Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

3075202425

COMBINED SCIENCE **0653/32**

Paper 3 (Core) **October/November 2017**

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
A copy of the Periodic Table is printed on page 20.

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.

This document consists of **20** printed pages.

CAMBRIDGE International Examinations

1 **(a)** Use the following numbers or words to complete the sentences about the menstrual cycle.

Each number or word may be used once, more than once or not at all.

4 **14** **28** **blood** **enzymes** **fertilised**

hormones **nerves** **ovary** **oviduct**

pancreas **pollinated** **uterus**

The menstrual cycle starts when the lining of the uterus breaks down and leaves the body along with some ..... .

A new lining of the uterus is made and starts to become thicker. At the same time an egg starts to mature in the ..... .

The egg is released around day ..... .

The lining of the uterus continues to thicken to prepare for a

..... egg.

[4]

(b) Fig. 1.1 shows a flow chart of how identical twins occur.

A fetus is the name given to a developing baby in the later stages of pregnancy.

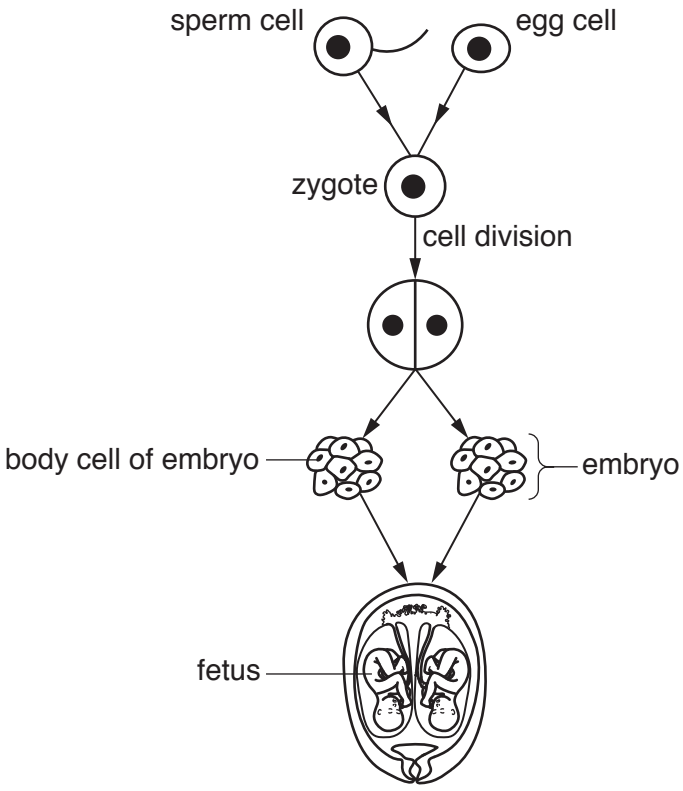


Fig. 1.1

Use Fig. 1.1 to name

1. a haploid cell, ...

2. a diploid cell. .....
[2]

(c) Fig. 1.1 shows how the genetic material in the nuclei of the cells is passed from the egg and sperm to the fetus.

Use the information in Fig. 1.1 to compare the genetic material in the body cells of the twins.

Explain your answers.

.....

.....

.....[2]

2 A student places four pieces of metal, at the same time, into separate beakers containing dilute hydrochloric acid, HC*l*.

The four metals react with the acid to produce the same gas, but at different rates.

The gas is collected in test-tubes, as shown in Fig. 2.1.

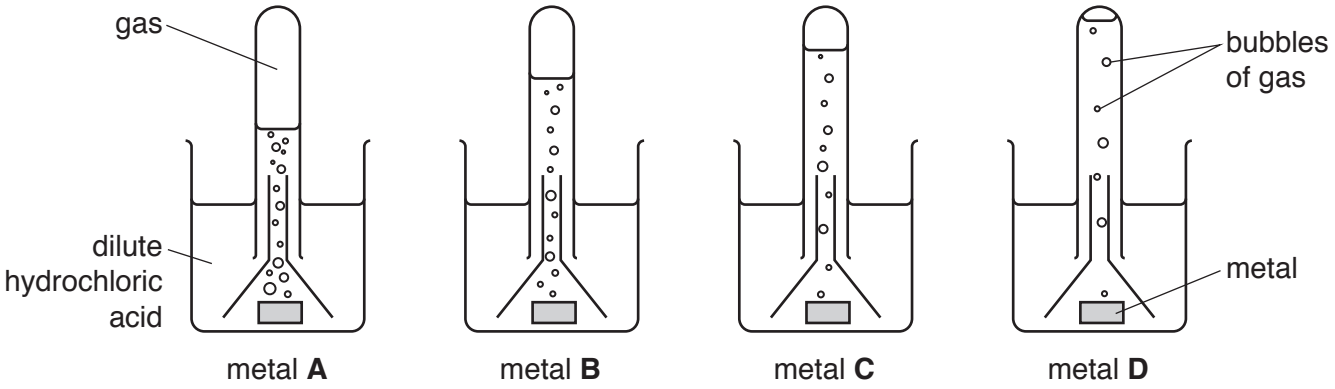


Fig. 2.1

The four metals are calcium, iron, magnesium, and zinc.

(a) (i) Using the information in Fig. 2.1 and your knowledge of the reactivity series, identify metals **A**, **B**, **C** and **D**.

metal **A** .....

metal **B** .....

metal **C** .....

metal **D** .....

[2]

(ii) Name the gas made in the reaction between magnesium and dilute hydrochloric acid.

.....[1]

(iii) State the effect of increasing the temperature of the acid on the rate of reaction with the metals.

.....[1]

(iv) Suggest **one** other way of changing the rate of reaction.

.....[1]

(b) When iron reacts with dilute hydrochloric acid, a solution of an iron salt is made.

The student thinks that this salt contains iron(II) ions.

Another student thinks that the salt contains iron(III) ions.

They add dilute sodium hydroxide solution to a sample of the iron salt solution.

Describe the observations that are expected for iron(II) ions and for iron(III) ions.

iron(II) ions .....

iron(III) ions .....
[2]

(c) Iron is a transition metal.

(i) Suggest **two** properties of iron that are **not** properties of Group I metals.

1. .....

2. .....
[2]

(ii) Explain why iron is used in the form of alloys, rather than as pure iron, for kitchen knives.

.....

.....

.....[1]

3 Fig. 3.1 shows a helicopter hovering above the ground.

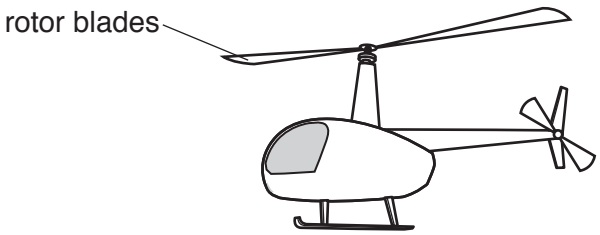


Fig. 3.1

(a) The helicopter stays in one place as it hovers. The turning rotor blades provide the uplift force to keep it in the air.

On Fig. 3.1 draw two force arrows to show the vertical forces acting on the helicopter.

Label each arrow with the name of the force acting on the helicopter. [3]

(b) The helicopter uses fuel to power its engines which turn the rotor blades. The pilot increases the speed of the rotor blades and the helicopter climbs vertically to a height of 1000 m. It then hovers again at this height.

Complete the sequence of energy transfers for the helicopter below.

..... energy in the fuel

→ ..... energy of the rotor blades

→ kinetic ..... energy of the climbing helicopter

→ ..... energy of the helicopter at 1000 m. [3]

(c) The helicopter starts to move forward.

It increases speed for 20 s until it reaches a constant speed of 50 m / s.

It continues at this speed for 100 s.

It then slows down for 10 s to hover in one place again.

(i) On the grid in Fig. 3.2, plot a speed-time graph of the helicopter journey, which lasts 130 s.

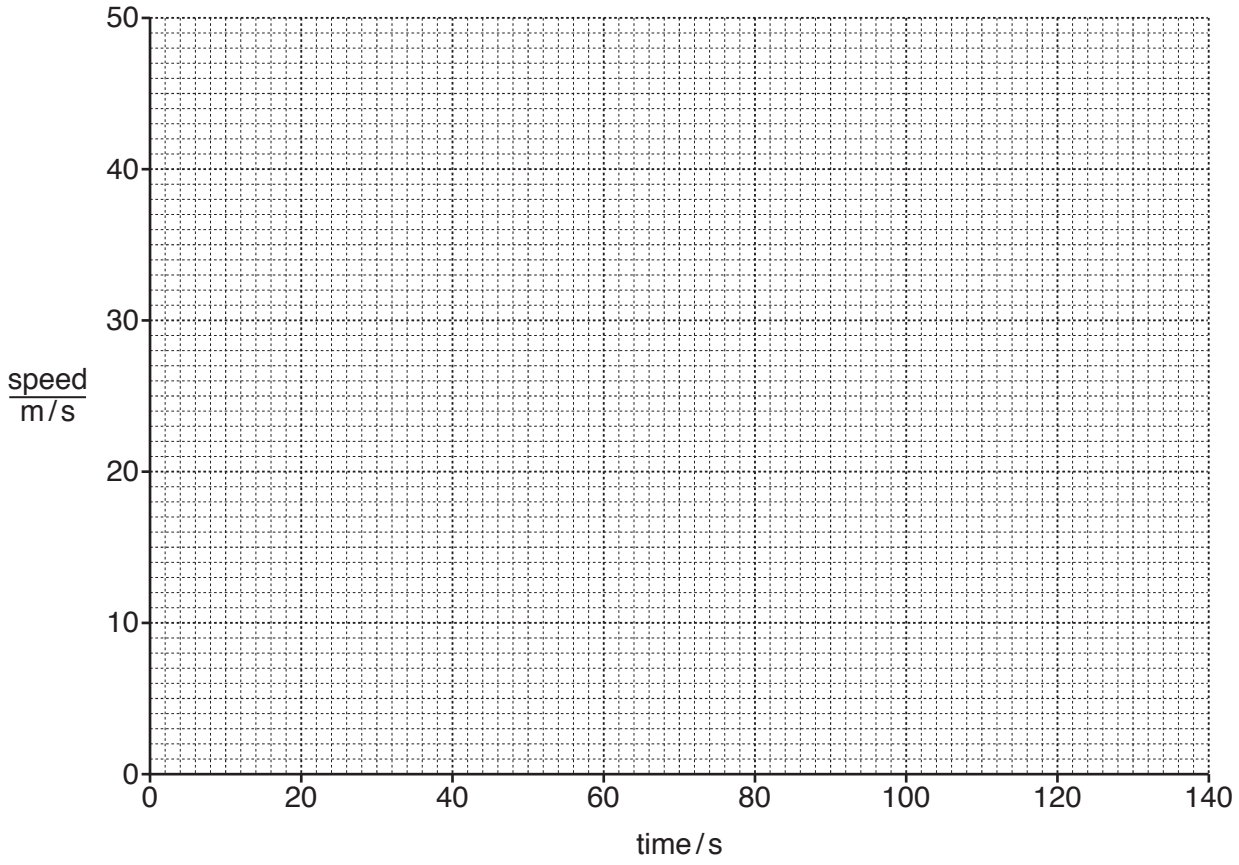


Fig. 3.2

[2]

(ii) Calculate the distance moved by the helicopter while flying at constant speed.

Show your working.

working

distance = ... m [2]

4 A student does an experiment to investigate the germination of barley seeds. The treatment of the seeds before the experiment is shown in Table 4.1.

Table 4.1

seed	treatment of seeds before the experiment	pH of soaking solution
A	boiled in water for 10 minutes	7
B	soaked at room temperature for a few hours	3
C	soaked at room temperature for a few hours	7

- After treatment, a piece of each seed is placed on an agar plate containing starch.
- After two days a test solution is added to the plate. This solution changes colour when starch is present.

The results are shown in Fig. 4.1.

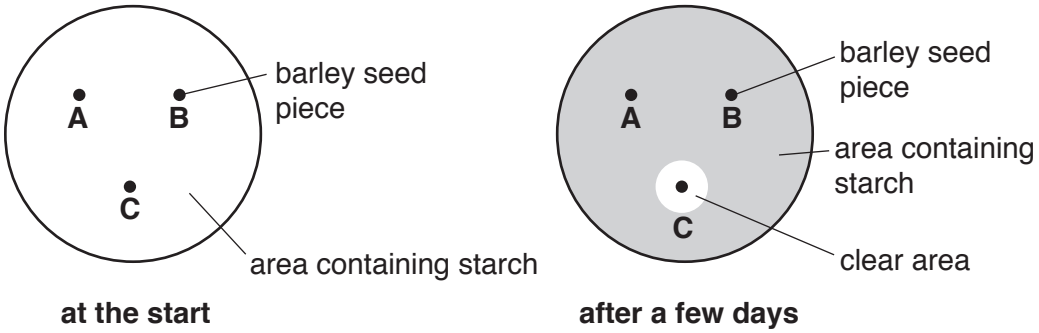


Fig. 4.1

(a) Name the test solution and the colour change that occurs when starch is present.

name of solution .....

colour change .....

[2]

(b) The student thinks that an enzyme is produced by the barley seed **C** which causes the starch to be broken down in the clear area.

Explain how the results for seed **A** and seed **B**, shown in Fig. 4.1, support this idea.

seed **A** .....

.....

.....

seed **B** .....

.....

.....

[3]

(c) The breaking down of starch is an example of chemical digestion.

Explain why chemical digestion is necessary in the human alimentary canal.

.....

.....

.....[2]

(d) In the human alimentary canal, food is broken down by both chemical and mechanical digestion. The teeth are involved in mechanical digestion.

Fig. 4.2 shows one type of tooth found in the human mouth.

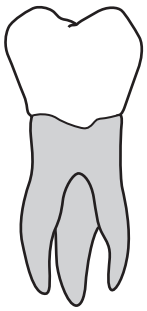


Fig. 4.2

Name this type of tooth and explain how the structure of the tooth makes it suitable for its function.

name .....

explanation .....

.....

.....
[3]

5 **(a)** The Periodic Table lists all of the elements in atomic number order.

Define *atomic number*.

.....

.....[1]

(b) Part of the Periodic Table is shown in Fig. 5.1. The letters in this table are **not** the symbols of the elements.

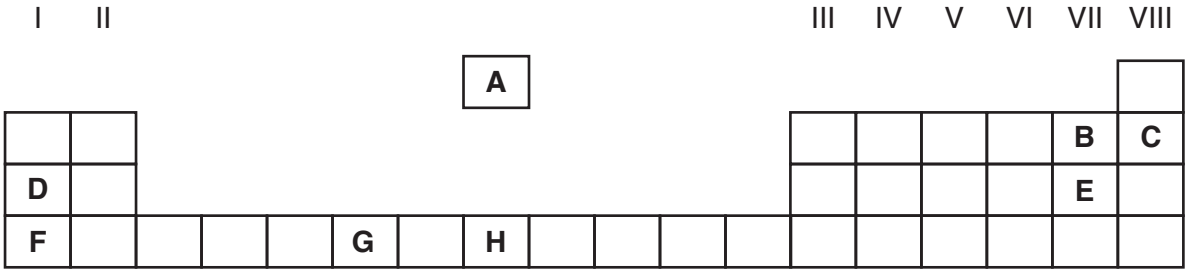


Fig. 5.1

(i) Use the letters in Fig. 5.1 to identify

one element that is an unreactive gas, ...

the element with the lowest mass (nucleon) number ..... .

[2]

(ii) State the type of chemical bond that forms between element **D** and element **E**.

.....[1]

(iii) Element **F** and element **B** combine in an exothermic reaction.

State what is meant by *exothermic*.

.....

.....[1]

(c) Chlorine gas is bubbled through a solution of potassium bromide, as shown in Fig. 5.2.

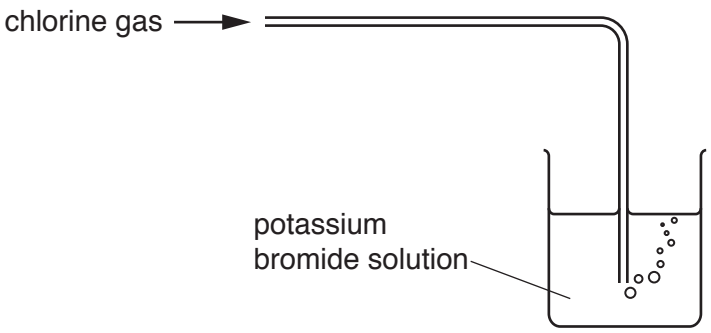


Fig. 5.2

(i) State the colour of chlorine gas.

.....[1]

(ii) The solution of potassium bromide turns from colourless to orange-brown.

Name the orange-brown substance.

.....[1]

(d) A student tries to produce chlorine gas using the apparatus shown in Fig. 5.3.

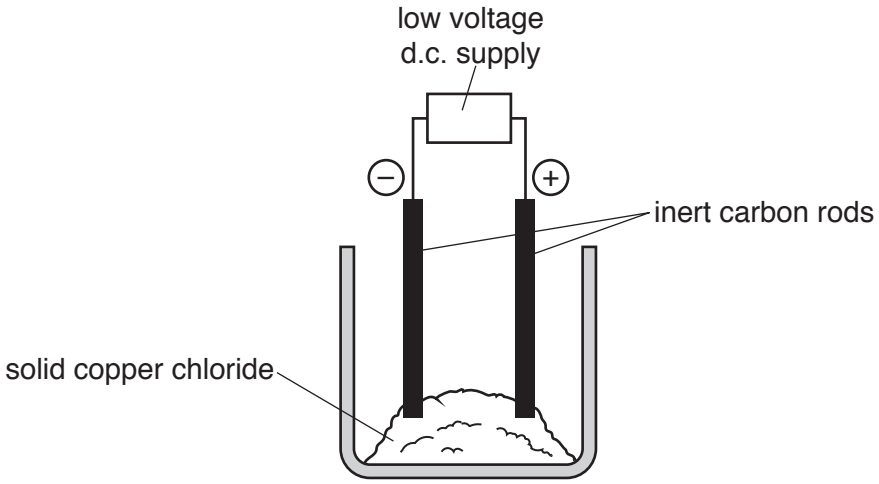


Fig. 5.3

No chlorine gas is made.

(i) Name the process that the student is trying to use.

.....[1]

(ii) Suggest **one** change that the student must make to produce chlorine gas.

.....

.....[1]

6 Fig. 6.1 shows a radiator which uses hot water to provide heating for people sitting in a room watching television.

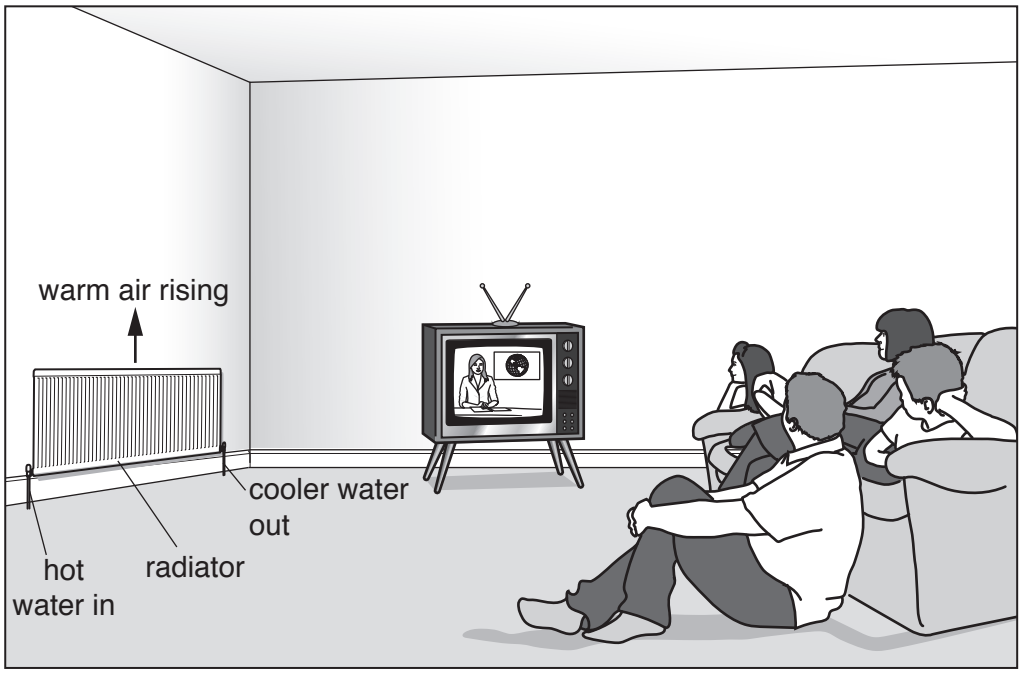


Fig. 6.1

(a) (i) Name the method of thermal energy transfer from the hot water inside the radiator, through the radiator, to the air outside the radiator.

.....[1]

(ii) Suggest a suitable material for making the radiator so that this thermal energy transfer is efficient.

.....[1]

(b) (i) On Fig. 6.1 complete a sequence of **five** arrows to show how the warm air from the radiator is able to transfer thermal energy to the people sitting in the room and return as cool air to the radiator. [2]

(ii) State the term used to describe this type of thermal energy transfer.

.....[1]

(c) Television signals use electromagnetic waves.

Fig. 6.2 shows an incomplete electromagnetic spectrum.

gamma		ultra-violet	visible	infra-red	micro-waves	radio

Fig. 6.2

(i) On Fig. 6.2, in the first row of the table, write the name of the missing type of electromagnetic waves in the blank box. [1]

(ii) The aerial on the television set receives a signal from a television transmitter on a nearby hill.

On Fig. 6.2 in the second row of the table place a tick in the box under the electromagnetic waves used by this television set. [1]

(d) The screen of the television set is very dusty. A man uses a cloth to clean the screen, but he notices that the dust is attracted back to the screen.

His friend tells him that this is due to an electrostatic charge on the screen.

Describe one or more experiments that the friend could do to show the man

- how electrostatic charges are produced,
- that there are two types of electric charge.

You may wish to include diagrams to help your answer.

.....

.....

.....

.....

.....[3]

7 (a) During transpiration water is lost from the leaves of a plant.

An experiment is carried out to compare the transpiration rates of the upper and lower surfaces of leaves of three similar plants, **N**, **U** and **B**, using the apparatus shown in Fig. 7.1.

The leaves of two plants are treated with petroleum jelly, a waterproof substance which prevents evaporation from the surface of the leaf.

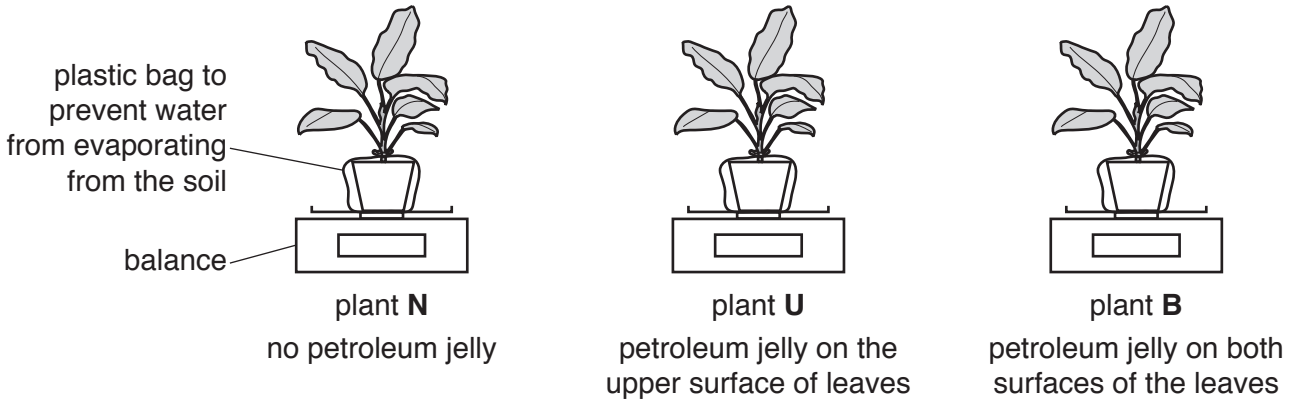


Fig. 7.1

The masses of plants **N**, **U** and **B** are measured.

After six hours the mass of each plant is measured again and the mass of water lost from each plant is calculated.

The results are shown in Fig. 7.2.

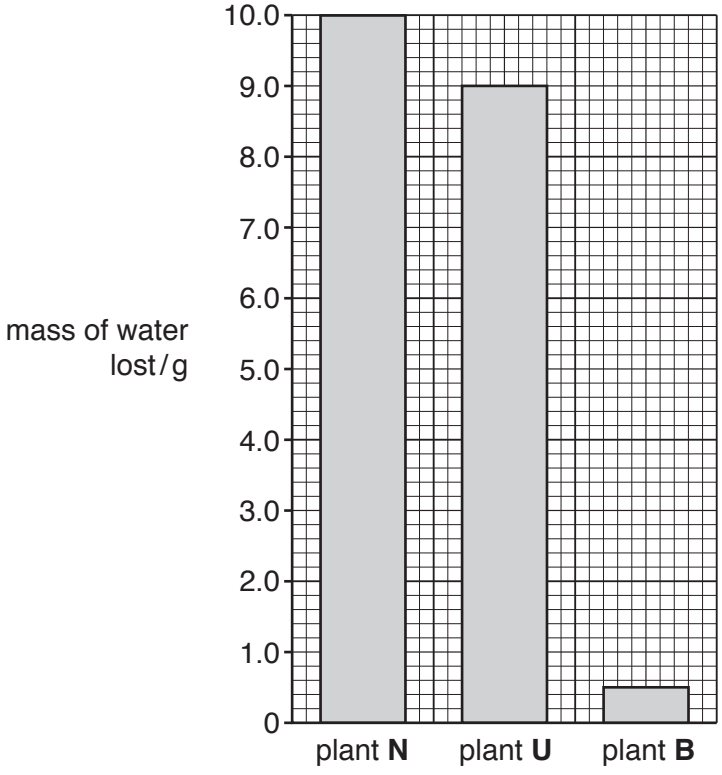


Fig. 7.2

(i) Use the results in Fig. 7.2 to state which surface of the leaf, upper or lower, loses more water.

Explain your answer.

surface .....

explanation .....

.....

.....

.....

[2]

(ii) Explain your conclusion to **(i)** in terms of leaf structure.

.....

.....

.....[2]

(b) Water is taken in at the roots and travels upwards to the leaves through the stem.

Fig. 7.3 shows the tissues found in a cross-section of a plant stem.

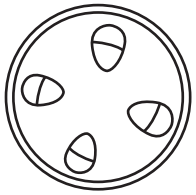
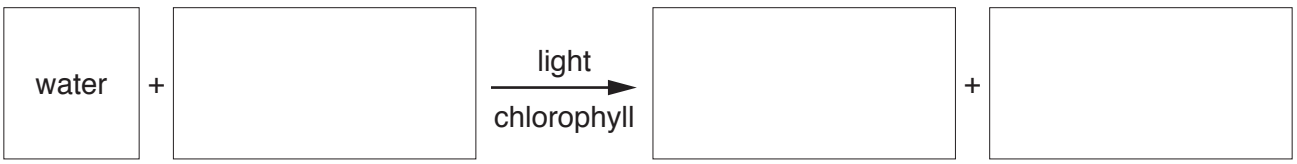


Fig. 7.3

Label the tissue that transports water with the correct name. [2]

(c) Water is one of the raw materials needed for photosynthesis.

Complete the word equation for photosynthesis.



[1]

(d) Green plants are producers which rely on the Sun to provide light energy for photosynthesis.

Explain why carnivores cannot survive without producers.

.....

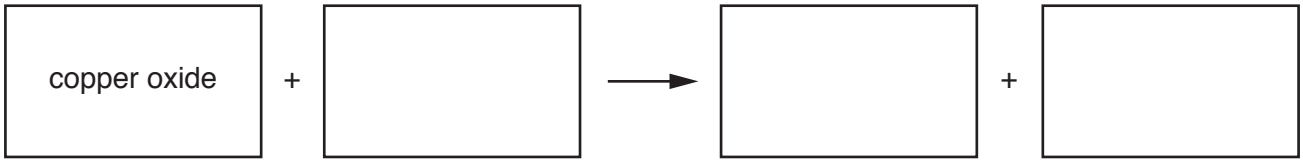
.....

.....[2]

8 (a) (i) Copper is extracted when copper oxide is heated with carbon.

Carbon dioxide is produced and released into the air.

Complete the word equation for this reaction.



[1]

(ii) Fossil fuels also release carbon dioxide during combustion.

Suggest **one other** process that releases carbon dioxide into the air.

.....[1]

(iii) Natural gas is a fossil fuel.

Name one **solid** fossil fuel and one **liquid** fossil fuel.

solid .....

liquid .....

[2]

(b) Fig. 8.1 shows the structure of a molecule of compound **X**.

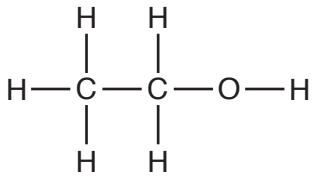


Fig. 8.1

(i) Name compound **X**.

.....[1]

(ii) State what is meant by a *hydrocarbon*.

.....

.....[1]

(iii) Explain why compound **X** is **not** a hydrocarbon.

.....

.....[1]

9 In a theatre, spotlights are used to shine a beam of light on one person on the stage.

Fig. 9.1 shows a spotlight shining a parallel beam of light on a singer.

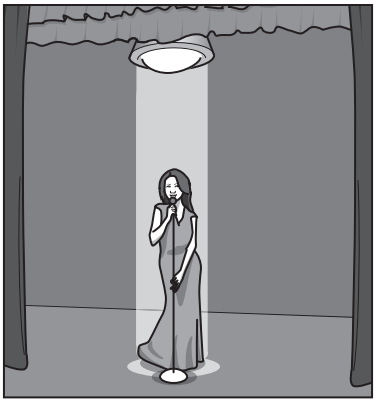


Fig. 9.1

(a) Fig. 9.2 shows a powerful lamp shining through a narrow hole in front of a lens inside the spotlight.

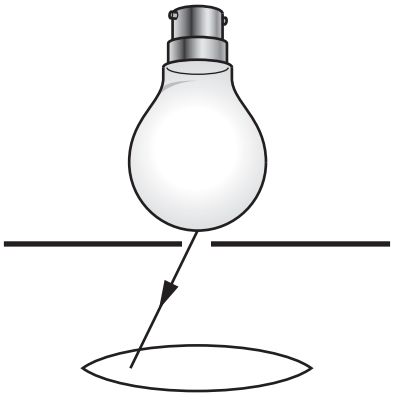


Fig. 9.2

(i) On Fig. 9.2 use a ruler to draw three rays that come through the narrow hole, pass through the lens and emerge parallel to each other to form a narrow beam of light.

One ray has been started for you. [2]

(ii) Name the distance from the narrow hole to the lens.

.....[1]

(b) Fig. 9.3a shows the way the lamps in two spotlights are connected to a power supply. The circuit contains a dimmer control so that the brightness of the lights can be changed.

Fig. 9.3b shows part of the circuit diagram for this.

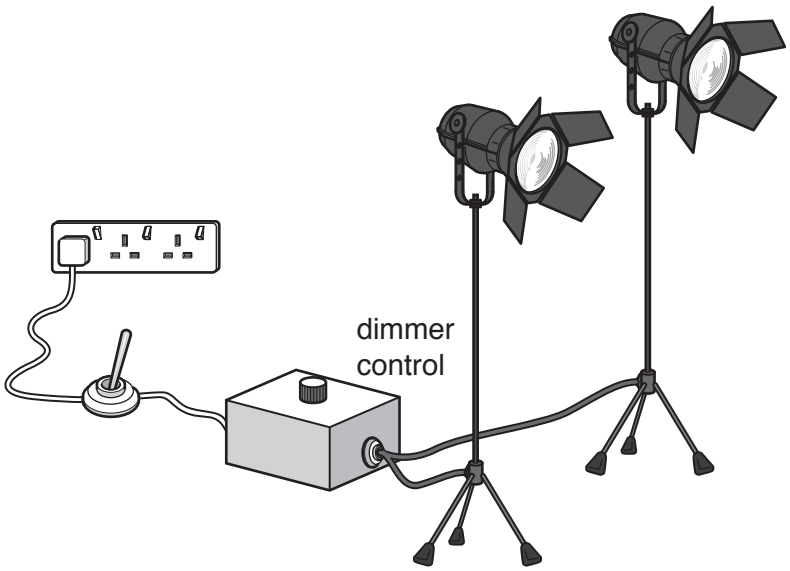


Fig. 9.3a

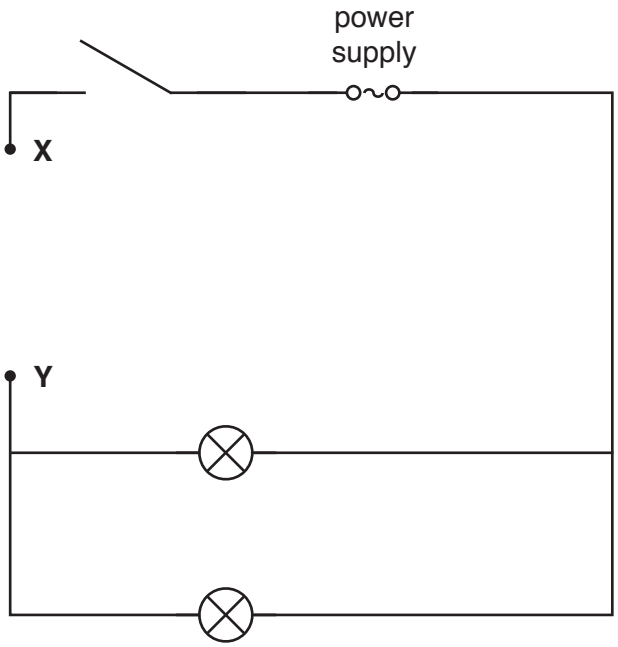


Fig. 9.3b

(i) The dimmer control contains a variable resistor.

On Fig 9.3b complete the circuit diagram by connecting the variable resistor into the circuit between **X** and **Y** using the correct circuit symbol. [1]

(ii) The current from the power supply is 20 A.

State the conclusion that can be drawn about the size of the current through each lamp. Give a reason for your answer.

conclusion .....

reason .....

.....

[2]

(iii) The filament of one of the lamps breaks.

State what will happen to the other lamp. Give a reason for your answer.

.....

.....

.....[1]

The Periodic Table of Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

Key

atomic number
atomic symbol
name
relative atomic mass

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

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