

Centre Number	Candidate Number	Name
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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**

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.

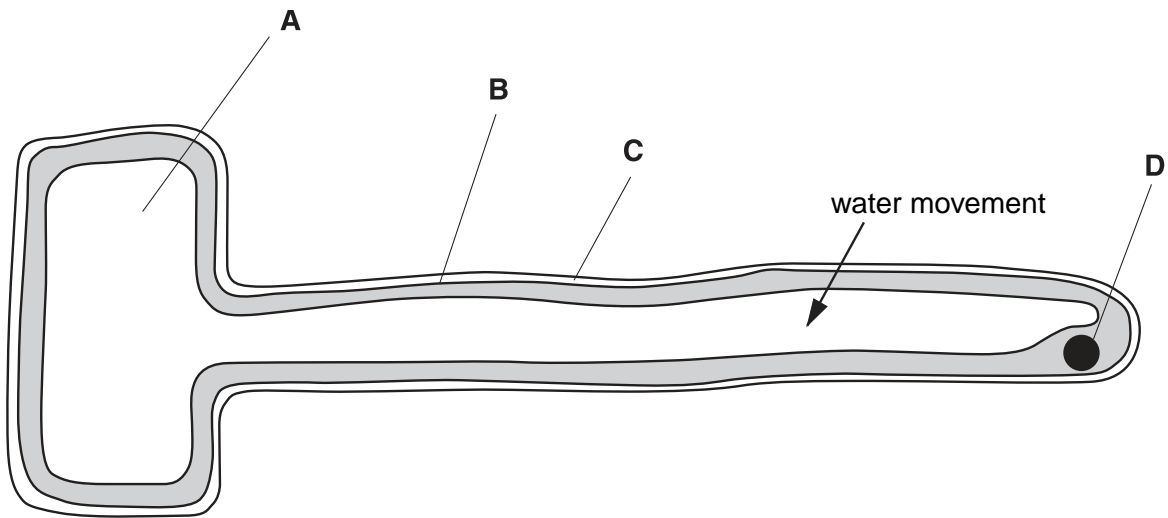


Fig. 3.1

(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.

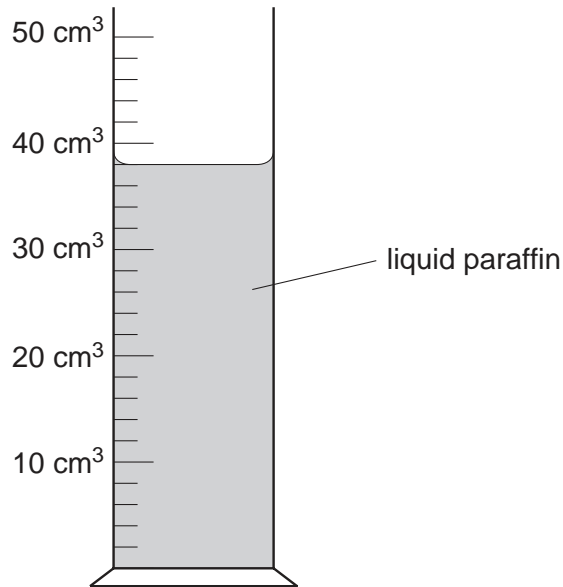


Fig. 4.1

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

.....cm<sup>3</sup> [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.

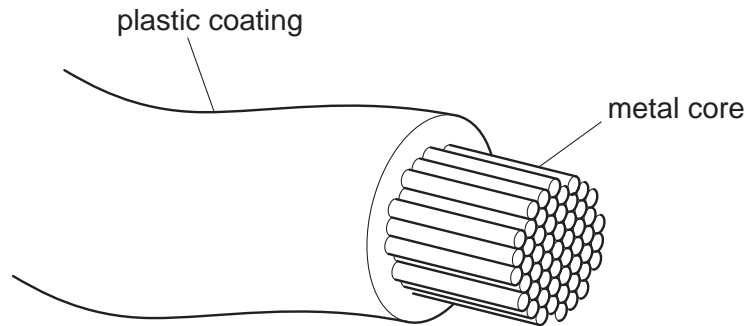


Fig. 5.1

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

6 One isotope of nitrogen is represented as



(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  $\text{N}^{3-}$  rather than the ion  $\text{N}^{2-}$ .

.....

.....[2]

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

.....[1]

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

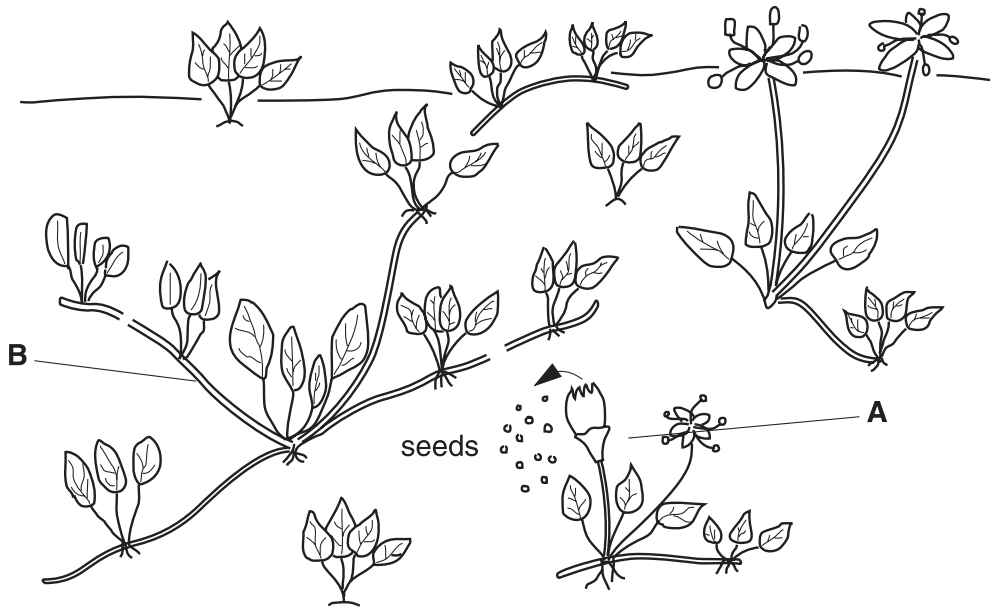


Fig. 7.1

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]

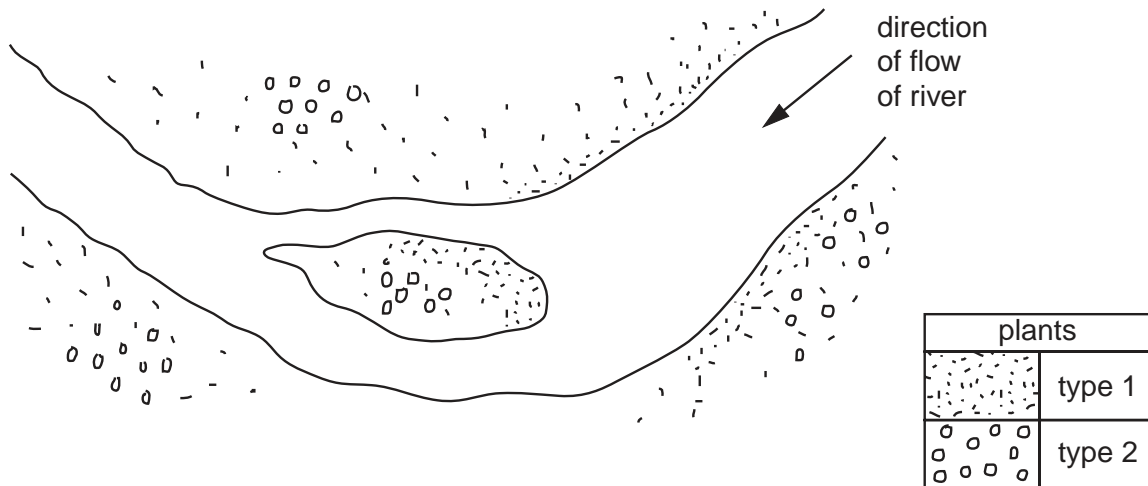
(ii) State the difference between the offspring resulting from these two types of reproduction.

.....  
 .....  
 ..... [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 at the 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.

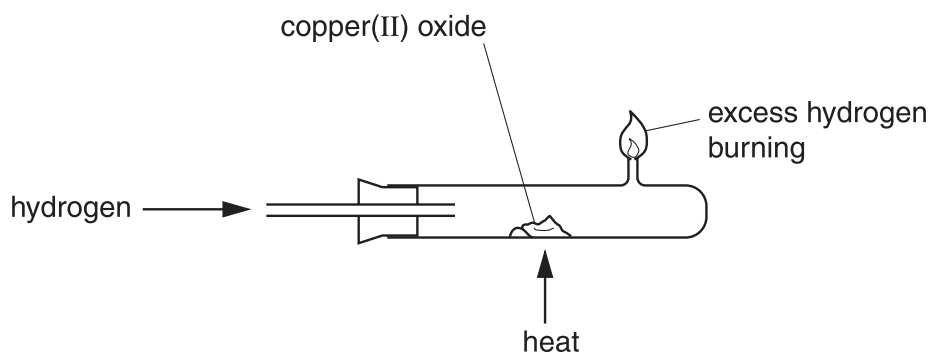
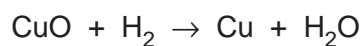


Fig. 10.1

The equation for the reaction is



(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.

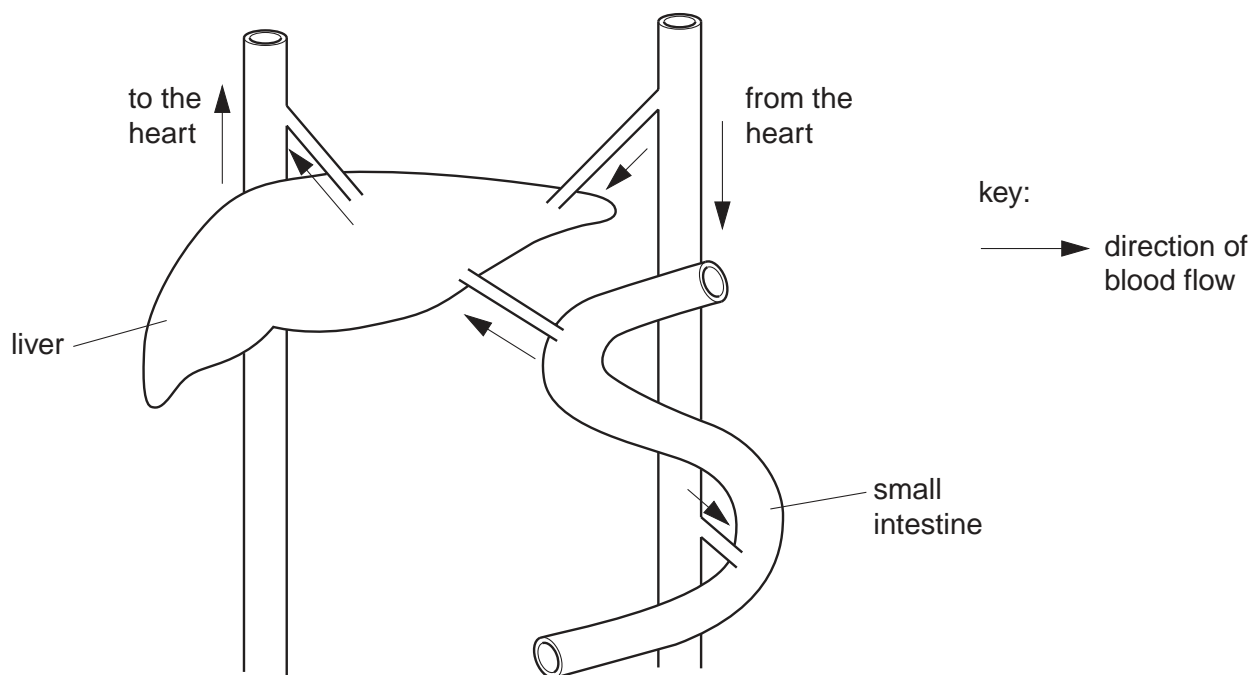


Fig. 11.1

(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. ....[2]

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

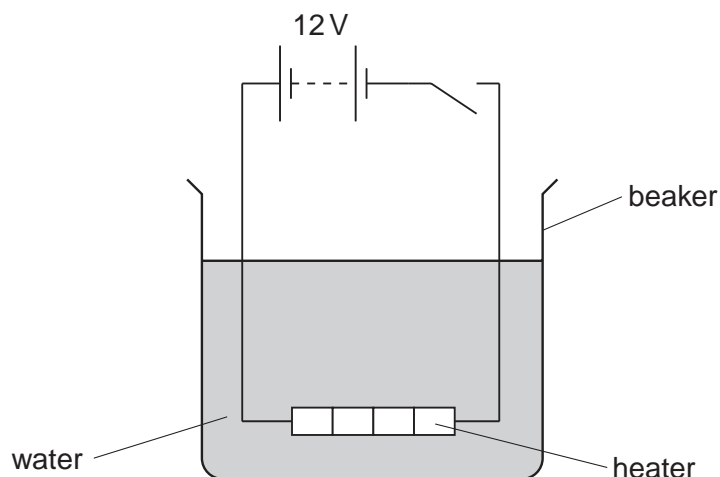


Fig. 12.1

- (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.

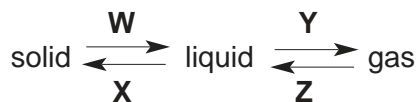


Fig. 13.1

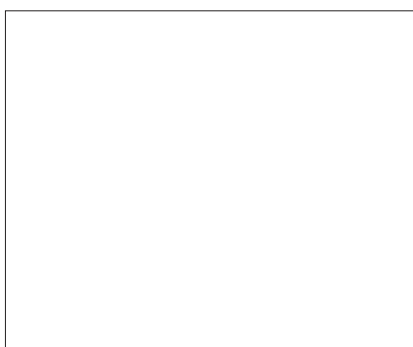
(a) State the letter, **W**, **X**, **Y** or **Z**, that represents

(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 the light is reflected at the surface of the block. Normals to the glass surface are shown.

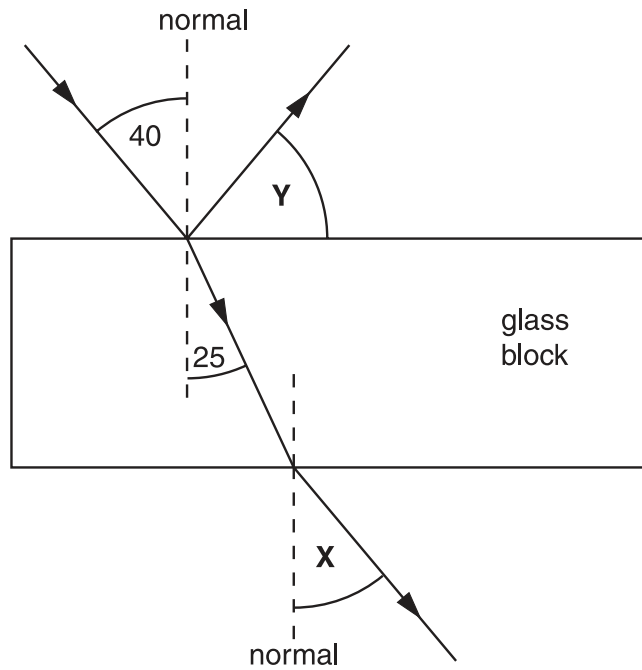


Fig. 15.1

- (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.

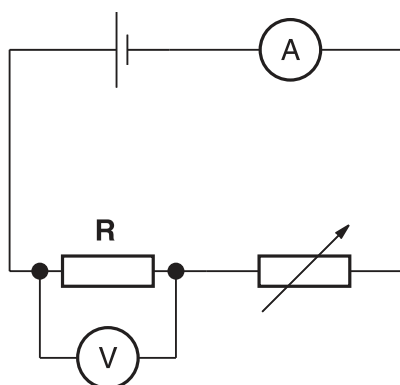


Fig. 16.1

- (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**.

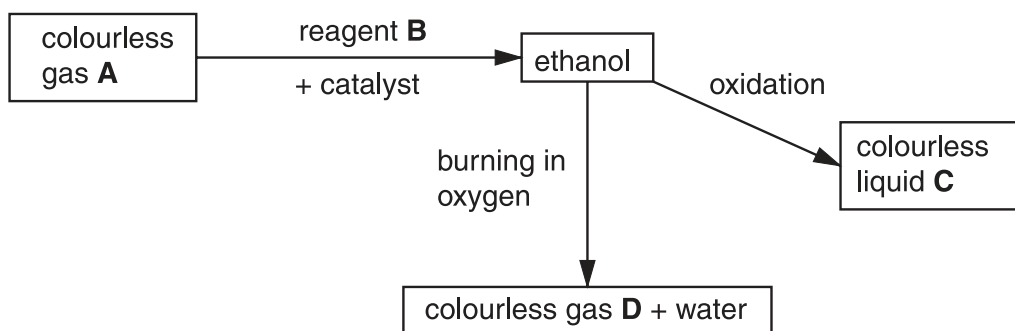
[3]

- (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.

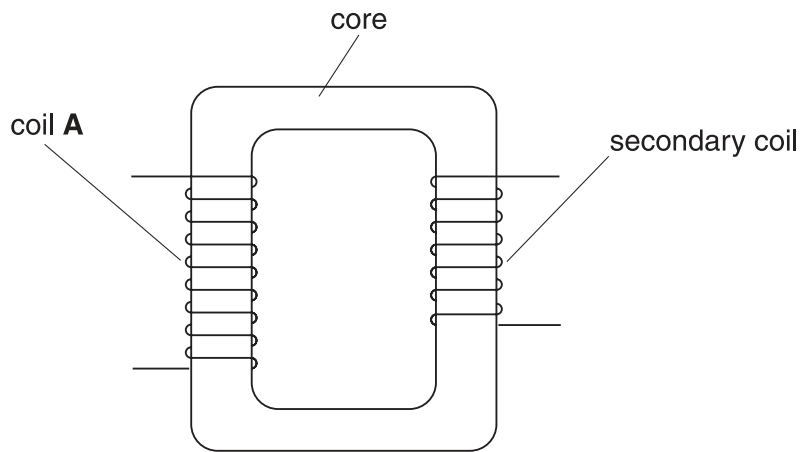


Fig. 18.1

(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																		
7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4	1 <b>H</b> Hydrogen 1	11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	14 <b>N</b> Nitrogen 7	16 <b>O</b> Oxygen 8	19 <b>F</b> Fluorine 9	20 <b>Ne</b> Neon 10																	
23 <b>Na</b> Sodium 11	24 <b>Mg</b> Magnesium 12	27 <b>Al</b> Aluminium 13	28 <b>Si</b> Silicon 14	31 <b>P</b> Phosphorus 15	32 <b>S</b> Sulphur 16	35.5 <b>Cl</b> Chlorine 17	40 <b>Ar</b> Argon 18																		
39 <b>K</b> Potassium 19	40 <b>Ca</b> Calcium 20	45 <b>Sc</b> Scandium 21	48 <b>Ti</b> Titanium 22	51 <b>V</b> Vanadium 23	52 <b>Cr</b> Chromium 24	55 <b>Mn</b> Manganese 25	56 <b>Fe</b> Iron 26	59 <b>Co</b> Cobalt 27	59 <b>Ni</b> Nickel 28	64 <b>Cu</b> Copper 29	65 <b>Zn</b> Zinc 30	70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	80 <b>Br</b> Bromine 35	84 <b>Kr</b> Krypton 36								
85 <b>Rb</b> Rubidium 37	88 <b>Sr</b> Strontium 38	89 <b>Y</b> Yttrium 39	91 <b>Zr</b> Zirconium 40	93 <b>Nb</b> Niobium 41	96 <b>Mo</b> Molybdenum 42	101 <b>Tc</b> Technetium 43	101 <b>Ru</b> Ruthenium 44	103 <b>Rh</b> Rhodium 45	106 <b>Pd</b> Palladium 46	108 <b>Ag</b> Silver 47	112 <b>Cd</b> Cadmium 48	115 <b>In</b> Indium 49	119 <b>Sn</b> Tin 50	122 <b>Sb</b> Antimony 51	128 <b>Te</b> Tellurium 52	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54								
133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56	139 <b>La</b> Lanthanum 57	178 <b>Hf</b> Hafnium 72	181 <b>Ta</b> Tantalum 73	184 <b>W</b> Tungsten 74	186 <b>Re</b> Rhenium 75	190 <b>Os</b> Osmium 76	192 <b>Ir</b> Iridium 77	195 <b>Pt</b> Platinum 78	197 <b>Au</b> Gold 79	201 <b>Hg</b> Mercury 80	204 <b>Tl</b> Thallium 81	207 <b>Pb</b> Lead 82	209 <b>Bi</b> Bismuth 83	209 <b>Po</b> Polonium 84	209 <b>At</b> Astatine 85	209 <b>Rn</b> Radon 86								
226 <b>Fr</b> Francium 87	226 <b>Ra</b> Radium 88	227 <b>Ac</b> Actinium 89											140 <b>Ce</b> Cerium 58	141 <b>Pr</b> Praseodymium 59	144 <b>Nd</b> Neodymium 60	150 <b>Sm</b> Samarium 62	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	159 <b>Tb</b> Terbium 65	162 <b>Dy</b> Dysprosium 66	165 <b>Ho</b> Holmium 67	167 <b>Er</b> Erbium 68	169 <b>Tm</b> Thulium 69	173 <b>Yb</b> Ytterbium 70	175 <b>Lu</b> Lutetium 71
				232 <b>Th</b> Thorium 90	232 <b>Pa</b> Protactinium 91	238 <b>U</b> Uranium 92	238 <b>Np</b> Neptunium 93	238 <b>Pu</b> Plutonium 94	238 <b>Am</b> Americium 95	238 <b>Cm</b> Curium 96	238 <b>Bk</b> Berkelium 97	238 <b>Cf</b> Californium 98	238 <b>Es</b> Einsteinium 99	238 <b>Fm</b> Fermium 100	238 <b>Md</b> Mendelevium 101	238 <b>No</b> Nobelium 102	238 <b>Lr</b> Lawrencium 103								

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

**Key**

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

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).