Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE
NAME

CENTRE
NUMBER

CANDIDATE
NUMBER

COMBINED SCIENCE 0653/32

Paper 3 (Core) **October/November 2018**

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.
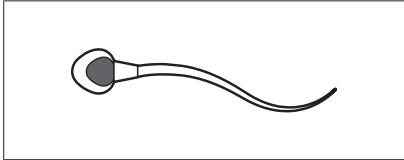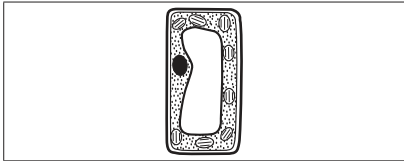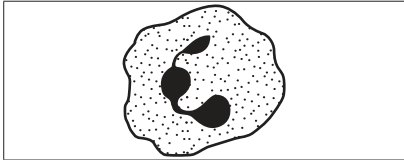A copy of the Periodic Table is printed on page 20.
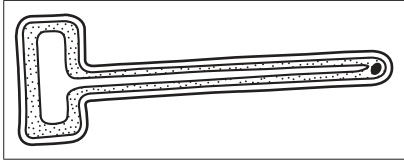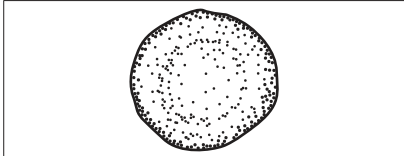
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

Cambridge
International Examinations

[Turn over

1 (a) The boxes in Fig. 1.1 contain the names of cells, diagrams of these cells, and their functions.

Draw straight lines to connect each named cell with its correct diagram and function.
One is done for you.

diagram (not to scale)	name of cell	function
sperm diagram	palisade cell	carries out photosynthesis
palisade diagram	red blood cell	defends against disease
white blood cell diagram	root hair cell	male gamete
root hair diagram	sperm cell	transports oxygen
red blood cell diagram	white blood cell	water uptake

[4]

Fig. 1.1

(b) One of the cells is shown in Fig. 1.2.
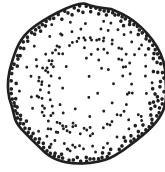
Fig. 1.2

The actual diameter of the cell is 0.0070 mm.

Calculate the magnification shown by the diagram.

magnification = ...[2]

(c) The list shows some substances that are found in living organisms.

amino acids   bile   carbon dioxide   enamel

glycogen   platelets   starch

Draw a circle around **three** substances which are transported by the blood plasma.   [2]

(d) (i) Describe the importance of chemical digestion in the body.

....

....

....

....

....[3]

(ii) State **one** organ of the body which produces digestive enzymes.

....[1]

2 (a) A student makes a salt using the apparatus shown in Fig. 2.1.
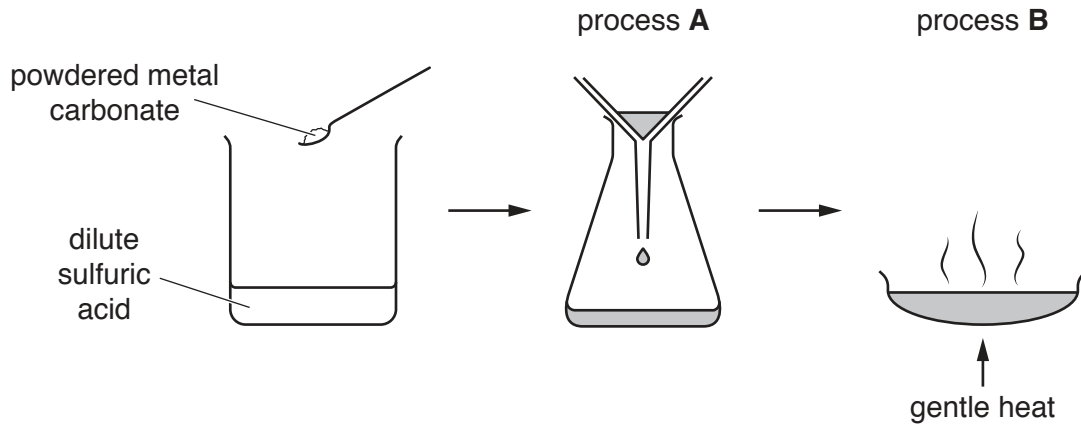
Fig. 2.1

(i) Name process **A** and process **B**.

process **A** ....

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

(ii) The student uses 1 g of the powdered metal carbonate.

Describe the effect of using a single 1 g piece of the metal carbonate on the rate of this reaction.

....[1]

(iii) Describe the effect of using the same volume of a more concentrated sulfuric acid on the rate of this reaction.

....[1]

(iv) When the metal carbonate is mixed with dilute sulfuric acid, the temperature increases.

State the name given to chemical reactions that cause the temperature to increase.

....[1]

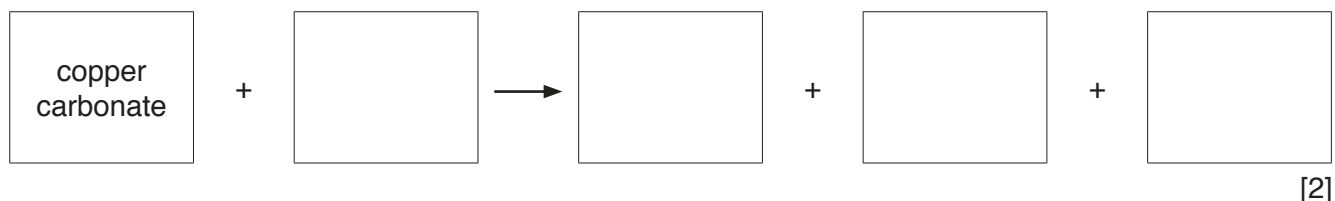**(b)** The student mixes copper carbonate with dilute sulfuric acid. Copper(II) sulfate and a colourless gas and a colourless liquid are formed.

(i) Complete the word equation for this reaction.

copper carbonate	+		⟶		+		+	

[2]

(ii) Describe a test for aqueous copper(II) ions.

State the observations that show copper(II) ions are present.

test ....

observations ....

....
[2]

(iii) Copper is a transition metal. It forms coloured compounds.

Describe **one other** property of a **transition** metal.

....[1]

3 Fig. 3.1 shows a farm tractor pulling a trailer.
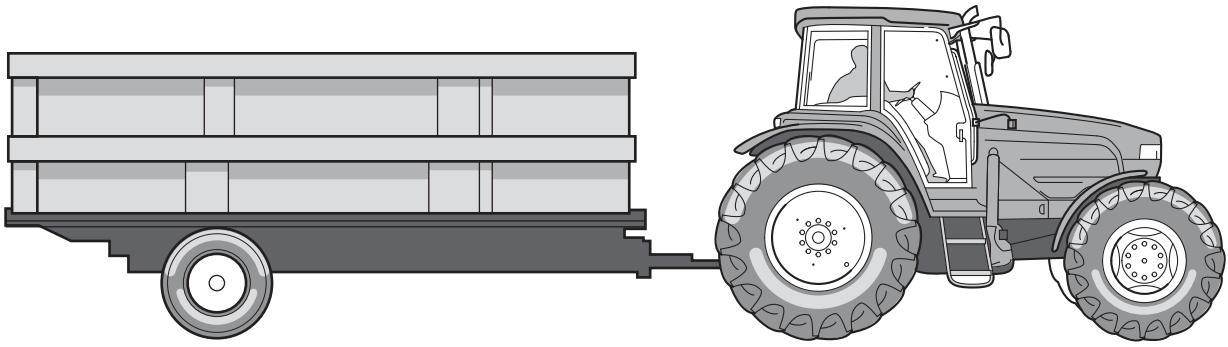
Fig. 3.1

(a) The tractor and trailer are moving across a level field. Fig. 3.2 shows the four forces **W**, **X**, **Y** and **Z** acting on the trailer.
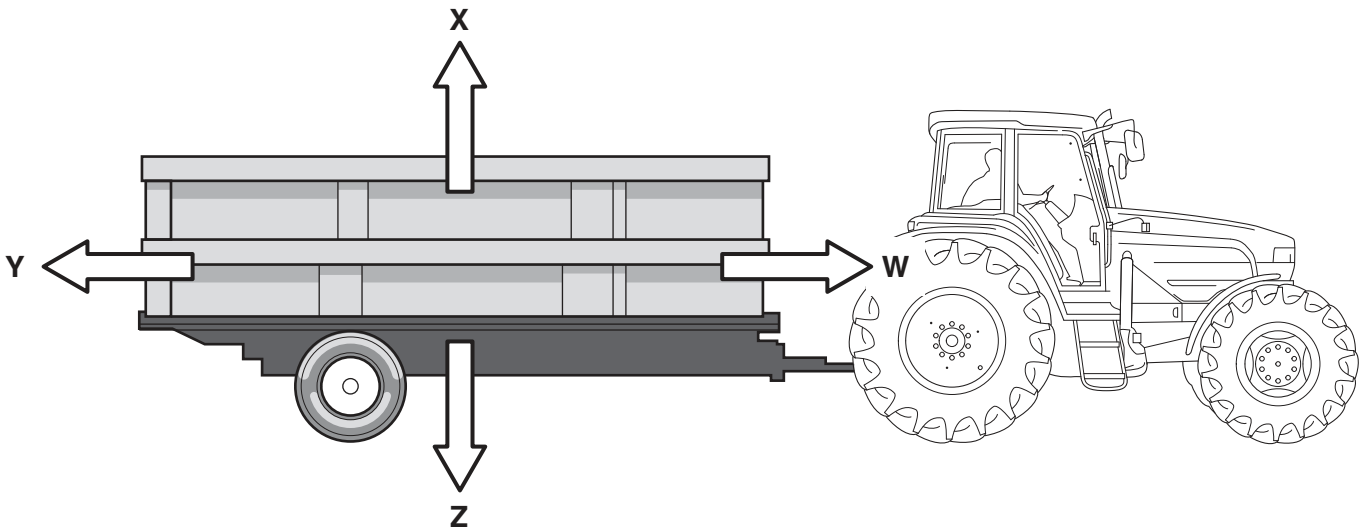
Fig. 3.2

(i) State the letter corresponding to the gravitational force acting on the trailer.

.... [1]

(ii) The tractor and trailer are moving at a constant speed.

Force **W** has a value of 2000 N.

State the value of force **Y**. Explain your answer.

value of force **Y** = ... N

explanation ....

....
[2]

(b) The tractor leaves the trailer in the field and drives to the farmyard.

Fig. 3.3 shows a speed–time graph of the tractor as it travels from the field to the farmyard.

Fig. 3.3

(i) On Fig 3.3, label with a letter **C** a point in the journey when the tractor is travelling with changing speed. [1]

(ii) The tractor travels 200 m from the field to the farmyard.

Use information from the graph to calculate the average speed of the tractor on this journey in m/s.

Show your working.
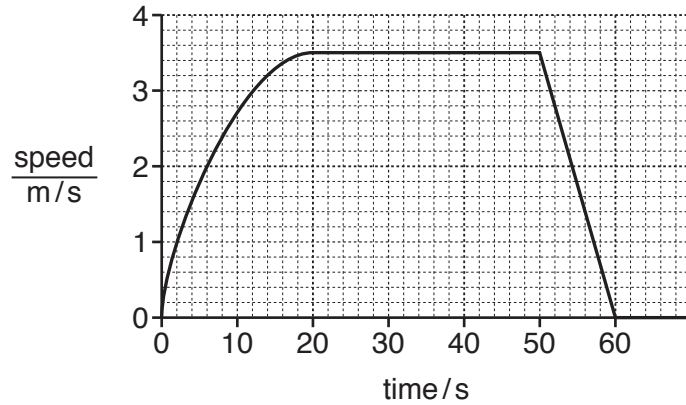
average speed = ... m/s [2]

(c) (i) The tractor is powered by a diesel engine, which burns diesel oil.

Complete the energy transfer that occurs to move the tractor.

.... energy in the diesel oil

⟶ .... energy of the tractor. [2]

(ii) State the **original** source of the energy stored in diesel oil.

....[1]

(iii) To keep the tractor moving at constant speed for 30 s, an energy input of 300 000 J from diesel fuel is needed. Only 60 000 J is required to do the work against forces resisting the motion.

Describe what happens to most of the wasted energy.

....

....[1]

4 (a) Fig. 4.1 shows a piece of potato in a solution of hydrogen peroxide. A reaction occurs and oxygen gas is produced.
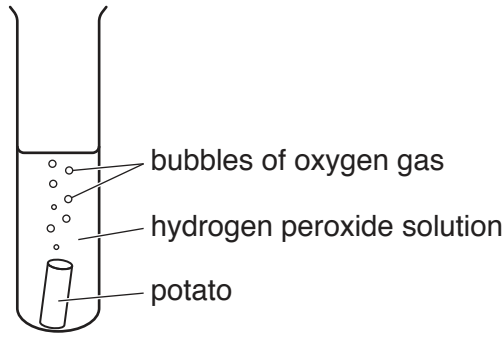

Fig. 4.1

The student thinks the reaction is caused by an enzyme in the potato. She repeats the experiment with potato that has been boiled first, and then allowed to cool.

Predict what the student sees if an enzyme in the potato is responsible for the reaction. Explain your prediction.

prediction ....

explanation ....

....
[2]

(b) A farmer has a field of potato plants near a river.

Some untreated human sewage is spilled into the river. The river overflows and deposits some of the sewage onto the potato field.

(i) Explain why the potatoes in the field are now unsafe to eat.

....

....

....[2]

(ii) The concentration of oxygen in the river decreases after the sewage is spilled into the river.

Suggest how this affects the animals living in the river. Explain your answer.

....

....

....[2]

5 (a) Natural gas and coal are fossil fuels.

(i) Name **one other** fossil fuel.

....[1]

(ii) Name the main constituent of natural gas.

....[1]

(b) Ethane, C_2H_6, is an alkane.

(i) Describe the chemical properties of alkanes.

....

....[1]

(ii) Complete the structure of a molecule of ethane.

H—C

[2]

(c) The atomic numbers and mass numbers of carbon and of hydrogen are shown in Table 5.1.

Table 5.1

	atomic number	mass number
carbon	6	12
hydrogen	1	1

(i) Define *atomic number*.

....

....[1]

   [Turn over

(ii) Complete Table 5.2 to describe the particles in an atom.

Table 5.2

particle	position in atom	relative charge	relative mass
electron		−1	
neutron	in nucleus		
proton			1

[3]

BLANK PAGE

 [Turn over

6 **(a)** **(i)** State **one** property that distinguishes a liquid from a solid.

....[1]

(ii) Describe how this property is the result of the arrangement of molecules.

....

....

....

....[2]

(b) When a liquid is heated, it expands.

Name a measuring instrument that makes use of this property of liquids.

....[1]

(c) Fig. 6.1 shows a hot drink in a cup left to cool down.

Fig. 6.1

The statements below describe ways in which the drink loses thermal energy as it cools.

Put a tick (✓) in the box alongside any **correct** statement.

Put a cross (✗) in the box alongside any **incorrect** statement.

conduction through the sides and base of the cup ☐

convection as air above the cup is heated and the warm air moves upwards ☐

ultraviolet radiation in all directions ☐

evaporation as the faster molecules escape from the surface of the liquid ☐

[2]

(d) Astronomers use telescopes to study stars. Stars are extremely hot bodies that lose energy by emitting electromagnetic radiation into space.

(i) Explain why stars can only lose energy by radiation, and not by conduction or convection.

....

....

....[1]

(ii) Some stars can emit gamma radiation.

Fig. 6.2 shows an incomplete electromagnetic spectrum.

On Fig. 6.2 place gamma radiation in the correct box.

		ultra-violet		infra-red	microwaves	

Fig. 6.2

[1]

(iii) Some telescopes use converging lenses. Light from a distant star arrives at a telescope as a beam of parallel rays.

On Fig. 6.3 complete the ray diagram to show how a clear image of the star is formed on the screen by a converging lens.
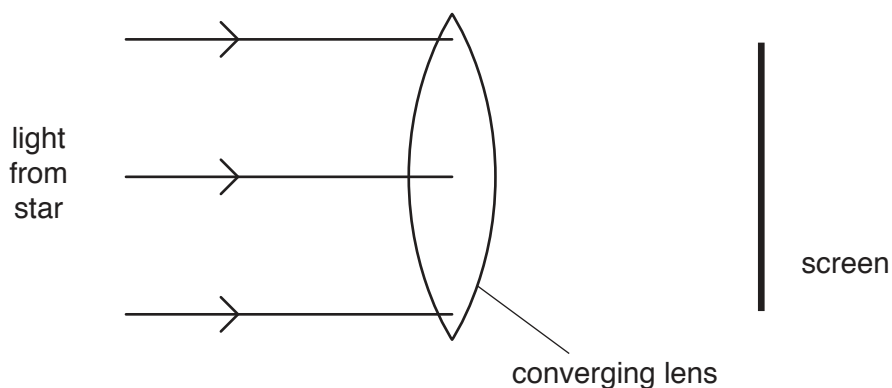

Fig. 6.3

[1]

(iv) On your ray diagram in Fig. 6.3, mark and label the focal length of the lens. [1]

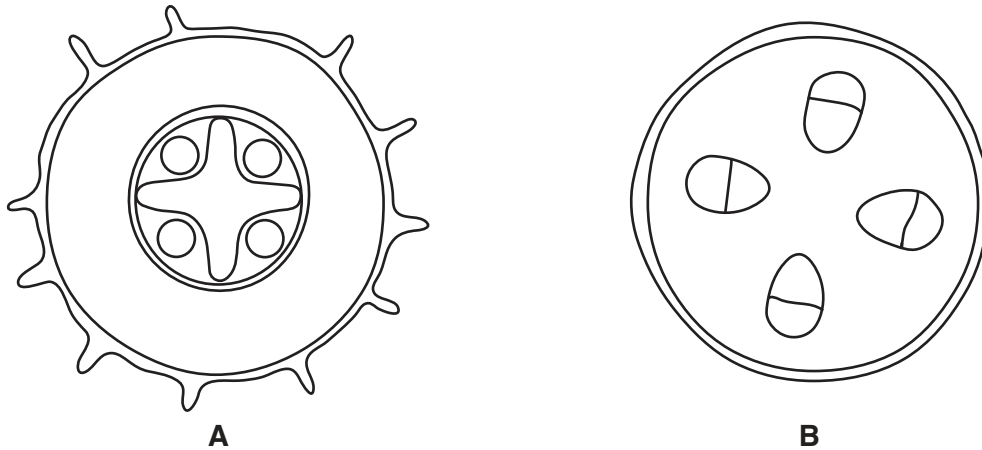**7 (a)** Fig. 7.1 shows cross-sections through a root and a stem of a flowering plant.

Fig. 7.1

(i) State which diagram, **A** or **B**, represents the root.

Give **two** reasons for your answer.

The root is diagram ....

reason 1 ....

....

reason 2 ....

....
[2]

(ii) On diagram **B**, in Fig. 7.1, shade in **one** area where the xylem is found. [1]

(b) Use the words or phrases to complete the sentences about transpiration.

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

cuticle   diffuses   dissolves   guard cells   higher   lower

mesophyll cells   stomata   similar   xylem

Water evaporates from the surfaces of .... inside the leaf. This gives the air inside the leaf a .... concentration of water vapour than the atmosphere. As a result the water vapour .... out of the leaves through tiny holes called the .... [4]

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

Complete the word equation for photosynthesis.

water	+		→		+	

[2]
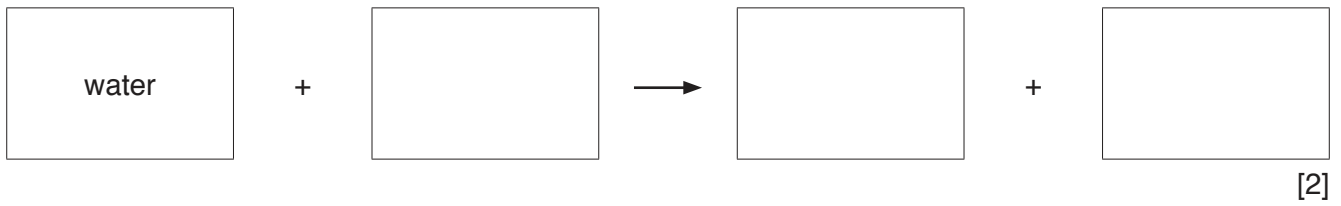
8 (a) A teacher uses the apparatus shown in Fig. 8.1 to demonstrate the electrolysis of lead(II) bromide.

low voltage
d.c. supply

solid lead(II) bromide
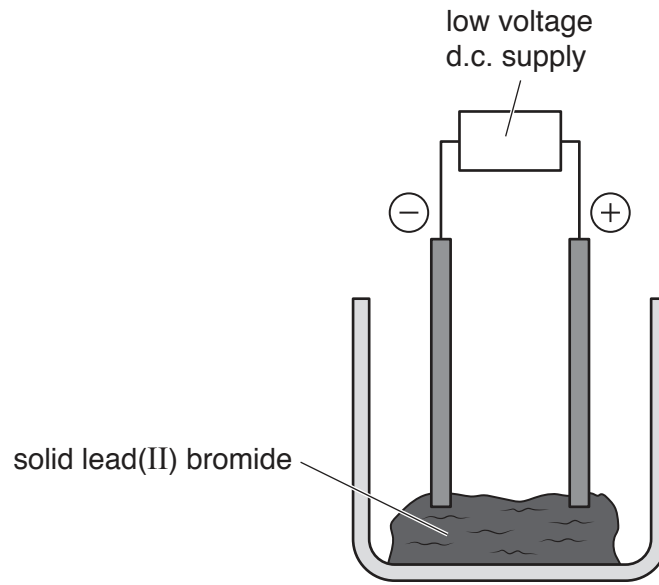
Fig. 8.1

Predict whether this electrolysis works.

Explain your answer.

prediction ....

explanation ....

....

....
[1]

(b) A student electrolyses aqueous copper chloride using the apparatus shown in Fig. 8.2.
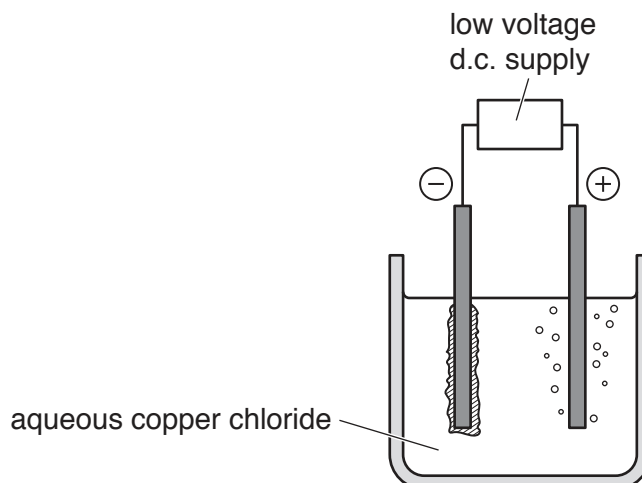
Fig. 8.2

Copper forms on the negative electrode.

A gas forms at the positive electrode. The student tests this gas with damp litmus paper.

Name the gas and predict its effect on the colour of the litmus paper.

name ....

effect ....
[2]

(c) Copper can be extracted by heating copper oxide with carbon.

The equation for this reaction is:

copper oxide + carbon ⟶ carbon dioxide + copper

Identify one substance which is oxidised and one substance which is reduced during this reaction.

oxidised ....

reduced ....
[2]

(d) Carbon dioxide is present in clean air in small quantities.

(i) Name **one other** gas which is present in clean air in small quantities.

....[1]

(ii) Name **two** substances present in clean air which cause rusting.

1. ....

2. ....
[1]

9   Fig. 9.1 shows a circuit diagram for an investigation of how the resistance of a lamp changes with the current in the lamp.
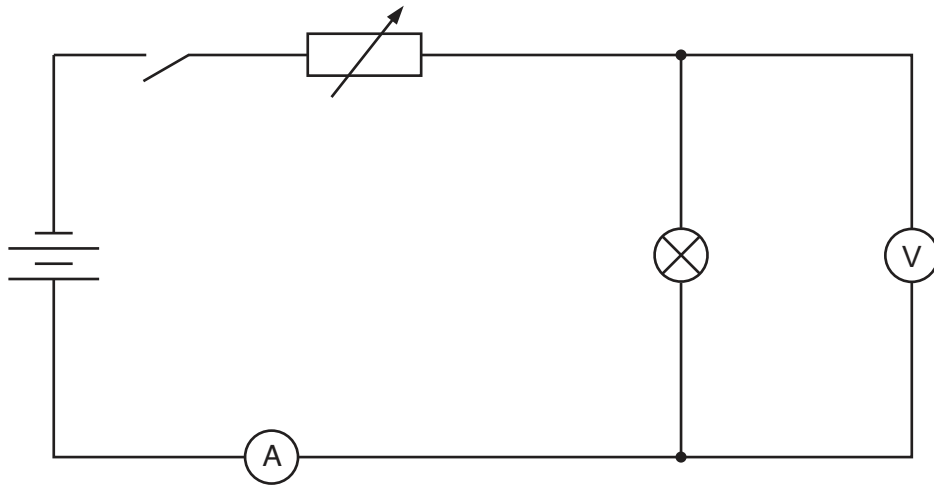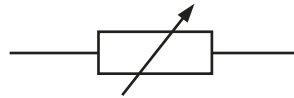

Fig. 9.1

(a) Name the circuit component with the symbol

....[1]

(b) Table 9.1 shows some results from the investigation.

Table 9.1

experiment number	voltmeter reading/V	ammeter reading/A	resistance of lamp/Ω
1	6.0	0.54	11
2	4.0	0.46	8.7
3	3.0	0.40	
4	2.0	0.32	6.3

(i) Complete Table 9.1 by calculating the missing resistance value.

State the formula you use and show your working.

formula

working

[2]

      (ii) Suggest what happens to the lamp as the experiments are carried out in turn from experiment **1** to experiment **4**.

         ....[1]

  (c) **(i)** On Fig. 9.1 add a second identical lamp in parallel with the first lamp.   [1]

      (ii) Experiment **1** is now repeated with the second lamp in the circuit in parallel with the first lamp.

        Suggest how the ammeter reading will compare with the reading in the original experiment **1**.

        Give a reason for your answer.

        effect on ammeter reading ....

        reason ....

        ....

                              [2]

The Periodic Table of Elements

Group

I	II												III	IV	V	VI	VII	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 dm³ at room temperature and pressure (r.t.p.).

0653/32/O/N/18