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.

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

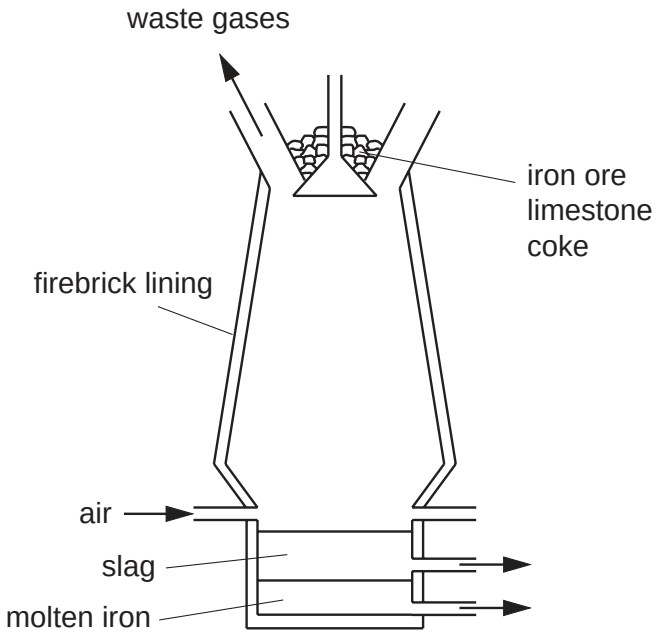

Fig. 1.1

(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.

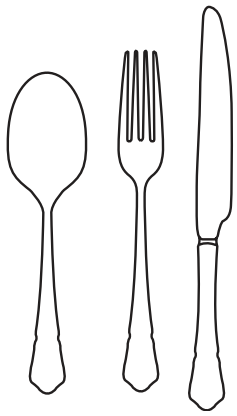

Fig. 1.2

(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.

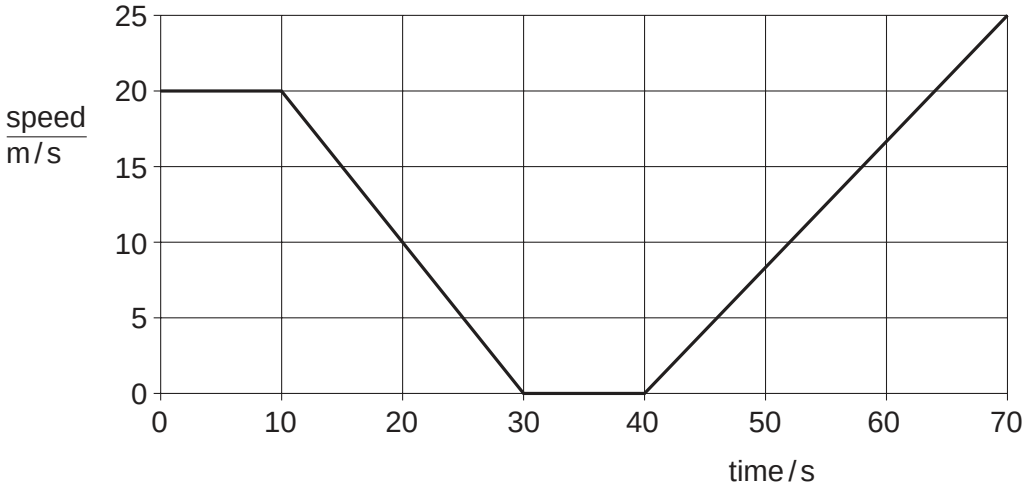

Fig. 2.1

(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.

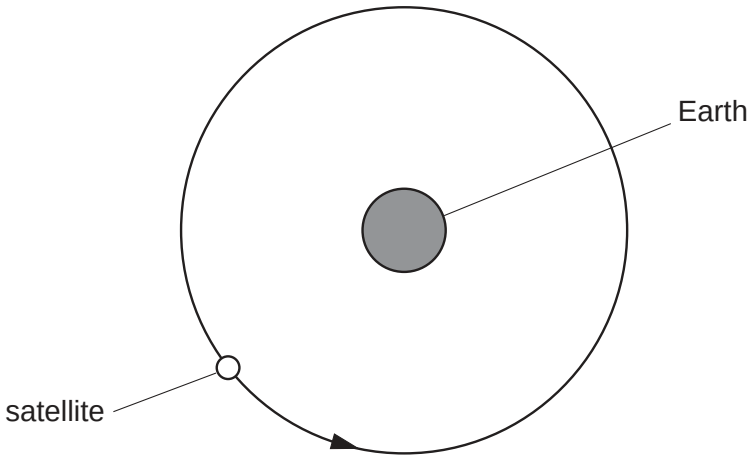

Fig. 3.1

(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]

[Turn over

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.

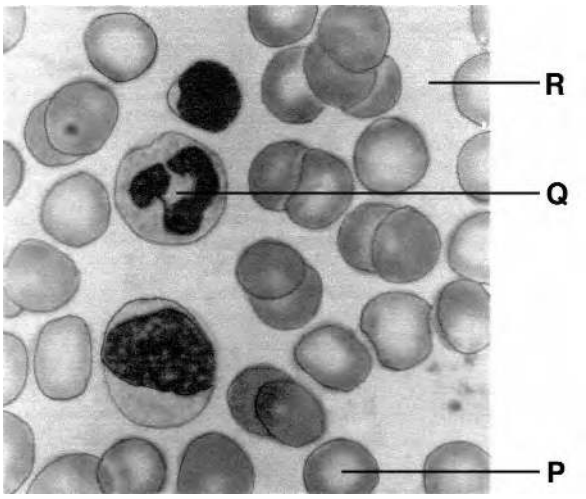

Fig. 4.2

(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.

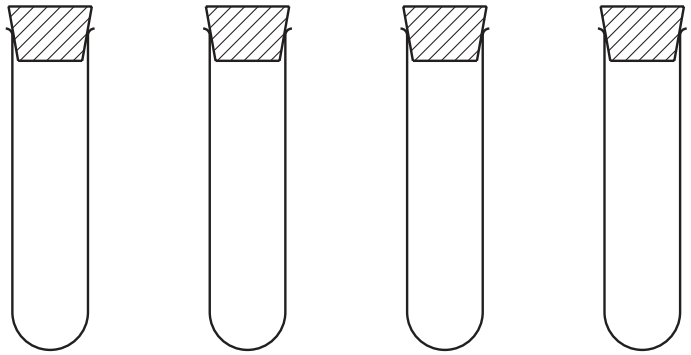

Fig. 5.1

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.

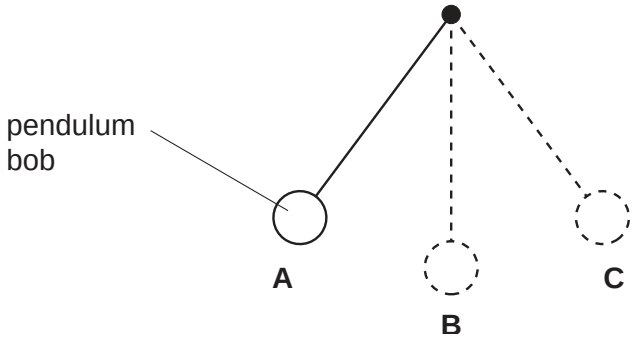

Fig. 7.1

(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.

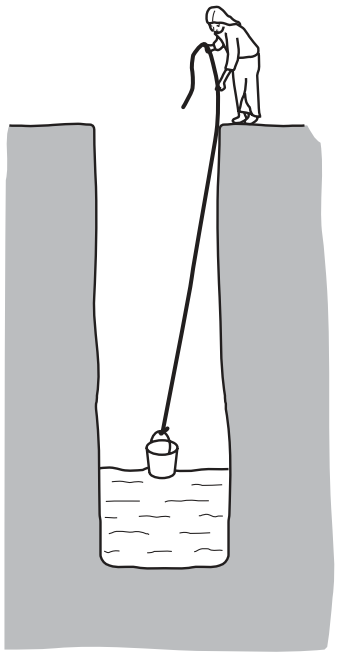

Fig. 8.1

(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.

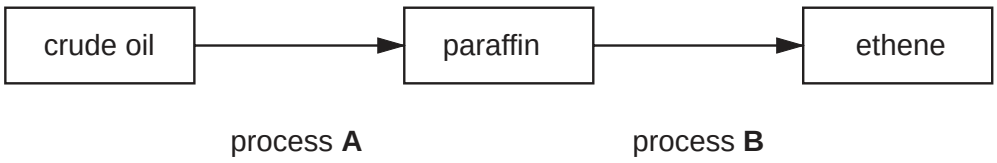

Fig. 9.1

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.

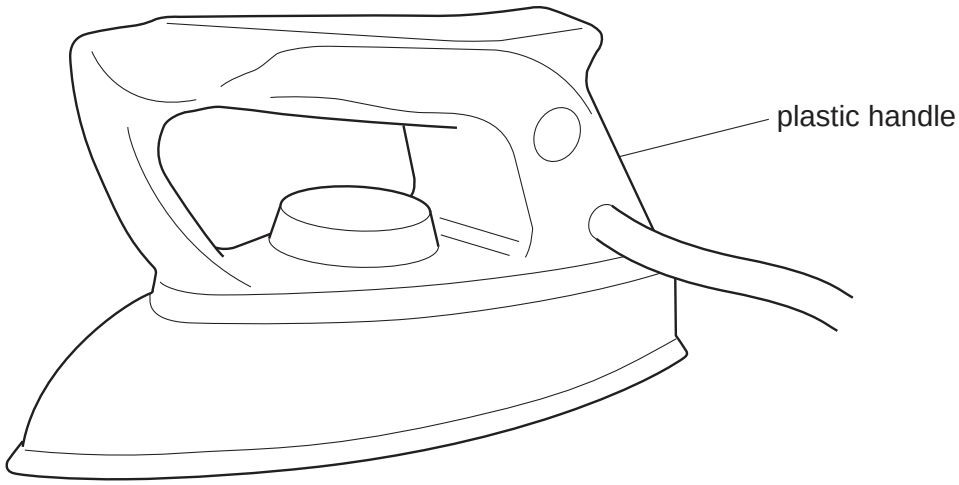

Fig. 12.1

(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.

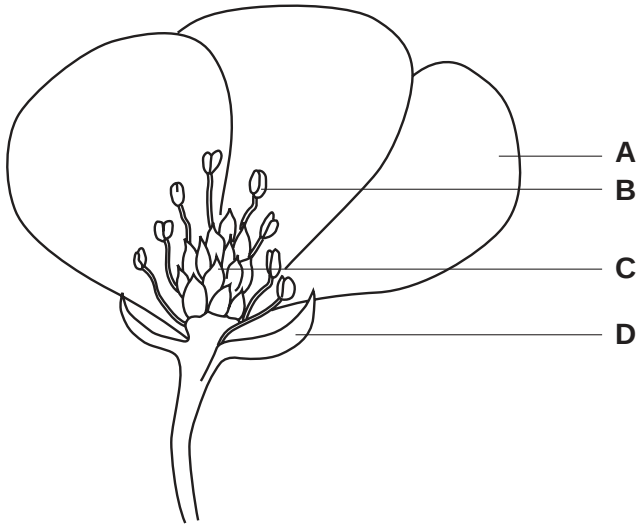

Fig. 13.1

(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.

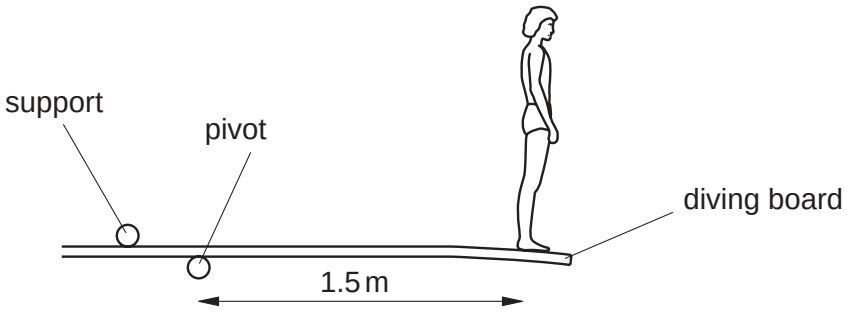

Fig. 14.1

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.

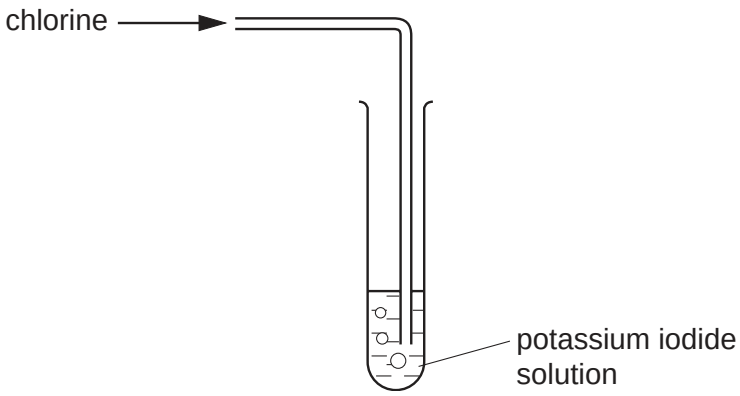

Fig. 15.1

(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.

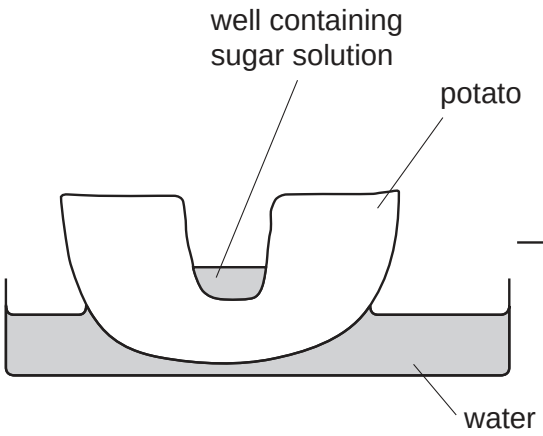

Fig. 16.1

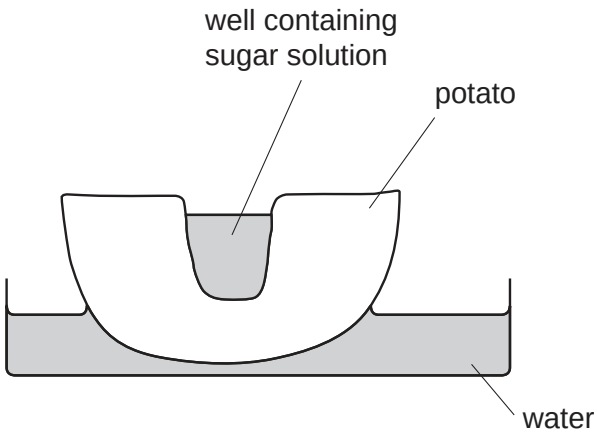

Fig. 16.2

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.

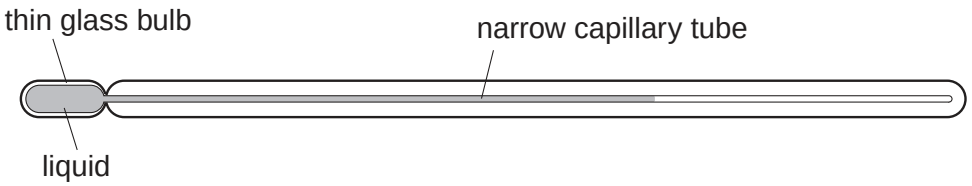

Fig. 17.1

(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. Ammonia solution and nitric acid are reacted together so that neither remains in the final solution.

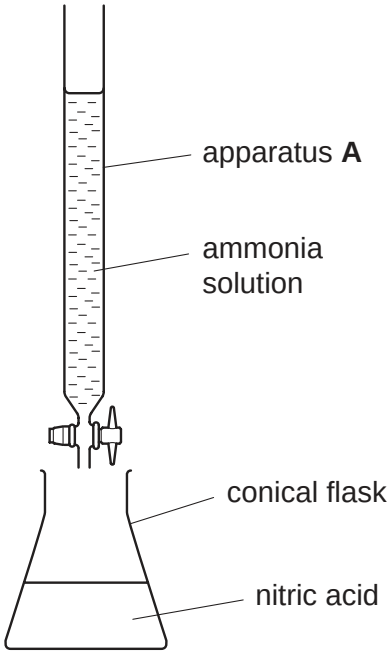

Fig. 18.1

(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]

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DATA SHEET
The Periodic Table of the Elements

Group I	Group II						Group III	Group IV	Group V	Group VI	Group VII	Group 0
					1 H Hydrogen 1							4 He Helium 2
7 Li Lithium 3	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 11	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 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	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
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
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.).