Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

COMBINED SCIENCE **5129/02**

Paper 2

October/November 2005

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 in the spaces provided on the Question Paper.
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.

Answer **all** questions.
The number of marks is given in brackets [ ] at the end of each question or part question.
A copy of the Periodic Table is printed on page 20.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

For Examiner's Use

This document consists of **18** printed pages and **2** blank pages.

1 Rubidium, Rb, is below potassium in Group 1 of the Periodic Table.

(a) State the formula of the rubidium ion. .....[1]

(b) **(i)** Rubidium and potassium both react with cold water.

Suggest **one** difference in the way that they react.

.....

.....[1]

(ii) State the products of the reaction between rubidium and cold water.

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

2 The following is a list of gases.

ammonia	**carbon dioxide**	**chlorine**
hydrogen	**nitrogen**	**oxygen**

Answer the following questions by selecting from the list. Each gas may be used once, more than once or not at all.

Name the gas that

(a) relights a glowing splint, ...

(b) is pale green in colour, ...

(c) is the most abundant in air, ...

(d) is used in the manufacture of margarine, ...

(e) turns Universal Indicator solution blue. ..... [5]

3 Fig. 3.1 shows a plant cell.

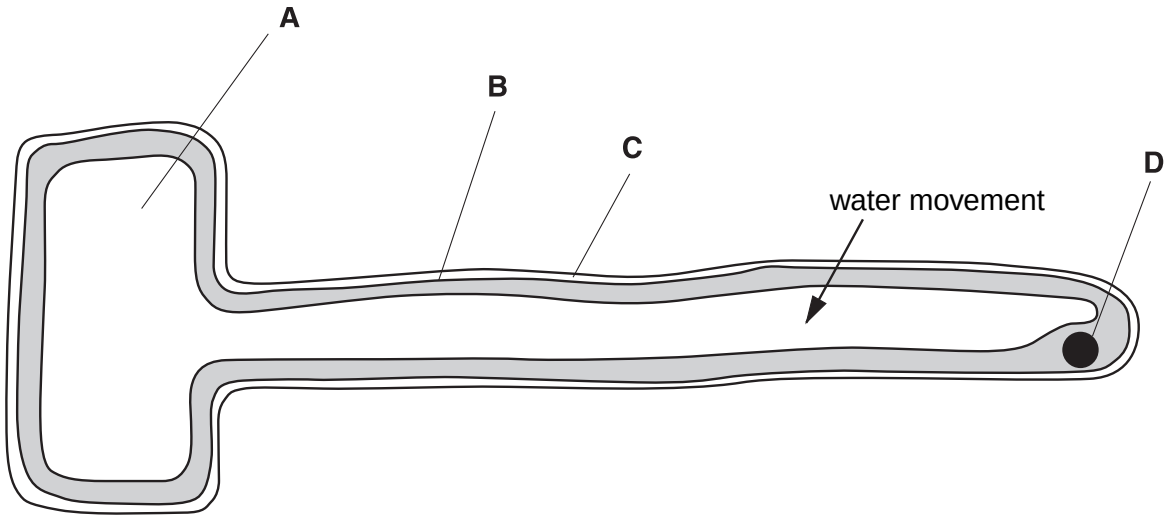


Fig. 3.1

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

A .....

B .....

C .....

D .....[4]

(b) State the type of cell shown in Fig. 3.1.

.....[1]

(c) **(i)** Name the process by which water moves into this cell.

.....[1]

(ii) State three conditions for the process named in **(c)(i)** to occur.

1. .....

2. .....

3. .....[3]

4 Fig. 4.1 shows a measuring cylinder containing liquid paraffin.

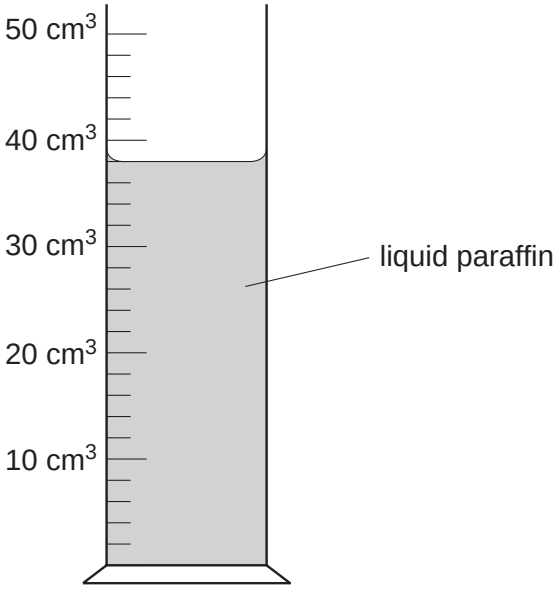


Fig. 4.1

(a) State the volume of the liquid paraffin shown in the measuring cylinder in Fig. 4.1.

.....cm^3 [1]

(b) A student measures the mass of the empty measuring cylinder and then containing the liquid paraffin. His results are shown in Fig. 4.2.

mass of empty measuring cylinder	20.2 g
mass of measuring cylinder containing the liquid paraffin	50.6 g

Fig. 4.2

Calculate

(i) the mass of the paraffin,

.....[1]

(ii) the density of the paraffin.

[3]

5 **(a)** Suggest a property of aluminium that makes it useful in the manufacture of

(i) aircraft, ...

.....

(ii) food containers. .....

.....[2]

(b) Fig. 5.1 shows an electric cable.

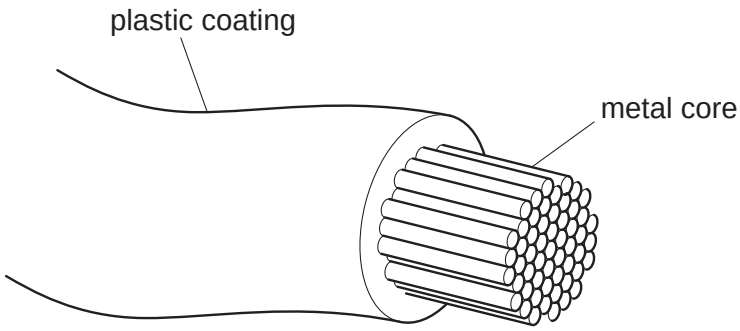


Fig. 5.1

Name the metal most commonly used for the core. .....[1]

6 One isotope of nitrogen is represented as

$$^{15}_{7}N$$

(a) State the number of protons, neutrons and electrons in an atom of this isotope.

number of protons .....

number of neutrons .....

number of electrons ..... [3]

(b) Explain why nitrogen forms the ion N^{3-} rather than the ion N^{2-}.

.....

.....[2]

(c) Nitrogen reacts with lithium to form lithium nitride. The lithium ion is Li^{+}.
Construct the formula of lithium nitride.

.....[1]

7 **(a)** Fig. 7.1 shows one type of plant growing in a garden.

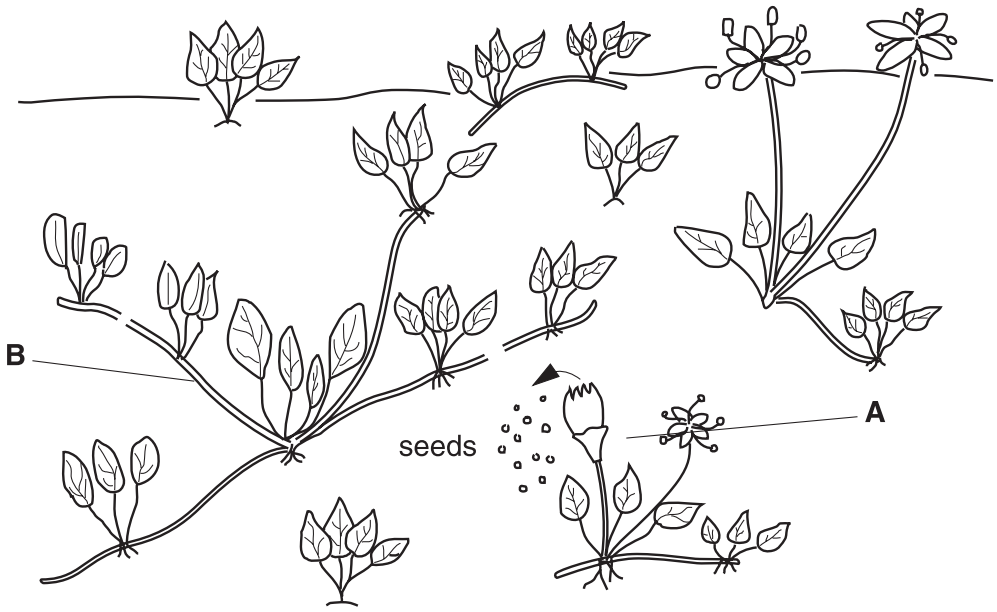


Fig. 7.1

A and **B** show two different types of reproduction carried out by this plant.
State the type of reproduction shown at

(i) **A**,.....

B..... [2]

(ii) State the difference between the offspring resulting from these two types of reproduction.

.....

.....

.....[2]

(b) Another type of plant produces fruits that are bright red and soft.
Explain how this adaptation helps the plant to colonise new areas.

.....

.....

.....[2]

(c) Some plants are growing on the banks of a river.
Over a period of years, an island forms in the middle of the river.
Plants grow on the island as shown in Fig. 7.2.

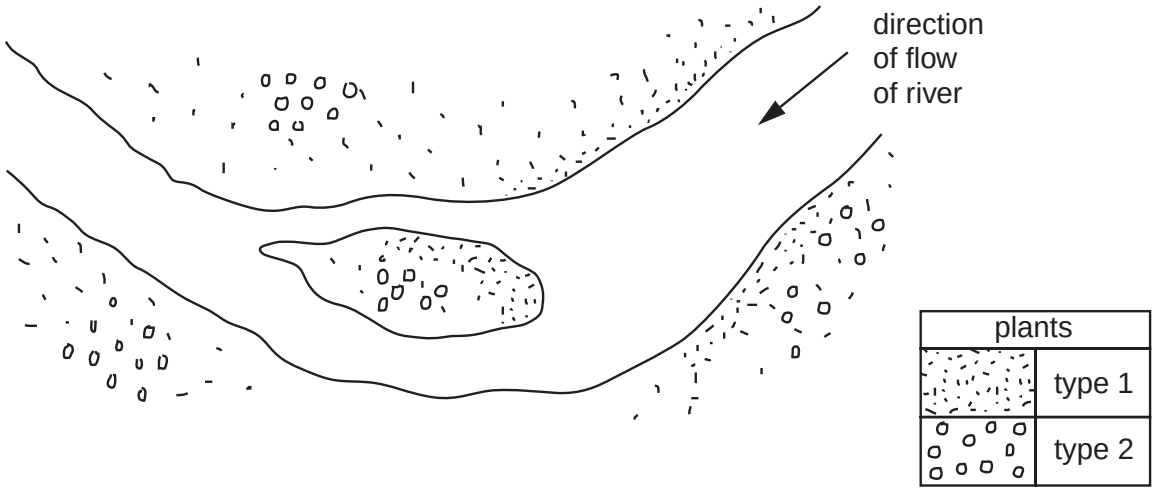


Fig. 7.2

Suggest two ways by which seeds from plants on the river banks reached the island.

1. .....

2. .....[2]

8 **(a)** On Earth, a spacecraft has a weight of 50 000 N. The gravitational field strength
Earth's surface is 10 N / kg.
Calculate the mass of the spacecraft.

[1]

(b) On the Moon, the weight of the spacecraft is less than 50 000 N.
Explain why it weighs less on the Moon.

.....

.....[1]

(c) **(i)** State the relation between force *F*, mass *m* and acceleration *a*.

.....[1]

(ii) The rockets on the spacecraft produce a force of 20 000 N.
Calculate the acceleration of the spacecraft.

[2]

9 **(a)** A laboratory thermometer contains mercury. The thermometer is taken from hot water and placed in cold water.
State what happens to

(i) the volume of the mercury, ...

(ii) the mass of the mercury. .....[2]

(b) Clinical thermometers may also contain mercury.
State two ways in which clinical thermometers differ from laboratory thermometers.

1. .....

.....

2. .....

.....[2]

10 Fig. 10.1 shows the reduction of copper(II) oxide by hydrogen.

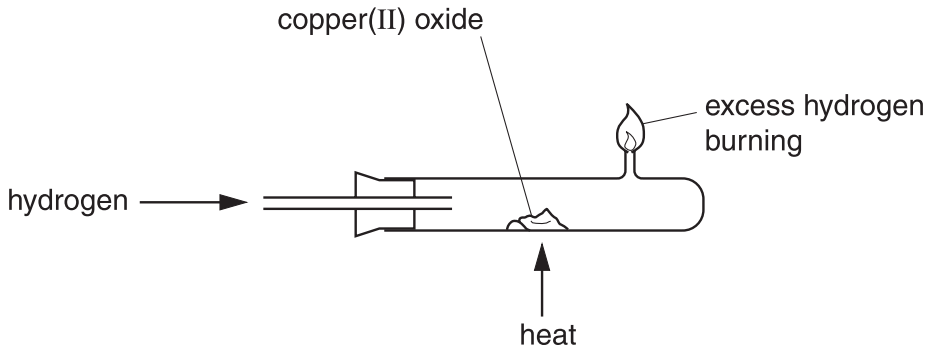


Fig. 10.1

The equation for the reaction is

$$CuO + H_2 \rightarrow Cu + H_2O$$

(a) State what is meant by the term *reduction*.

.....[1]

(b) **(i)** Calculate the relative molecular mass of copper(II) oxide.

[A_r: Cu,64; O,16; H,1.]

.....[1]

(ii) Calculate the relative molecular mass of water.

.....[1]

(iii) Calculate the mass of water produced from 4 g of copper(II) oxide.

.....

.....

.....[2]

11 Fig. 11.1 shows the liver, part of the small intestine and associated blood vessels.

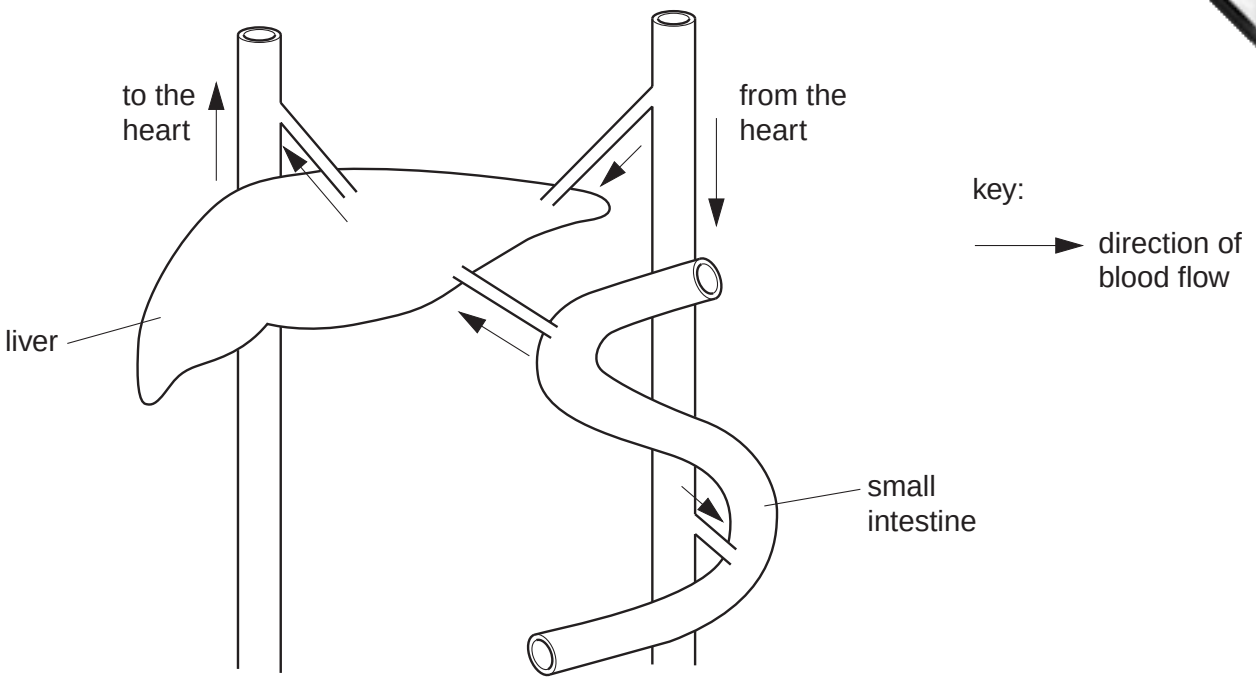


Fig. 11.1

(a) Glucose and amino acids are absorbed into the blood from the small intestine.

Describe how the liver changes each of these nutrients.

glucose .....

.....[2]

amino acids .....

.....[2]

(b) State two **other** functions of the liver.

1. .....

2. .....[2]

12 Fig. 12.1 shows an electrical heater being used to heat water in a beaker.

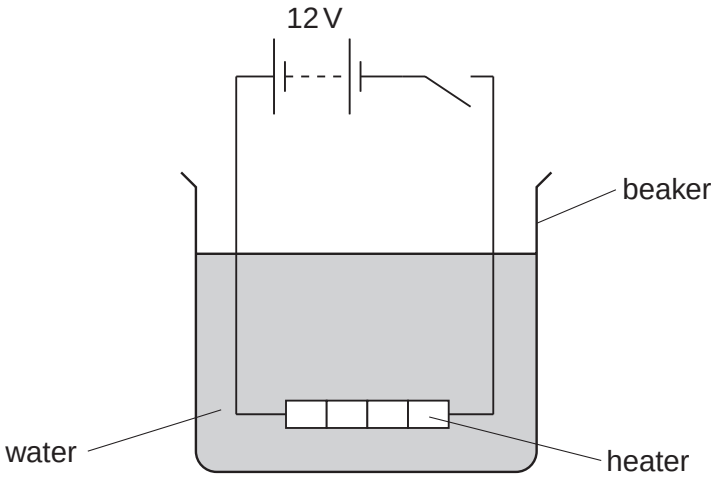


Fig. 12.1

(a) When a 12 V supply is connected across the heater, the power of the heater is 30 W. Calculate the current in the heater.

[2]

(b) Thermal energy can be transferred by conduction, convection or radiation. State the main method by which thermal energy is transferred

(i) through the walls of the beaker,

.....

(ii) from the water near the bottom of the beaker to the water at the top.

.....[2]

13 Fig. 13.1 shows changes of state.

Fig. 13.1

(a) State the letter, **W**, **X**, **Y** or **Z**, that represents

(i) condensation, ...

(ii) melting. ..... [2]

(b) Draw a diagram to show the arrangement of the particles in a gas.

[1]

(c) Describe differences in the arrangement and the movement of the particles when a solid changes to a liquid.

.....

.....

.....

.....[2]

14 **(a)** An athlete is walking to the start of a race.

(i) Name the type of respiration in her muscles as she walks.

.....[1]

(ii) Write a word equation for this type of respiration.

.....

.....[2]

(iii) State the advantage to the body of this type of respiration.

.....[1]

(b) The race starts and she runs.
A different type of respiration takes place in her muscles when she is running as fast as she can.

(i) Write a word equation for this type of respiration.

.....

.....[2]

(ii) State the advantage to the body of this type of respiration.

.....[1]

(c) There is a greater amount of two gases in expired air than in inspired air.
One of these gases is water vapour.

Name the other gas.

.....[1]

(d) Increased physical activity causes an increase in the rate and the depth of breathing.

Suggest two ways in which these increases are helpful to the body.

1. .....

2. .....[2]

15 Fig. 15.1 shows a ray of light passing through a parallel-sided glass block. Some of t
is reflected at the surface of the block. Normals to the glass surface are shown.

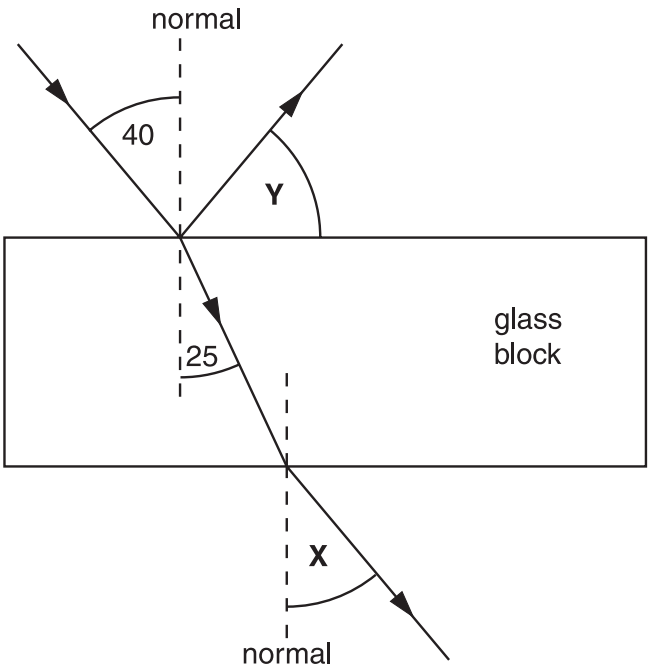


Fig. 15.1

(a) State the value of the angle **X**. .....[1]

(b) Calculate the value of the angle **Y**.

.....[1]

(c) Calculate the refractive index of the glass.

[3]

16 Fig. 16.1 shows an electric circuit.

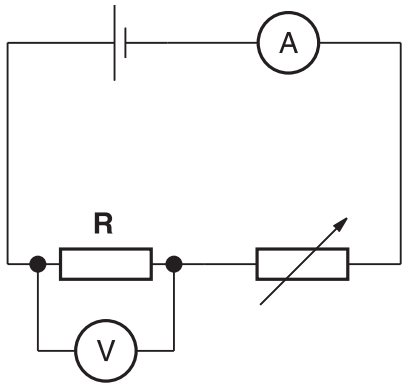


Fig. 16.1

(a) For one setting of the variable resistor, the ammeter reading is 0.20 A and the voltmeter reading is 0.80 V.
Calculate the resistance of the fixed resistor **R**.

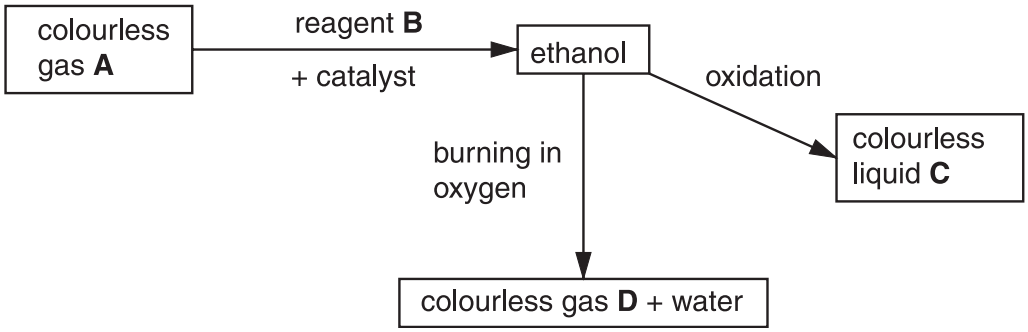
[3]

(b) The resistance of the variable resistor is increased.
State what happens to the reading on

(i) the ammeter, ...

(ii) the voltmeter. .....[2]

17 Study the following series of reactions.



(a) Identify substances **A**, **B**, **C** and **D**.

A .....

B .....

C .....

D ..... [4]

(b) Draw a diagram to show the structure of a molecule of ethanol.

[1]

(c) Colourless liquid **C** turns damp Universal Indicator paper red.
State what this shows about colourless liquid **C**.

.....[1]

18 Fig. 18.1 shows a simple transformer.

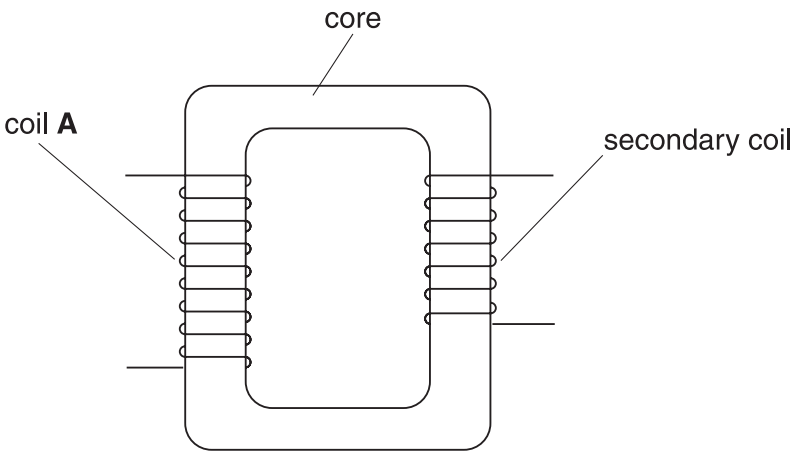


Fig. 18.1

(a) The secondary coil is labelled.

State

(i) the name of coil **A**, ...

(ii) the material used for the core. .....[2]

(b) Explain why the input to the transformer must be an alternating current, **not** a direct current.

.....

.....

.....

.....[3]

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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	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

8-71 Lanthanoid series
)0-103 Actinoid series

ey

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.).