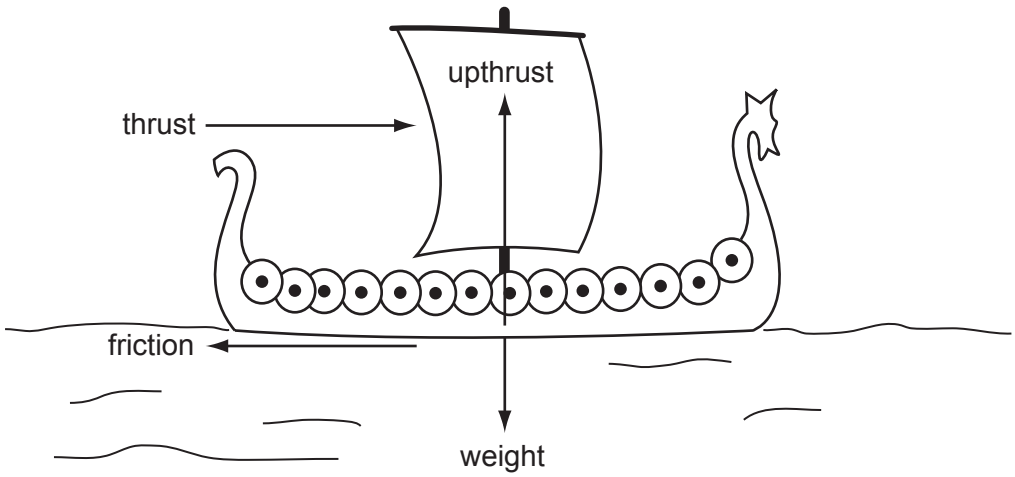
(ii) At one stage on their journey they were travelling at 7.2 km / h.

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]

For Examiner's Use

(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 petroleum (crude oil).

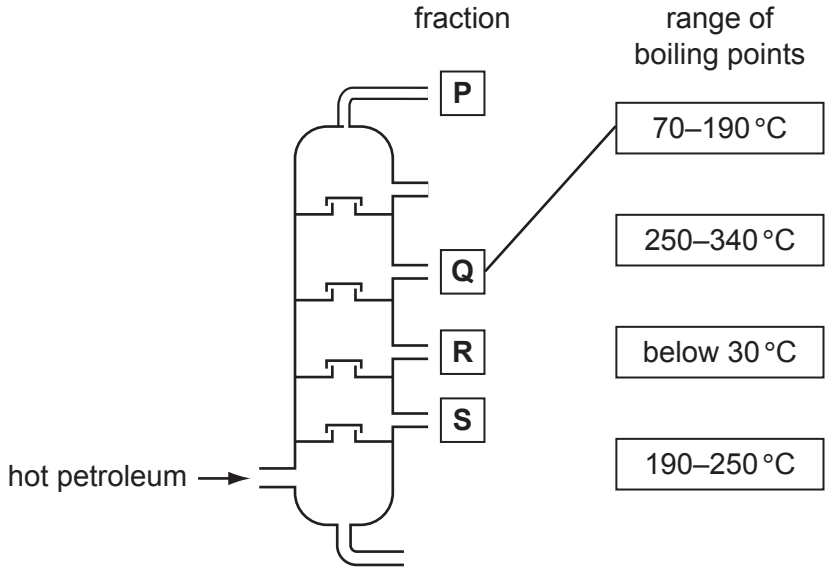
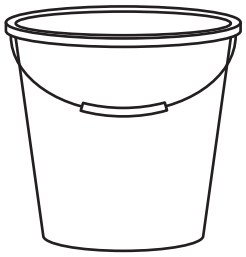


Fig. 6.1

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 Examiner's Use

(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.

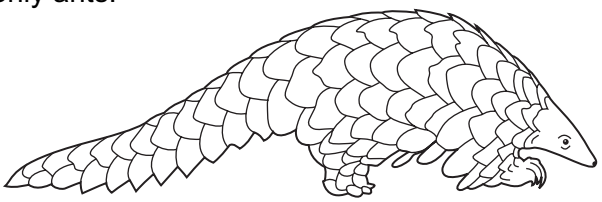
cutlery

Fig. 6.3

..... [1]

7 Read the following description of a food web.

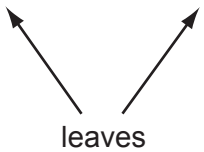
- Ants collect leaves from trees and take them into their nests.
- A fungus grows on the leaves and breaks them down.
- The ants eat the leaves, and also the fungus.
- Small birds eat the ants, and hawks eat the small birds.
- Pangolins eat only ants.



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.



[3]

For Examiner's Use

(b) (i) Name the producer in this food web.

..... [1]

(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]

For Examiner's Use

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

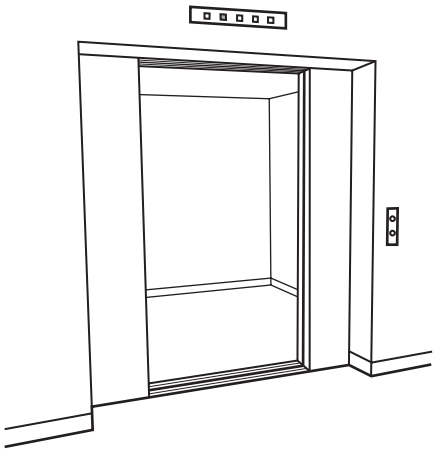


Fig. 8.1

(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]

For Examiner's Use

(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]

For Examiner's Use

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.

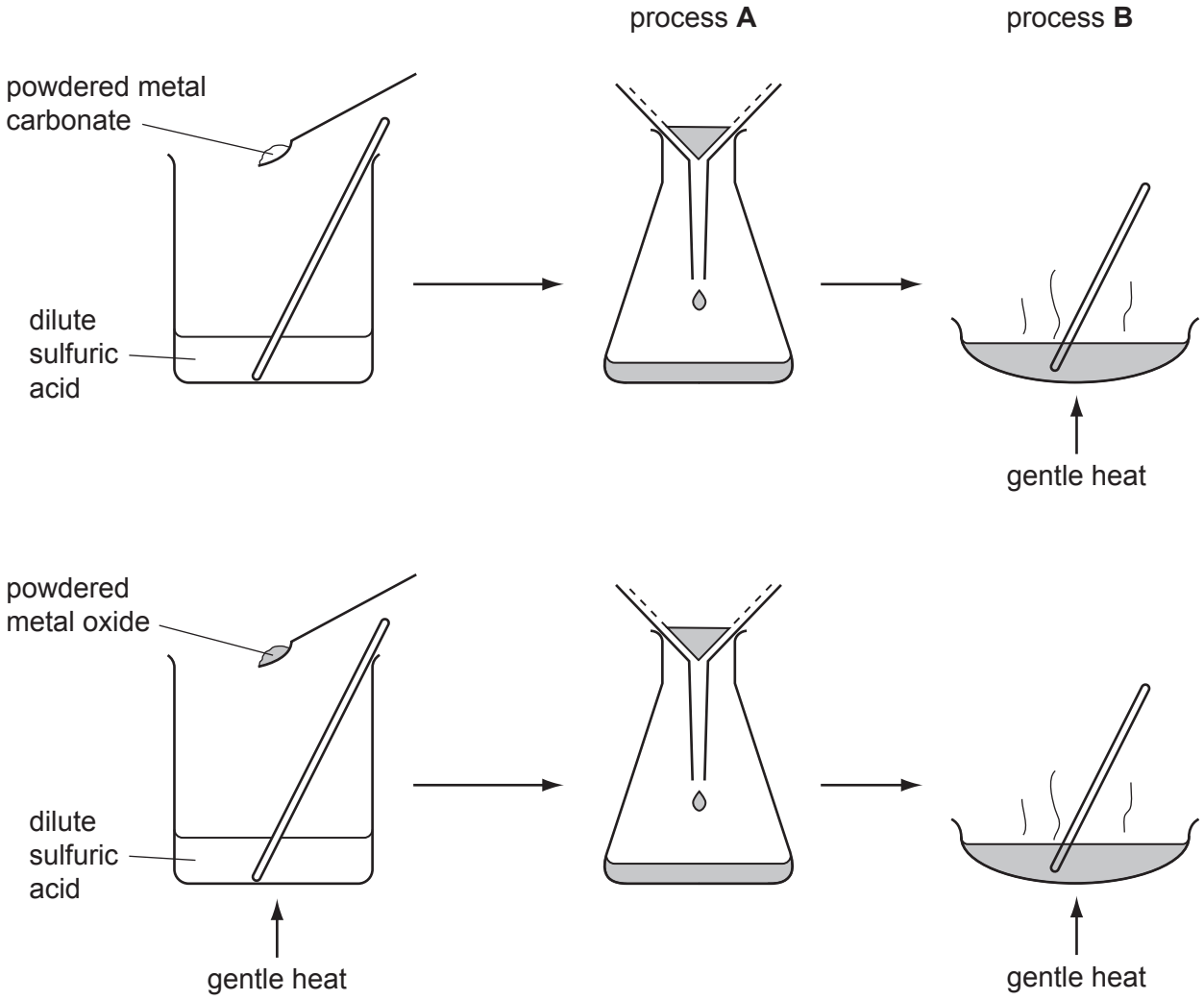


Fig. 9.1

(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.

.....

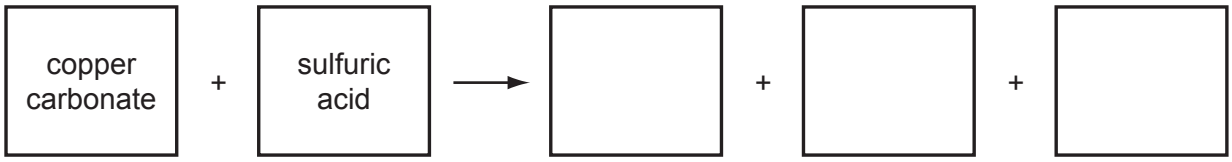
.....

..... [2]

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

.....[1]

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

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

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.

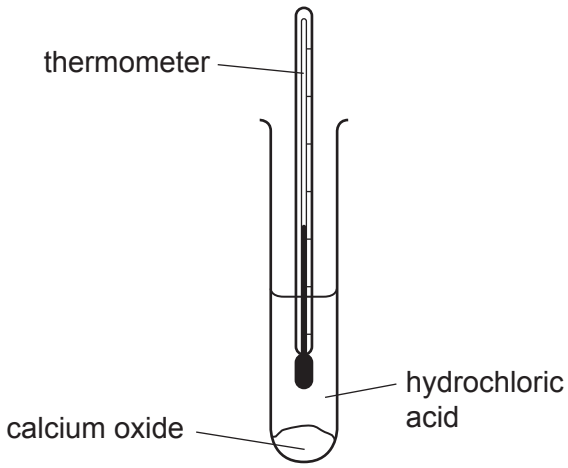


Fig. 9.2

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

	Group																	
	I	II									III	IV	V	VI	VII	0
																4 He Helium 2
					1 H Hydrogen 1							12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
	7 Li Lithium 3	9 Be Beryllium 4									11 B Boron 5	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
	23 Na Sodium 11	24 Mg Magnesium 12									27 Al Aluminium 13	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
	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	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
	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
	226 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 = 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.).