Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

COMBINED SCIENCE **5129/02**

Paper 2

May/June 2006

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.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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

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

UNIVERSITY of CAMBRIDGE

1 Fig. 1.1 shows the extraction of iron from iron ore using a blast furnace.

waste gases

iron ore
limestone
coke

firebrick lining

air

slag

molten iron
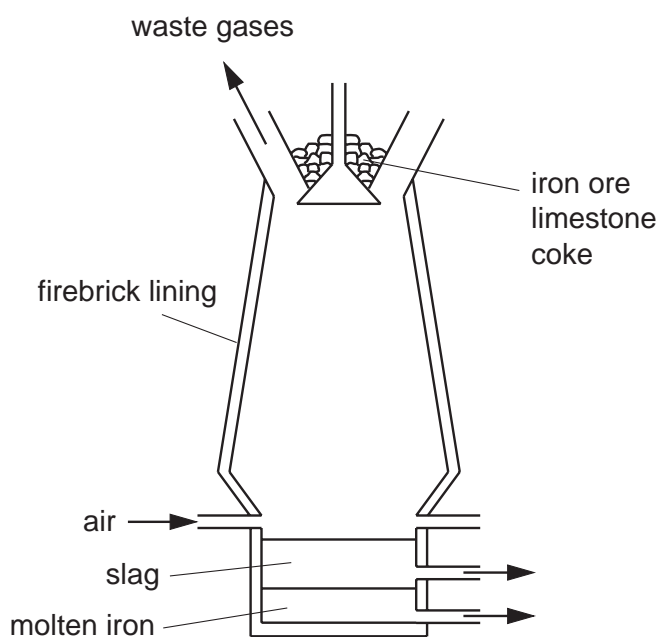
Fig. 1.1

(a) (i) State the name of an iron ore. ....[1]

(ii) Why is limestone added to the blast furnace?

....

....[1]

(b) In the blast furnace, iron is extracted from its ore by reduction using carbon.
Explain why sodium cannot be extracted from its ore by reduction using carbon.

....

....[2]

(c) The cutlery in Fig. 1.2 is made from stainless steel.
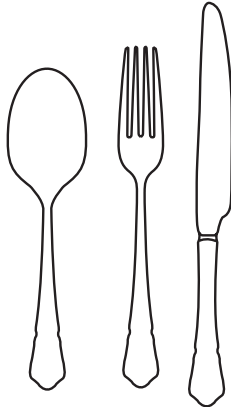
Fig. 1.2

   (i) Stainless steel is an alloy.
   What is an *alloy*?

   ....

   ....[1]

   (ii) State **one** other use for stainless steel.

   ....[1]

(d) Brass is an alloy of two metals.

   Name the two metals in brass.

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

2 Fig. 2.1 shows a speed-time graph for a car.
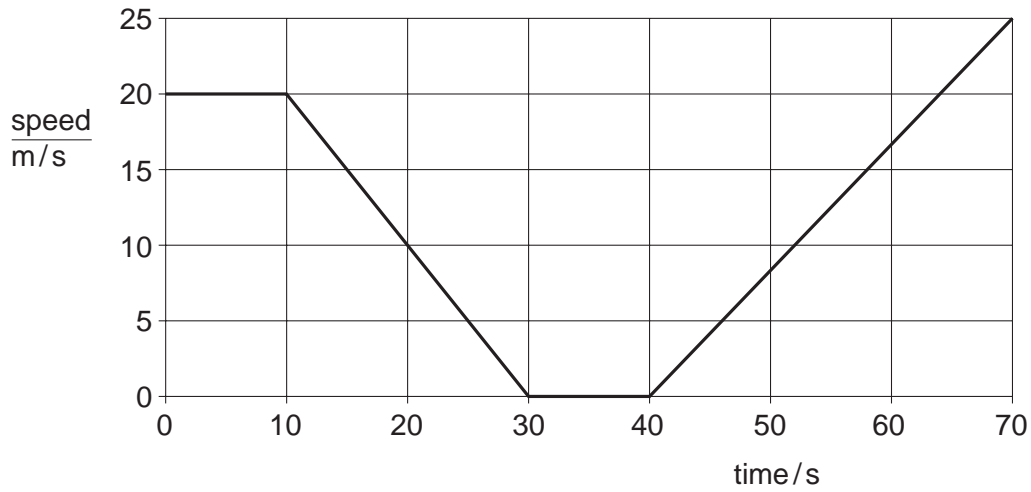
Fig. 2.1

(a) Complete the following sentence.

The car is at rest from a time of .... s to a time of .... s.   [1]

(b) Calculate the distance moved by the car in the first 10 seconds.

[2]

(c) The acceleration of the car between 40 s and 70 s is constant.

How does Fig. 2.1 show this?

....[1]

3 Fig. 3.1 shows a satellite in orbit around the Earth.

Earth
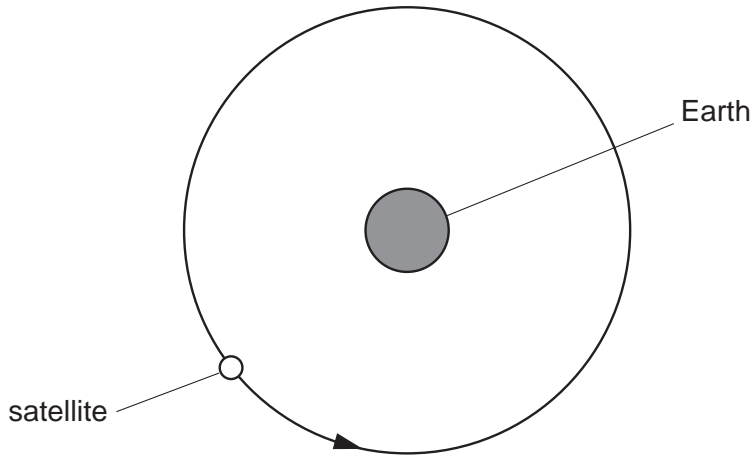
satellite

Fig. 3.1

(a) The satellite has constant speed.

Explain why it does not have constant velocity.

....

....[1]

(b) The satellite receives infra-red radiation from the Sun.

(i) The satellite must be kept cool.
Suggest a suitable colour for the satellite. .... [1]

(ii) Explain your answer to **(b)(i)**.

....

....[1]

(c) Name a region of the electromagnetic spectrum with a longer wavelength than infra-red radiation.

.... [1]

(d) Infra-red radiation is a transverse wave.

State **one** example of a longitudinal wave. .... [1]

4 **(a)** Fig. 4.1 shows sections cut through two different types of blood vessel.

X   Y
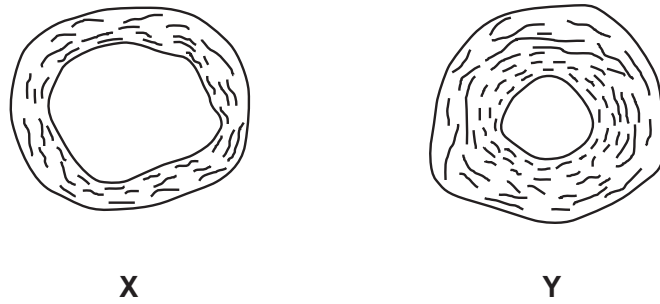
Fig. 4.1

Name the type of blood vessel shown in

X, ...

Y. ....[2]

(b) Fig. 4.2 shows some blood as seen under a microscope.
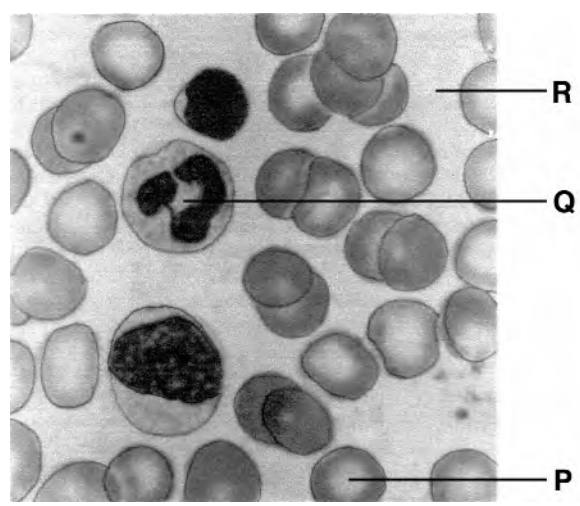
Fig. 4.2

(i) Name the red substance found in cell **P**.

....[1]

(ii) State the function of cell **P**.

....[1]
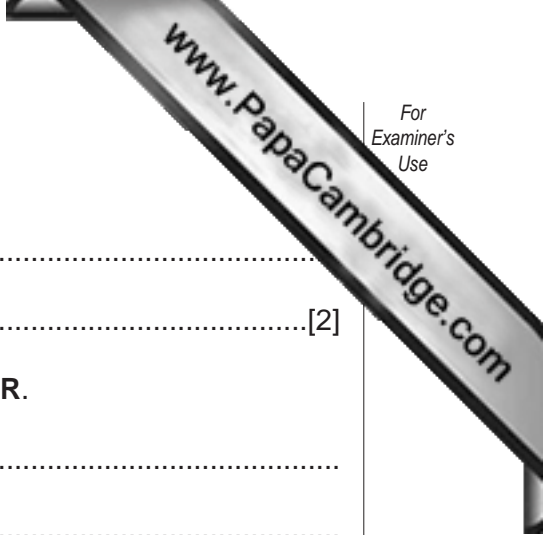
(c) Suggest two functions of cell **Q**.

1. ....

2. ....[2]

(d) State three types of substance that are transported in region **R**.

1. ....

2. ....

3. ....[3]

5 Fig. 5.1 shows four test-tubes, each containing a different gas.
The four gases are argon, carbon dioxide, hydrogen and oxygen.
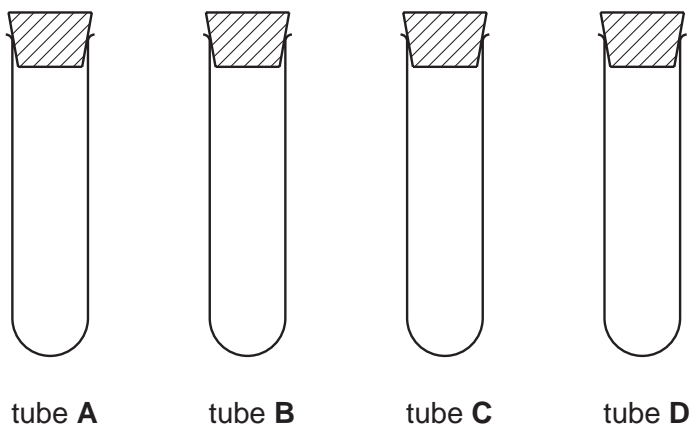There are no labels to say which gas is in each test-tube.

| tube **A** | tube **B** | tube **C** | tube **D** |

Fig. 5.1

The gases in tubes **A** and **C** extinguish a lighted splint.
The gas in tube **D** relights a glowing splint.
The gas in tube **A** turns limewater milky.

(a) Identify the four gases.

tube **A** ....

tube **B** ....

tube **C** ....

tube **D** ....   [3]

(b) (i) Hydrogen and oxygen react together to produce water.

State the formula for a molecule of

hydrogen, ...

oxygen, ...

water. ....   [1]

(ii) Write an equation for the reaction. Include state symbols.

....[2]

6 Gaseous exchange takes place in the lungs.
Oxygen moves from air to blood and carbon dioxide moves from blood to air.

(a) State where in the lungs gaseous exchange occurs.

....[1]

(b) (i) Name the process by which carbon dioxide moves from blood to air.

....[1]

(ii) Explain how this process takes place.

....

....[2]

7 Fig. 7.1 shows a swinging pendulum in three different positions. At position **A** and at position **C** the pendulum bob changes the direction in which it is moving.
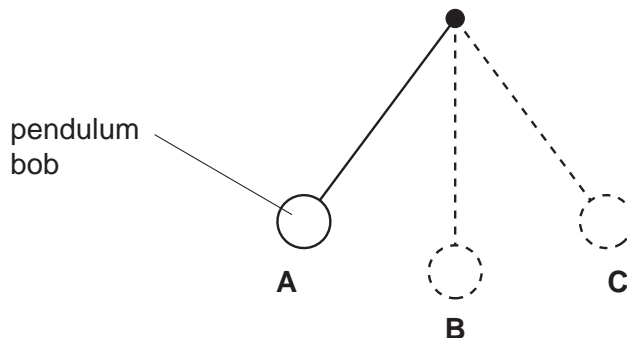
pendulum
bob

A

B

C

Fig. 7.1

(a) State the position, **A**, **B** or **C** at which the pendulum has the least potential energy.

.... [1]

(b) The pendulum takes 1.6 s to swing from position **A** to position **C**.
Calculate the period of the pendulum.

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

8   Fig. 8.1 shows a girl lowering an empty bucket into a well to fill it with water.
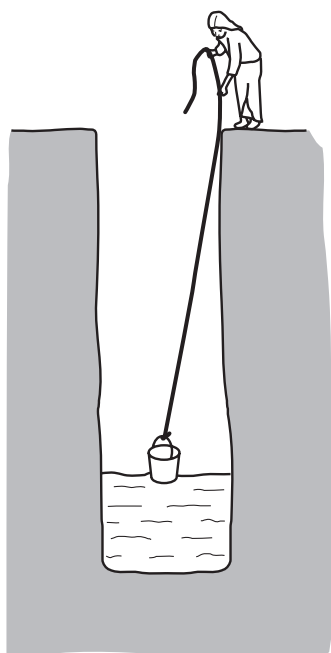
Fig. 8.1

(a)   The density of water is 1 000 kg / m^3. When the bucket is filled it contains 0.0020 m^3 of water.
Calculate the mass of water in the bucket.

[2]

(b)   When full, the weight of the bucket and the water is 25 N.

(i)   Calculate the useful work done in lifting the bucket full of water through a vertical distance of 6.0 m.

[2]

(ii)   State the unit of work done. .... [1]

9 Ethanol is manufactured by two different processes:

- the fermentation of glucose
- the catalytic addition of steam to ethene

(a) Fermentation is carried out at 40 °C and in the absence of air.
Explain why these conditions are used.

(i) temperature ....

....[2]

(ii) absence of air ....

....[1]

(b) The catalytic addition of steam to ethene uses a higher temperature and a catalyst.
State the temperature used and name the catalyst.

temperature .... °C

catalyst ....   [2]

(c) Fig. 9.1. shows how ethene is obtained from crude oil.

crude oil	→	paraffin	→	ethene

process **A**   process **B**

Fig. 9.1

Name the processes **A** and **B**.

A ....

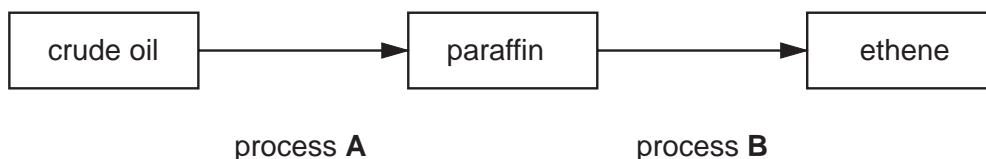**B** ....   [2]

10 Use words from the following list to complete the sentences below.
The words may be used once, or not at all.

> **bacterium**   **carrier**   **contraception**   **condom**
>
> **fertilisation**   **gonorrhoea**   **intercourse**   **virus**

HIV / AIDS is caused by a ....,

and is passed on by a person who is a ....

This infection can be prevented by using a ....

which is also a form of ....

Another infection that is passed on during ....

is ....   [6]

11 Fig. 11.1 gives information about four radioactive sources.

source	type of radiation	half-life
A	gamma	5 years
B	beta	4 minutes
C	alpha	12 years
D	beta	28 years

Fig. 11.1

(a) Use the information in Fig. 11.1 to choose the letter or letters of the sources that

    (i) emit the least penetrating radiation, ...

    (ii) emit electrons, ...

  (iii) emit radiation that can pass through several centimetres of lead.   .... [3]

(b) (i) Give the letter of the source that is most suitable for an experiment to measure half-life.

                                                      .... [1]

    (ii) Give a reason for your answer.

         ....

         ....[1]

12 Fig. 12.1 shows a 250 V electric iron. The iron has a power rating of 1500 W.
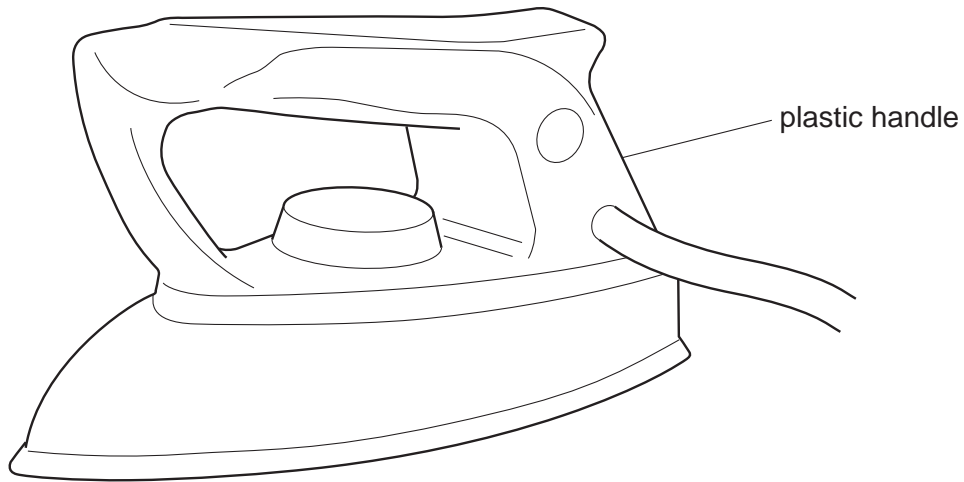
plastic handle

Fig. 12.1

(a) (i) State a formula for calculating electrical power.

....[1]

(ii) Calculate the current when the iron is working normally.

.... A [2]

(b) Explain why the handle of the iron is made of plastic rather than metal.

....

....[1]

(c) Complete the following sentence about energy changes.

The iron converts .... energy into .... energy.   [2]

13 Fig. 13.1 shows part of a flower.
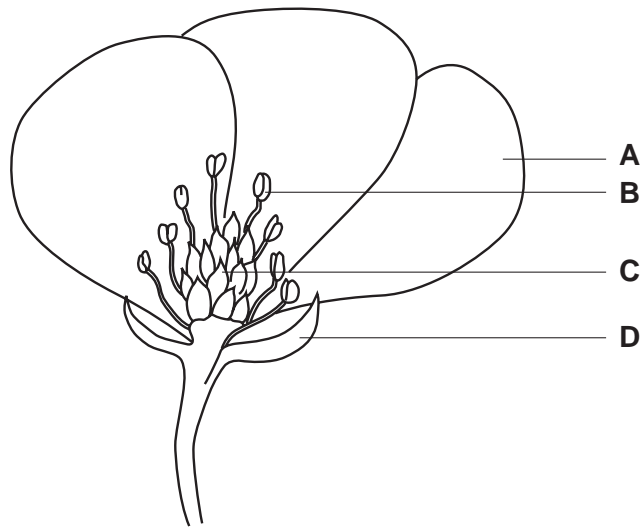
Fig. 13.1

(a) Name the parts labelled

A, ...

B, ...

C, ...

D. .... [4]

(b) State the function of the parts labelled

A, ...

B, ...

C, ...

D. .... [4]

(c) Fig. 13.2 shows a section cut through a seed.

Fig. 13.3 shows the seed after germination.

Fig. 13.2   **Fig.13.3**

State three conditions that are necessary for germination to occur.

1. ....

2. ....

3. ....[3]

14   Fig. 14.1 shows a boy on a diving board. The support holds the diving board in place.

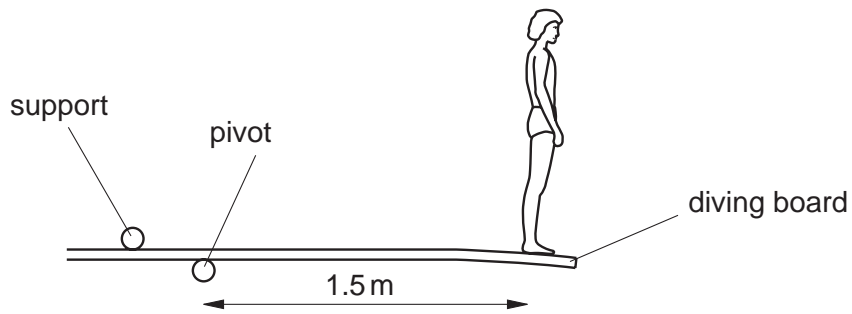**Fig. 14.1**

The boy weighs 500 N and is 1.5 m from the pivot.

(a)   On Fig. 14.1, draw arrows to represent

   (i)   the force of gravity on the boy,   [1]

   (ii)   the force on the diving board at the support.   [1]

(b)   Calculate the moment of the weight of the boy about the pivot.

[2]

15 Chlorine is a green gas in group VII of the Periodic Table.
Chlorine exists as a diatomic molecule.

(a) (i) State the formula of a chlorine molecule. ....[1]

(ii) State the number of electrons in the outer shell of a chlorine atom.

....[1]

(b) Fig. 15.1 shows chlorine being bubbled into a solution of potassium iodide.
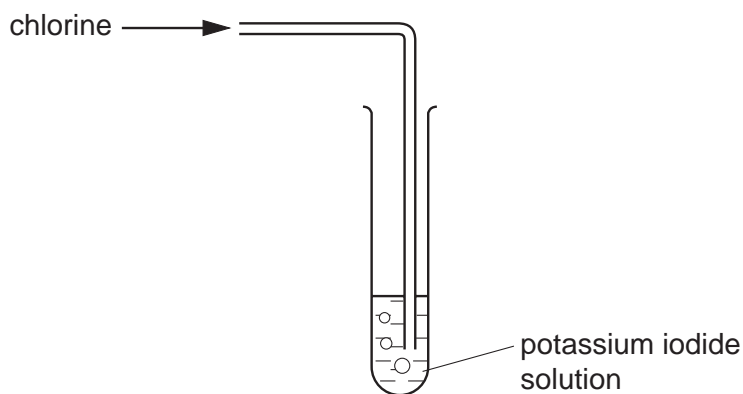The solution turns brown because iodine is produced.

chlorine

potassium iodide
solution

Fig. 15.1

(i) State the other product of this reaction...[1]

(ii) Explain how the experiment shows the relative reactivity of chlorine and iodine.

....

....

....[2]

(c) Chlorine is used in the purification of water supplies. Explain why.

....

....[1]

16 A potato is cut in half and the skin is removed.
A well is cut in the flat top of one half of the potato.
Concentrated sugar solution is poured into the well.
The potato is now placed in a tray of water as shown in Fig. 16.1.
It is left for four hours.
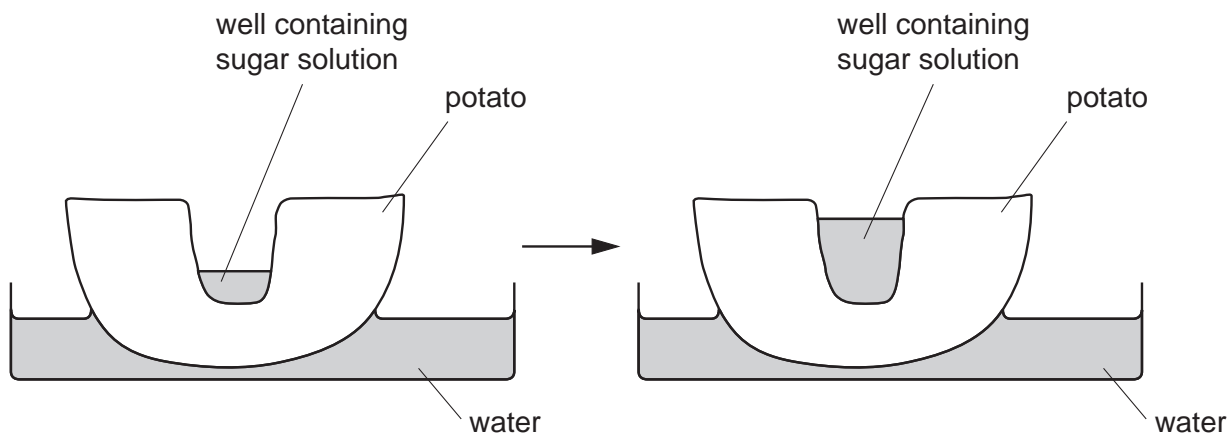The result is shown in Fig. 16.2.

Fig. 16.1   **Fig. 16.2**

During the four-hour period the volume of the sugar solution in the well increases.
Explain why.

....

....

....

....[3]

17 Fig. 17.1 shows a liquid-in-glass thermometer.

thin glass bulb   narrow capillary tube
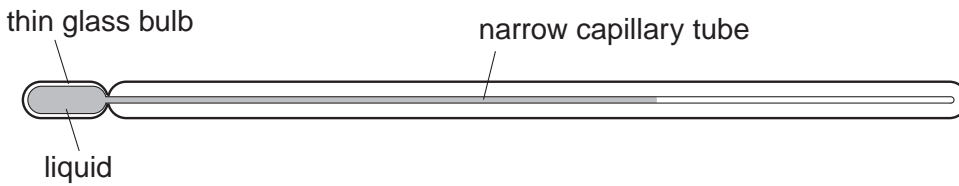
liquid

Fig. 17.1

(a) Name the physical property that is used for the measurement of temperature in this thermometer.

.... [1]

(b) State the change that could be made to the capillary tube to make a liquid-in-glass thermometer more sensitive.

....

....[1]

(c) State **one** difference between a mercury-in-glass laboratory thermometer and a mercury clinical thermometer.

The clinical thermometer..

....[1]

18 Fig. 18.1 shows the apparatus used to make ammonium nitrate in the laboratory. A~~~~
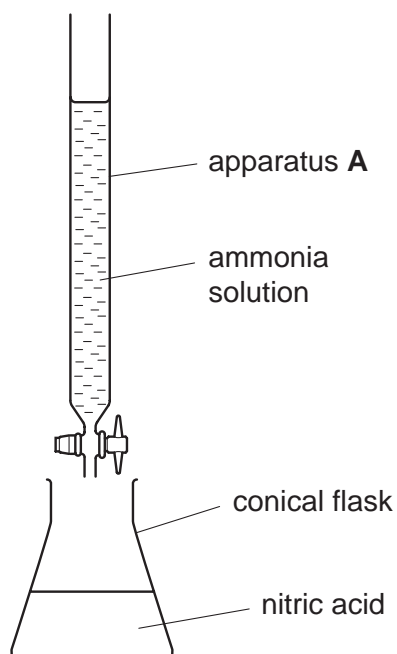solution and nitric acid are reacted together so that neither remains in the final solution~~~~

apparatus **A**

ammonia
solution

conical flask

nitric acid

Fig. 18.1

(a) Name the piece of apparatus labelled **A**. ....[1]

(b) (i) State the type of reaction that occurs when ammonia reacts with nitric acid.

....[1]

(ii) State the pH of the solution when the reaction is complete.

.... [1]

(c) The equation for the reaction is

$$NH_3 + HNO_3 \rightarrow NH_4NO_3$$
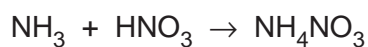
The relative molecular mass of ammonia is 17.
[A_r: N,14; H,1; O,16.]

(i) Calculate the relative molecular mass of ammonium nitrate.

....[1]

(ii) Calculate the mass of ammonium nitrate produced from 6.8 g of ammonia.

....

....

....[2]

21

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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	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	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	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	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	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 88	226 **Ra** Radium 88	227 **Ac** Actinium 89 †																

58-71 Lanthanoid series
90-103 Actinoid series

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	231 **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

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.).