Cambridge Assessment International Education

# Cambridge IGCSE™

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CANDIDATE NAME | | | | | | | | | |
| CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | | |

**PHYSICS** **0625/31**

Paper 3 Theory (Core) **May/June 2022**

**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 10 N (acceleration of free fall = 10 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 [ ].

This document has **16** pages.

© UCLES 2022

**1** Fig. 1.1 shows a dripping tap and a measuring cylinder. The water drops all have the same volume. The drops fall from the tap at equal time intervals.

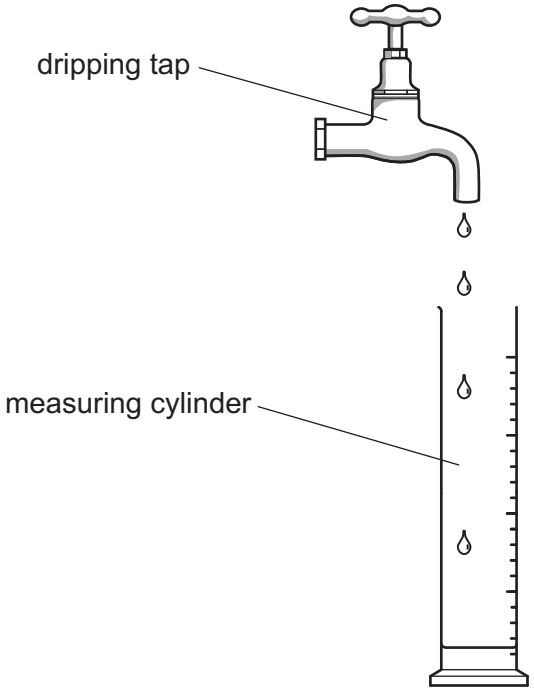


**Fig. 1.1** (not to scale)

**(a) (i)** The student collects 200 of the drops in a measuring cylinder. The total volume collected is 60 $cm^3$.

Calculate the average volume of **one** drop of water.

View solution

volume = ..... $cm^3$ [3]

**(ii)** Another student uses a stop-watch to measure the time taken for the tap to produce 200 drops. Fig. 1.2 shows the time reading on the stop-watch.

View solution




**Fig. 1.2**

Determine the time, in seconds, for the tap to produce 200 drops.

time = ..... s [2]

© UCLES 2022

**(iii)** Determine the average time interval between one drop starting to fall and the next drop starting to fall.

View solution

time interval = ..... s [2]

**(b)** Fig. 1.3 shows the volume of water collected in the measuring cylinder by another student.

View solution

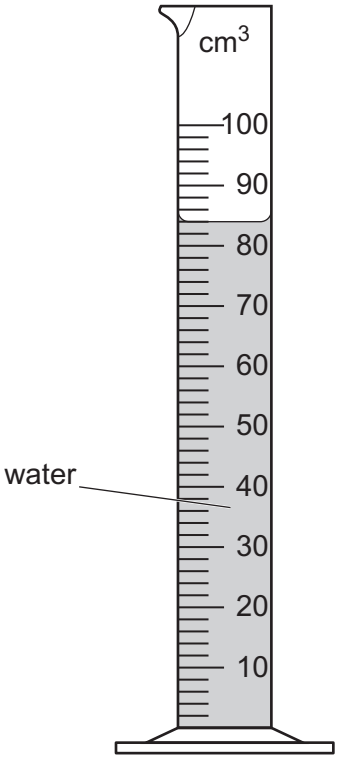


**Fig. 1.3**

Determine the volume of water in the measuring cylinder in Fig. 1.3.

volume = ..... $cm^3$ [1]

[Total: 8]

**2** Fig. 2.1 shows the speed–time graphs for two cars, A and B.

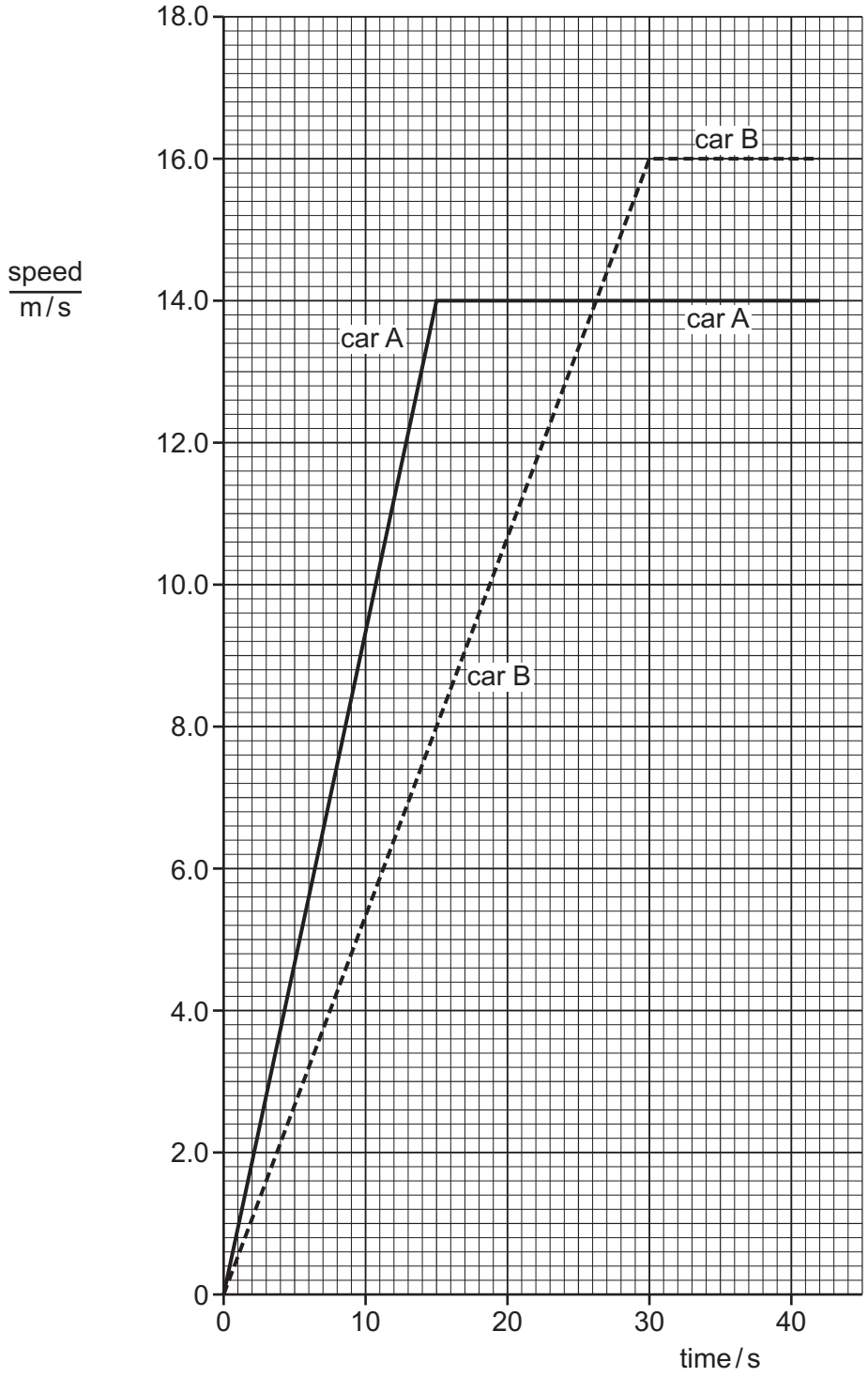


**Fig. 2.1**

**(a) (i)** Determine the speed of car A at time = 10 s.

View solution

speed = ..... m / s [2]

**(ii)** State and explain which car, A or B, has the greater acceleration during the first 10 seconds. Use information from the graph in Fig. 2.1 in your explanation.

.....

..... [2]

**(b) (i)** Describe the motion of car B after 30 s.

View solution

.....

..... [2]

**(ii)** Calculate the distance moved by car B from time = 0 to time = 30.0 s.

View solution

distance = ..... m [3]

[Total: 9]

**3** **(a)** Fig. 3.1 shows a metal block and its dimensions.

View solution

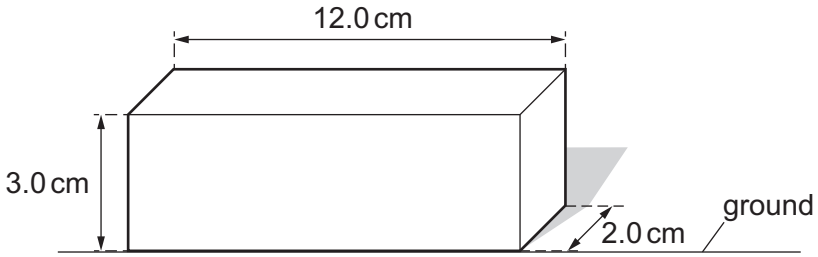


**Fig. 3.1** (not to scale)

**(i)** Calculate the area of the metal block in contact with the ground.

area = ..... $cm^2$ [2]

**(ii)** The mass of the metal block is 0.84 kg.

View solution

Calculate the weight of the metal block.

weight = ..... N [2]

**(b)** A different metal block has a weight of 24 N. The area of this metal block in contact with the ground is 4.0 $cm^2$.

View solution

Calculate the pressure of this block on the ground.

pressure = ..... $N/cm^2$ [3]

[Total: 7]

© UCLES 2022

**4** Fig. 4.1 shows an electric motor and pulley wheel being used to raise a load M. The electric motor uses a belt to turn the pulley wheel.

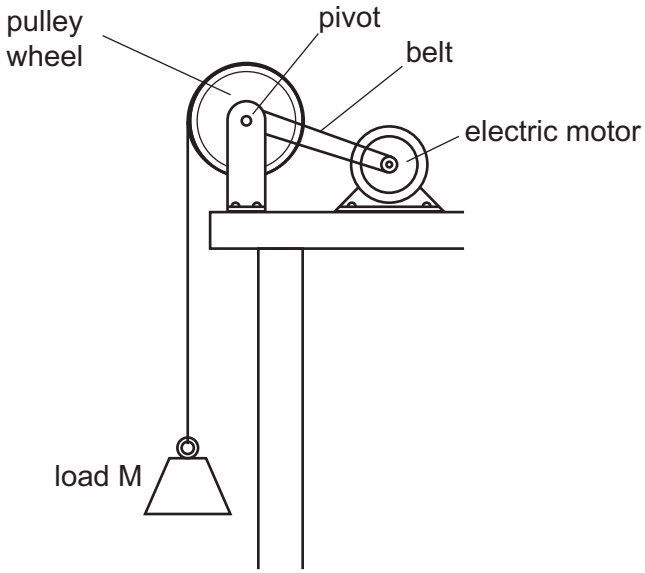


**Fig. 4.1**

**(a)** When the electric motor lifts the load, it transfers energy. Fig. 4.2 shows the energy transfers.

Write on Fig. 4.2 to complete the label in each box. The first label is done for you.

View solution

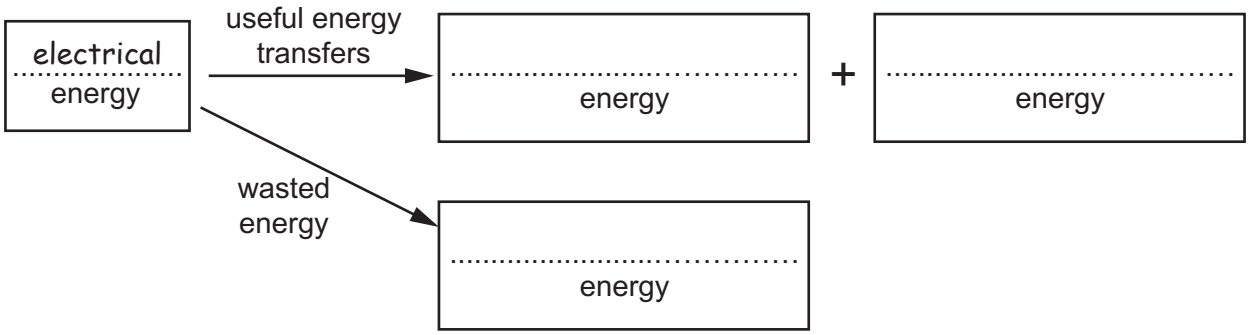


**Fig. 4.2**

[3]

**(b)** Fig. 4.3 shows the force on the pulley from the load M.

View solution

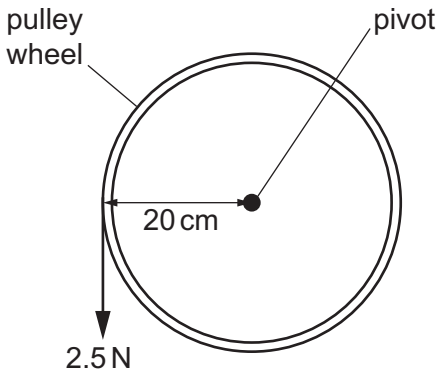


**Fig. 4.3**

The weight of load M is 2.5 N and the weight acts at a distance of 20 cm from the pivot of the pulley wheel.

Calculate the moment of the weight of load M about the pivot.

moment = ..... N cm [3]

[Total: 6]

© UCLES 2022

**5** **(a)** Describe how a wind turbine generates electricity from energy in the wind.

View solution

.....

.....

..... [3]

**(b)** Apart from cost, state **two advantages** of generating electricity using wind turbines compared with using a power station that burns coal.

1. .....

2. .....
[2]

**(c)** Apart from cost, state **two disadvantages** of generating electricity using wind turbines compared with using a power station that burns coal.

1. .....

2. .....
[2]

[Total: 7]

View solution

**6** A teacher fills a copper can with solid wax and heats the can. She measures the temperature of the wax every minute. She continues heating once the wax has melted and stops heating when the wax is boiling.

**(a) (i)** State the term used for the process that transfers thermal energy through the copper.

..... [1]

**(ii)** Fig. 6.1 shows how the temperature of the wax changes as it is heated.

View solution

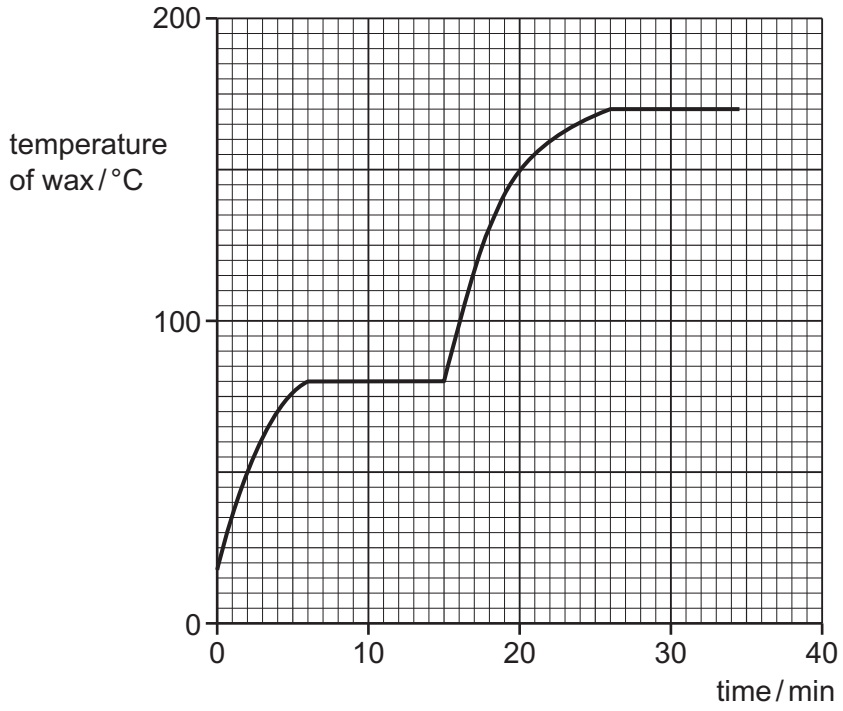


**Fig. 6.1**

Using the graph in Fig. 6.1, determine:

**1.** the melting point of the wax ..... °C [1]

**2.** the boiling point of the wax ..... °C [1]

**3.** the time at which the wax starts to boil. ..... min [1]

**(b)** Describe the molecular structure of the wax in terms of the arrangement, separation and motion of its molecules when it is a solid and when it is a gas.

solid wax .....

.....

wax as a gas .....

.....

View solution [6]

[Total: 10]

**7** **(a)** Fig. 7.1 shows the displacement of particles in a water wave.

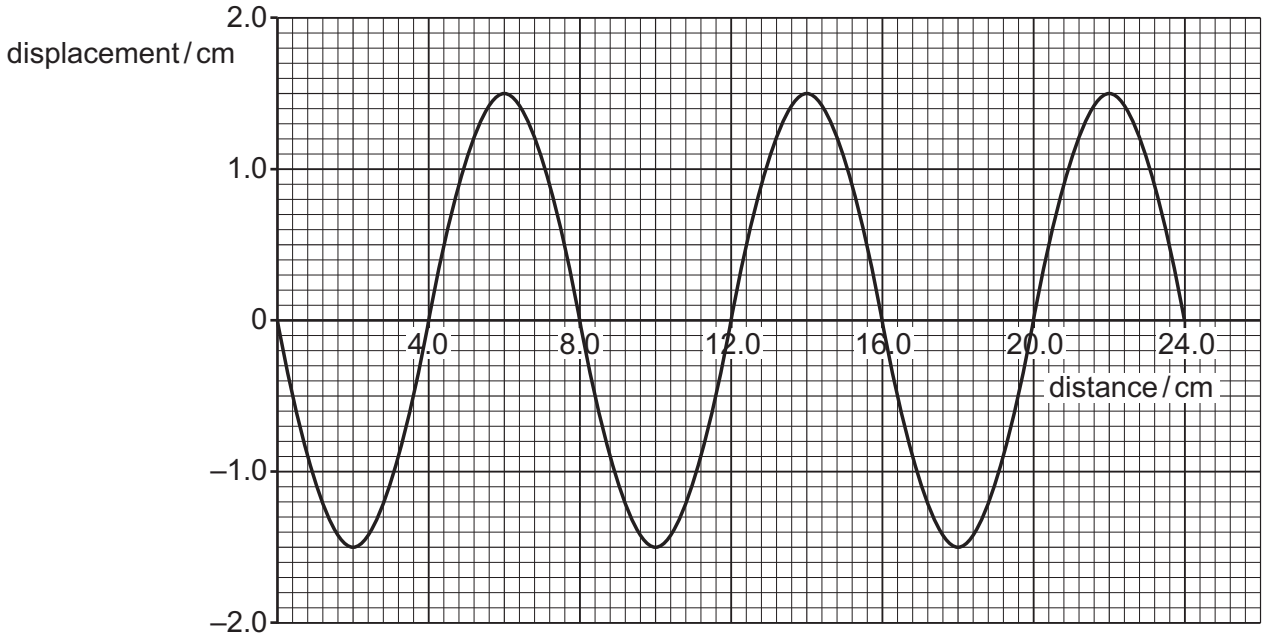


**Fig. 7.1**

View solution

Using the information in Fig. 7.1, determine:

**(i)** the wavelength of the wave

wavelength = ..... cm [1]

**(ii)** the amplitude of the wave.

View solution

amplitude = ..... cm [1]

**(b)** The water waves travel from deep water into shallow water. The water waves have a lower speed in the shallow water.

View solution

Fig. 7.2 shows wavefronts for the waves in deep water to the left of the boundary.

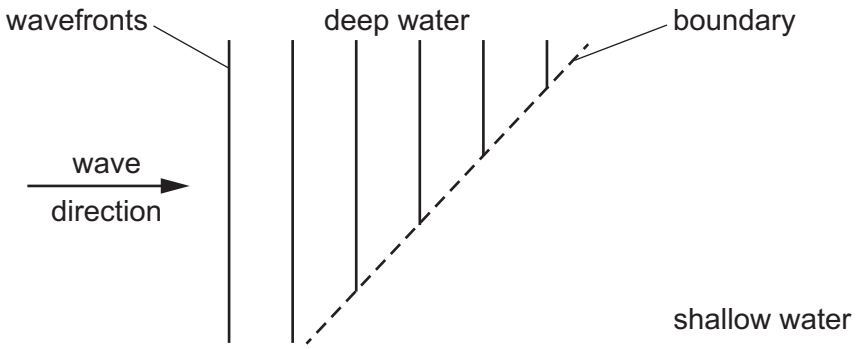


**Fig. 7.2**

**(i)** On Fig. 7.2, complete **three** wavefronts for the waves in shallow water to the right of the boundary. [2]

**(ii)** State the term for the process at the boundary in Fig. 7.2.

View solution

..... [1]

**(c) (i)** State the name of **one** type of electromagnetic wave with a wavelength shorter than that of visible light.

..... [1]

**(ii)** State **one** use of the type of wave you have given in **(c)(i)**.

..... [1]

[Total: 7]

View solution

**8** **(a)** Fig. 8.1 shows a bar magnet on a piece of card.

View solution

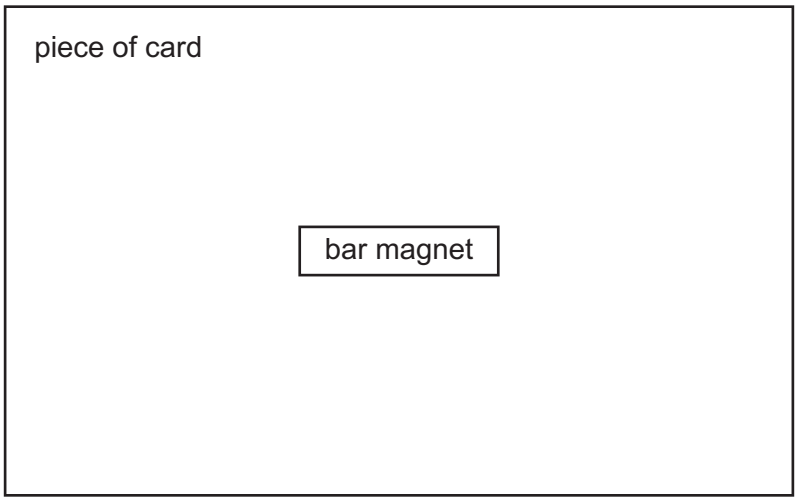


**Fig. 8.1**

Describe an experiment to determine the pattern of the magnetic field lines around the bar magnet.

You may draw on Fig. 8.1 if it helps to explain your answer.

.....

.....

.....

.....

..... [3]

**(b)** A student has a bar magnet and a metal bar with ends labelled X and Y. The student moves the metal bar close to either pole of the bar magnet. Fig. 8.2 and Fig. 8.3 show the force on the metal bar in each case.

View solution

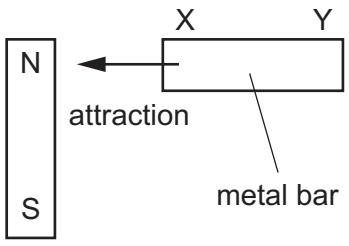


**Fig. 8.2**

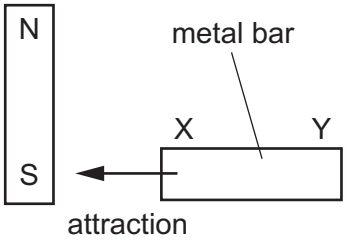


**Fig. 8.3**

State and explain what these results reveal about the metal bar XY.

.....

.....

..... [3]

[Total: 6]

**9** Fig. 9.1 shows an electric circuit which includes uninsulated resistance wire XY. A teacher shows some students how to complete the circuit by placing the contact C at various positions on the wire XY.

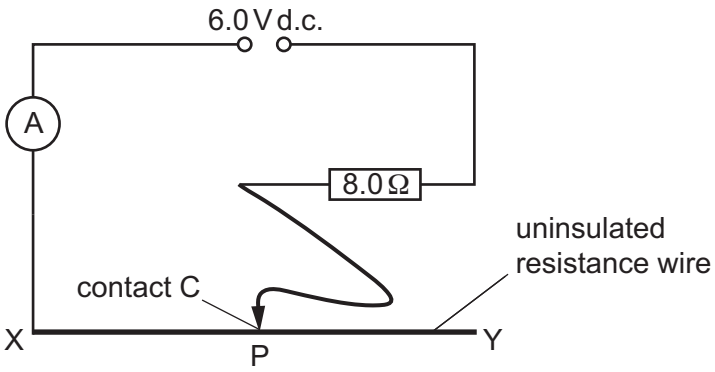


**Fig. 9.1**

View solution

**(a)** The students place contact C at Y. They measure the current on the ammeter. Then they move the contact C along the wire from Y to X.

State and explain the effect on the ammeter reading when they move the contact C from Y to X.

.....

..... [2]

**(b)** Calculate the reading on the ammeter when contact C is at X.

View solution

ammeter reading = ..... A [3]

**(c)** The students move contact C to point P. The resistance of the wire between X and P is 20 Ω.

Calculate the total resistance of the resistance wire between X and P and the fixed resistor.

View solution

total resistance = ..... Ω [2]

**(d)** The electric current in the circuit produces two effects.

View solution

Place a tick (✓) in the boxes next to these **two** effects.

| | |
|---|---|
| gravitational | ☐ |
| magnetic | ☐ |
| heating | ☐ |
| sound | ☐ |
| X-ray emissions | ☐ |

[2]

[Total: 9]

© UCLES 2022

**10** A microwave oven has a metal case and is connected to a 240 V electricity supply.

**(a)** The microwave oven is fitted with a 13A fuse and an earth wire is connected to the metal case of the microwave oven. A fault occurs and the live wire of the microwave oven touches the metal case.

View solution

Explain how the fuse and an earthed metal case protect the appliance and the user.

.....

.....

.....

.....

..... [4]

**(b)** The electric circuit for the microwave oven includes a transformer.
The voltage to the primary coil of the transformer $V_p$ is 240 V.
The number of turns on the primary coil $N_p$ is 70.

View solution

The number of turns on the secondary coil $N_s$ is 560.

Calculate the secondary voltage $V_s$ for the transformer.

$V_s$ = ..... V [3]

[Total: 7]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

© UCLES 2022

**11** A teacher determines the types of emission from a radioactive source. He uses different materials to absorb the emissions. Fig. 11.1 shows the equipment.

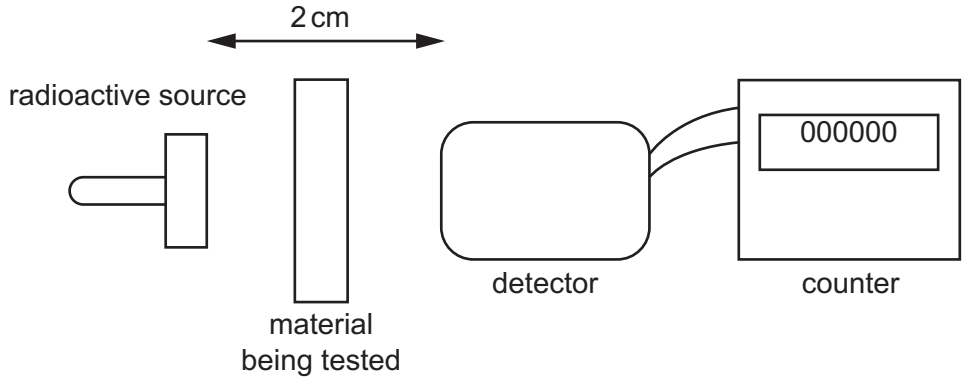


**Fig. 11.1** (not to scale)

The teacher places a material between the radioactive source and the detector. The counter shows the count rate for the emission that reaches the detector. The teacher records the count rate. He repeats the experiment for different materials.

Table 11.1 shows the results.

**Table 11.1**

| material being tested | count rate / counts / s |
|---|---|
| air (no object in gap) | 480 |
| thin sheet of paper | 481 |
| 2 mm sheet of aluminium | 479 |
| 10 mm block of lead | 120 |

**(a)** State whether the source emits $\alpha$ (alpha)-particles.
Use information from Table 11.1 to give a reason for your answer.

View solution

.....

.....

..... [2]

**(b)** State whether the source emits $\gamma$ (gamma)-rays.
Use information from Table 11.1 to give a reason for your answer.

View solution

.....

.....

..... [2]

[Total: 4]