GradeMax

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Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8882588973

COMBINED SCIENCE **0653/33**

Paper 3 Theory (Core) **October/November 2025**

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = 9.8 m / s^2).

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].
- The Periodic Table is printed in the question paper.

This document has **20** pages. Any blank pages are indicated.

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1 **(a)** Fig. 1.1 is a diagram of an animal cell and a plant cell.

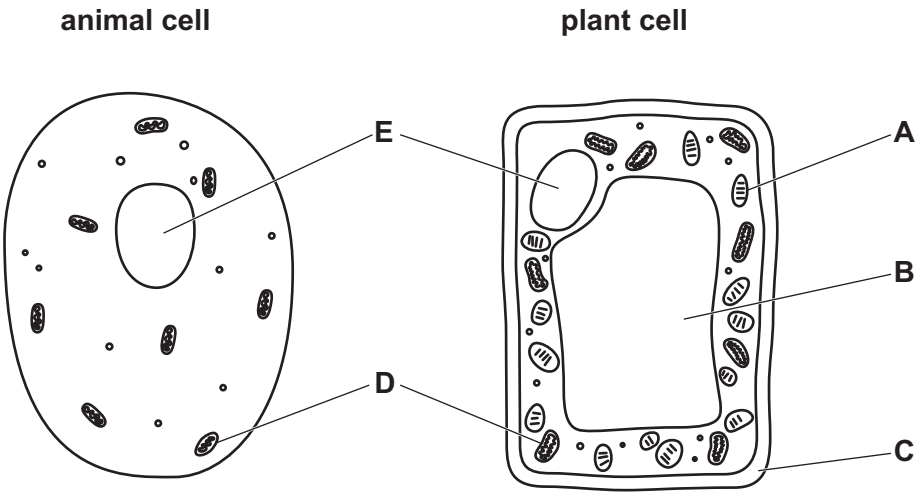


Fig. 1.1

Table 1.1 shows information about some of the parts labelled in Fig. 1.1.

Complete Table 1.1.

Table 1.1

name of part	letter of part	function of part
.....	**E**	control of cell activities
mitochondria	.....	.....
chloroplast	.....	photosynthesis

[4]

(b) Chloroplasts are needed for photosynthesis.

(i) Name the **two** raw materials used in photosynthesis.

1 .....

2 .....

[2]

(ii) Energy is needed for photosynthesis.

State the source of this energy.

..... [1]

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(c) Photosynthesis is needed for growth in plants.

Scientists measure the heights of two plants, **X** and **Y**, for 40 days.

Fig. 1.2 is a graph of the results.

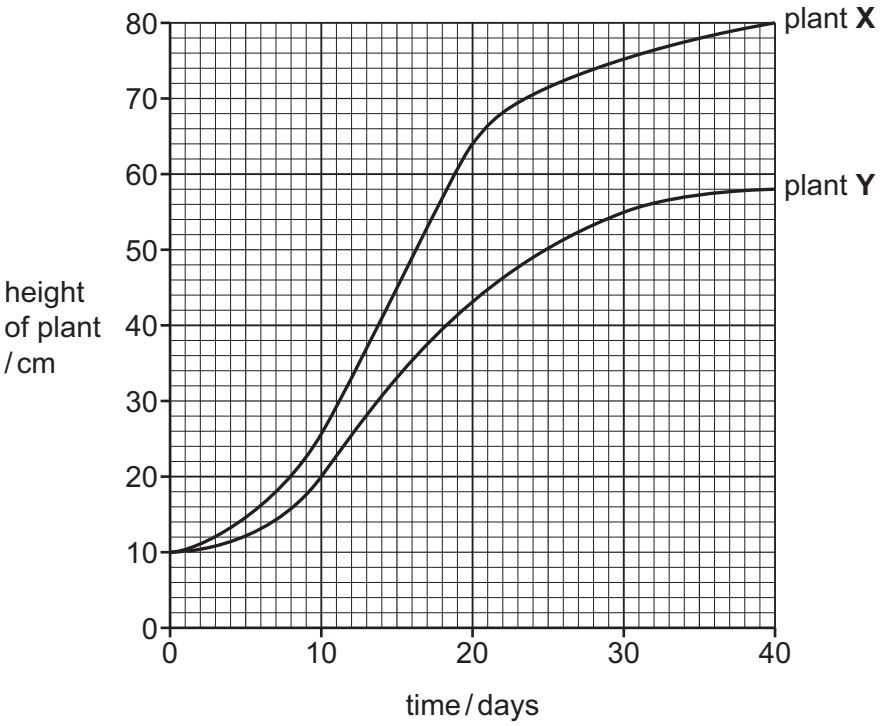


Fig. 1.2

(i) Calculate the difference in height between plant **X** and plant **Y** at 30 days.

difference in height = ... cm [2]

(ii) Identify the days when the growth rate of plant **X** was the fastest.

Place a tick (✓) in the correct box.

0 to 10 days	☐
10 to 20 days	☐
20 to 30 days	☐
30 to 40 days	☐

[1]

[Total: 10]

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2 **(a)** Fig. 2.1 is a diagram of the female reproductive system in humans.

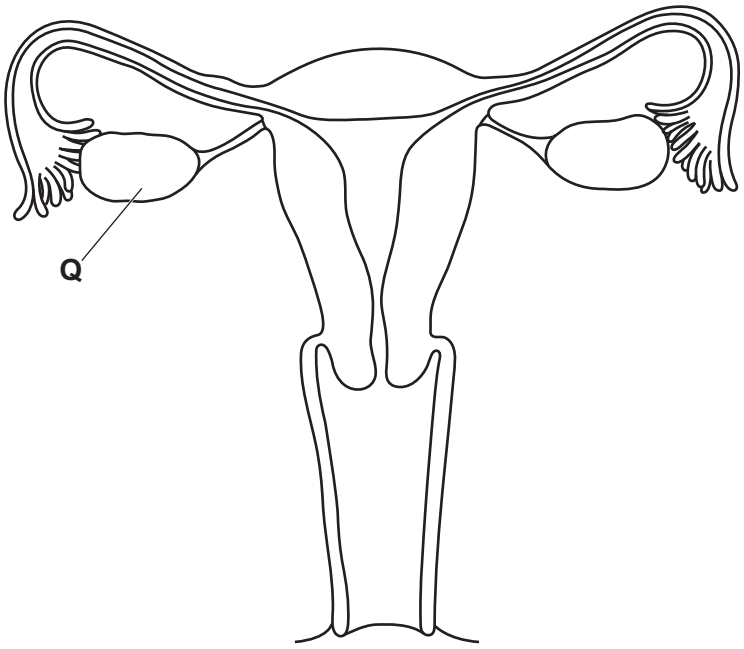


Fig. 2.1

(i) Name the part labelled **Q** in Fig. 2.1.

..... [1]

(ii) Draw a line labelled with the letter **V** to identify the vagina in Fig. 2.1. [1]

(b) Describe how the thickness of the uterus lining changes from day 1 to day 28 of the menstrual cycle.

.....

..... [1]

(c) **(i)** Complete the sentences about blood vessels.

The human circulatory system contains three main types of blood vessels: arteries, veins and ..... .

Arteries have thicker walls than veins, but veins have a .....

with a larger diameter.

Veins have ..... to ensure the one-way flow of blood.

[3]

(ii) State the component of blood that transports oxygen.

..... [1]

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(d) Iron and calcium are needed as part of a balanced diet.

(i) Circle **one** principal source of iron.

apples **milk** **nuts** **vegetable oil**

[1]

(ii) State the dietary importance of calcium.

.....

..... [1]

[Total: 9]

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3 Tigers are endangered animals that live wild only in parts of Asia. Tigers catch and eat many different animals.

(a) (i) Table 3.1 shows some information about the number of tigers that live wild.

Table 3.1

year	estimated number of tigers that live wild
1900	100 000
2000	3500
2020	4500

Suggest **two** reasons for the difference in the number of tigers between 1900 and 2000.

1 .....

2 .....

[2]

(ii) Circle all the words that describe the tiger.

carnivore **consumer** **decomposer**

herbivore **producer**

[2]

(b) Tigers are part of an ecosystem.

(i) Circle **two** words in **bold** to give a correct description of an ecosystem.

An ecosystem is a community of **habitats / organisms** and their

climate / environment, interacting together.

[1]

(ii) State the word that describes the number of different species that live in an area.

..... [1]

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(c) Tigers have a similar alimentary canal to humans.

The flow chart in Fig. 3.1 shows the direction that food moves as it passes through the alimentary canal.

Complete Fig. 3.1.

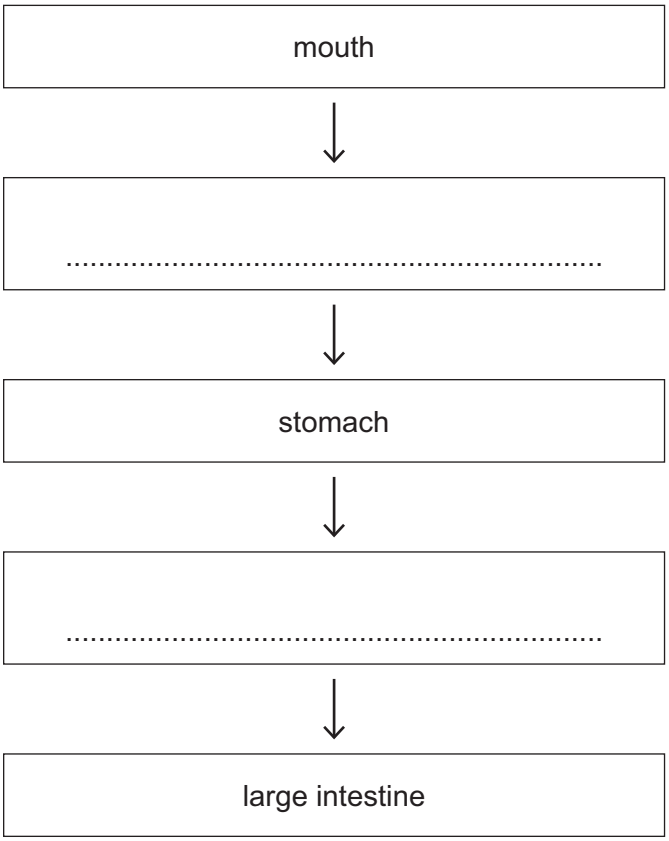


Fig. 3.1

[2]

[Total: 8]

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4 A student investigates the reaction between magnesium and steam.

Fig. 4.1 is a diagram of the apparatus used in the investigation.

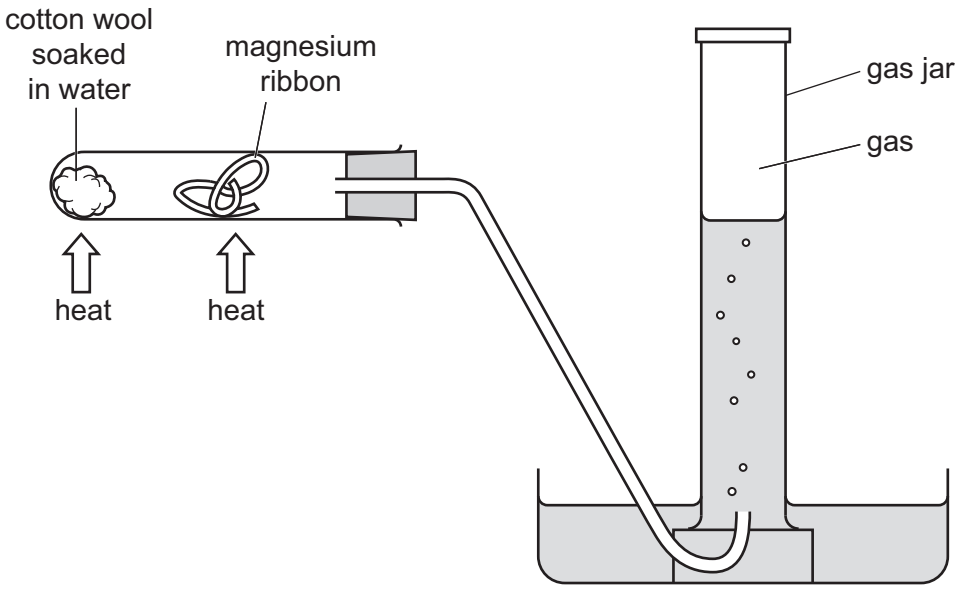


Fig. 4.1

(a) The reaction produces magnesium oxide and a gas.

(i) Complete the word equation for this reaction.

	+		→	magnesium oxide	+	

[2]

(ii) The gas jar in Fig. 4.1 collects the gas, but it does **not** allow the volume to be measured directly.

Name **one** piece of apparatus that allows the volume of gas to be measured directly.

..... [1]

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(iii) Complete the sentences about the reaction of magnesium with steam.

Use words from the list.

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

anions cations covalent electrons ionic

neutrons neutralisation oxidation protons reduction

During the reaction, magnesium atoms lose ..... to form positive ions.

These positive ions are known as ..... .

Oxygen atoms from the water molecules form negative ions.

Positive ions and negative ions attract each other and form ..... bonds.

During the reaction, magnesium atoms gain oxygen. This type of reaction is ..... .

[4]

(b) The student repeats the experiment using copper instead of magnesium.

Predict what the student observes during the reaction.

Explain your answer.

observation .....

.....

explanation .....

.....

[2]

[Total: 9]

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5 **(a)** Fig. 5.1 shows an organic compound.

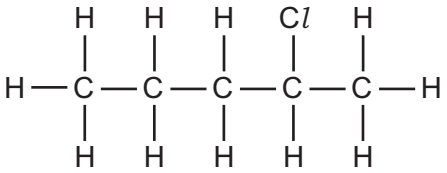


Fig. 5.1

(i) Deduce the molecular formula of the organic compound shown in Fig. 5.1.

..... [1]

(ii) Explain why the organic compound shown in Fig. 5.1 is **not** a hydrocarbon.

.....

..... [1]

(b) Fig. 5.2 is a diagram of the chemical structure of ethene.

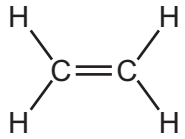


Fig. 5.2

(i) Name the group of hydrocarbons to which ethene belongs.

..... [1]

(ii) Complete the symbol equation for the complete combustion of ethene in the presence of oxygen.

$$C_2H_4 + ...O_2 \rightarrow .....CO_2 + ...H_2O$$

[1]

(iii) Complete the sentences about poly(ethene) using **one** word in each gap.

Poly(ethene) is a polymer made from ethene. Polymers are large molecules built up from many smaller molecules called ..... . The formation of poly(ethene) is an example of ..... polymerisation.

[2]

[Total: 6]

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6 **(a)** Fig. 6.1 shows Group I of the Periodic Table.

3 Li lithium 7
11 Na sodium 23
19 K potassium 39
37 Rb rubidium 85
55 Cs caesium 133
87 Fr francium –

Fig. 6.1

(i) Write a **number** in each gap to complete the sentence.

An atom of potassium contains ..... protons and ..... neutrons.

[2]

(ii) The electronic configuration of a potassium atom is 2,8,8,1.

State **two** ways that the electronic configuration is related to the position of potassium in the Periodic Table.

1 .....

.....

2 .....

.....

[2]

(iii) Complete Table 6.1 with information about an electron.

Table 6.1

	relative charge	**relative mass**
proton	+1	1
electron		

[2]

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(b) Fig. 6.2 shows the reaction of potassium with water.

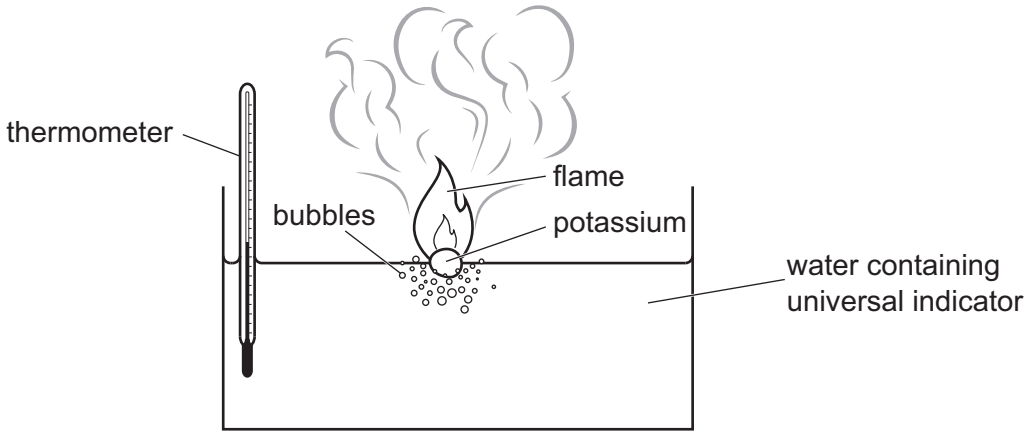


Fig. 6.2

(i) State the flame test colour for potassium.

..... [1]

(ii) A gas is produced during the reaction.

Describe a test to identify the gas.

Give the observation for a positive result.

test .....

observation .....

[2]

(iii) The temperature of the water increases during the reaction.

Name the type of reaction that causes an increase in the temperature of the surroundings.

..... [1]

(iv) The universal indicator turns purple during the reaction.

Suggest the pH of the solution formed during the reaction.

pH = ... [1]

[Total: 11]

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7 A student wants to determine the density of a liquid.

(a) Fig. 7.1 shows the equipment the student uses to measure the volume and the mass of the liquid.

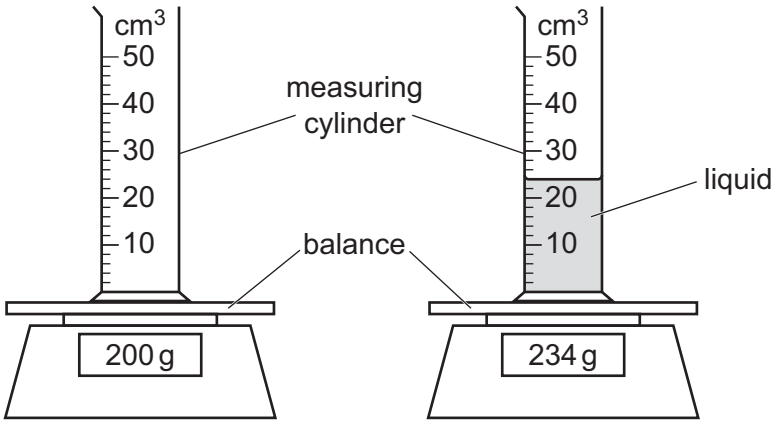


Fig. 7.1

(i) Determine the volume of the liquid.

volume = ...cm^3 [1]

(ii) Determine the mass of the liquid.

mass = ... g [1]

(iii) Calculate the density of the liquid.

Include the unit in your answer.

density = ... unit ..... [3]

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(b) Some of the liquid evaporates from the measuring cylinder.

Describe the process of evaporation.

Use ideas about particles in your answer.

.....

.....

.....

..... [2]

[Total: 7]

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8 **(a)** Fig. 8.1 shows a ray of light reflected by a plane mirror.

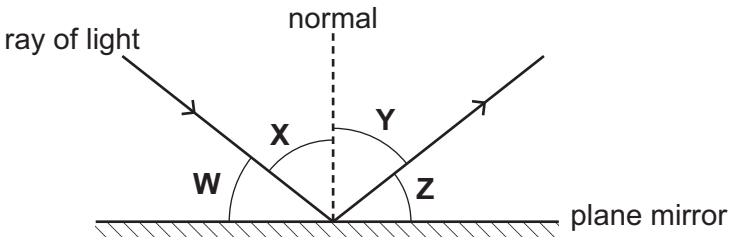


Fig. 8.1

(i) Tick (✓) **one** box to show the name of angle **X**.

angle of dispersion ☐

angle of incidence ☐

angle of reflection ☐

angle of refraction ☐

[1]

(ii) Angle **W** is 30°.

Determine the size of angle **Y**.

angle **Y** = ...° [1]

(b) A ray of light in air enters a glass block, as shown in Fig. 8.2.

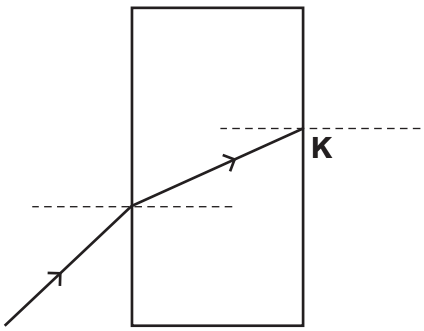


Fig. 8.2

Draw on Fig. 8.2 the emergent ray of light leaving the glass block at **K**. [1]

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(c) Fig. 8.3 shows the regions of the electromagnetic spectrum in order of low to high frequency.

radio	microwave	infrared	visible	ultraviolet	X-ray	gamma

Fig. 8.3

(i) An application of the ultraviolet region of the electromagnetic spectrum is detecting fake bank notes.

State an application of each of the following regions.

microwave .....

infrared .....

[2]

(ii) The Sun radiates most of its energy in three regions of the electromagnetic spectrum.

State the names of these **three** regions.

1 .....

2 .....

3 .....

[2]

(iii) List the colours of the **visible** spectrum in order of low to high frequency.

.....

..... [2]

(d) The Moon reflects light from the Sun to the Earth.

The Moon is a distance of 380 000 km from the Earth.

The speed of light is 3.0×10^5 km / s.

Calculate the time it takes light to travel from the Moon to the Earth.

time = ... s [2]

[Total: 11]

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9 **(a)** Fig. 9.1 shows an electric kettle used to boil water.

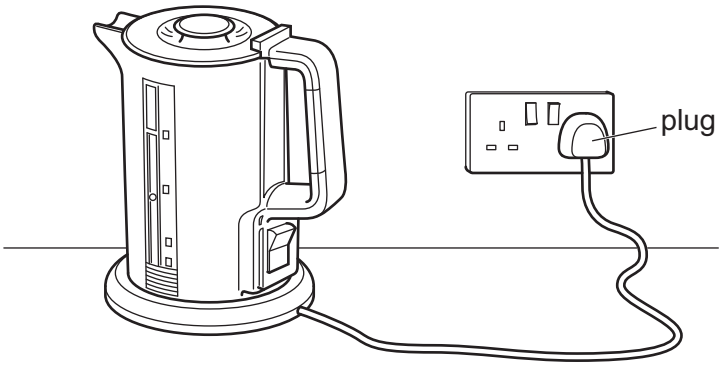


Fig. 9.1

The kettle is connected to a mains supply of 230 V.

The kettle has a fuse in its plug.

(i) Complete the sentences to describe how the fuse protects the kettle against a large current.

Use words from the list.

boil **circuit** **cooling** **freeze**

heating **kettle** **melt**

The large current causes a ..... effect in the wire in the fuse.

This causes the wire to ..... and the fuse 'blows'.

This breaks the ..... and prevents the large current damaging the kettle. [2]

(ii) The power input to the kettle is 2300 W.

Calculate the current in the kettle under normal working conditions.

current = ...A [2]

(iii) Use your answer to **(a)(ii)** to suggest a suitable rating for the fuse in the kettle.

Circle the correct answer.

1 A **3 A** **5 A** **10 A** **13 A** **30 A**

[1]

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(b) Fig. 9.2 shows an electrical circuit with two resistors in series.

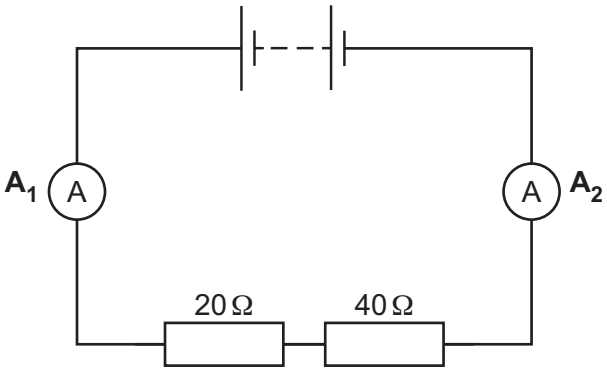


Fig. 9.2

(i) The reading on ammeter $\mathbf{A_1}$ is 0.10A.

State the reading on ammeter $\mathbf{A_2}$.

reading on ammeter $\mathbf{A_2}$ = ...A [1]

(ii) Calculate the voltage of the battery in Fig. 9.2.

voltage = ...V [3]

[Total: 9]

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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 –	113 Nh nihonium –	114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

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.).

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