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Cambridge Assessment International Education

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8705255420

PHYSICS **0625/33**

Paper 3 Theory (Core) **October/November 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. Any blank pages are indicated.

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1 Fig. 1.1 shows a tram. Trams carry passengers from one place to another.

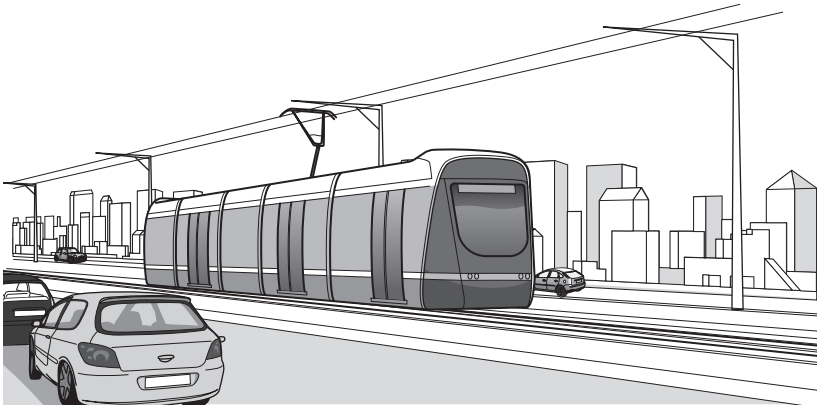


Fig. 1.1

A tram travels from A to E, stopping at B, C and D on the way.
Fig. 1.2 shows the speed–time graph for this tram journey.

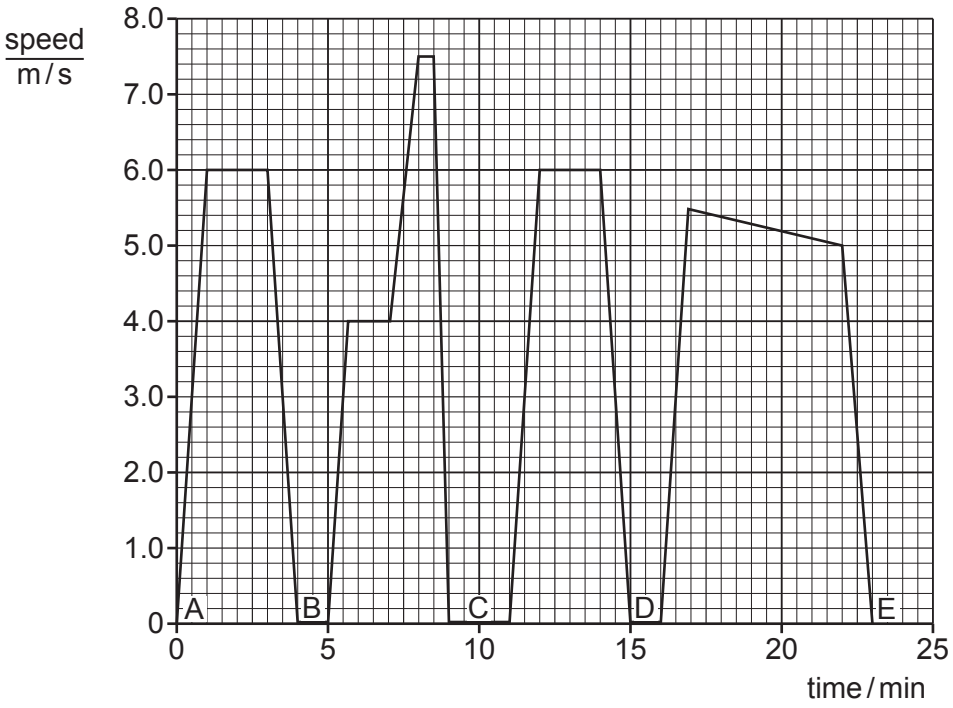


Fig. 1.2

(a) (i) Determine the time between the tram leaving A and arriving at C.

time = ... min [1]

(ii) Determine the maximum speed of the tram during the journey from A to E.

maximum speed = ... m / s [1]

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(iii) The tram decelerates as it approaches each stop. Use information from Fig. 1.2 to identify the greatest deceleration. Give a reason for your answer.

Complete the sentence.

The greatest deceleration occurs as the tram approaches ..... .

reason .....

.....

[2]

(b) The total distance between A and E is 5200 m.
The tram takes 1380 s to travel from A to E.

Calculate the average speed of the tram between A and E.

average speed = ... m / s [3]

[Total: 7]

2 A builder buys some tiles to repair a floor. He checks that the new tiles are the same size as the tiles on the floor.

The dimensions of the tiles on the floor are 25 cm × 20 cm × 0.30 cm.

The new tiles are shown in Fig. 2.1.

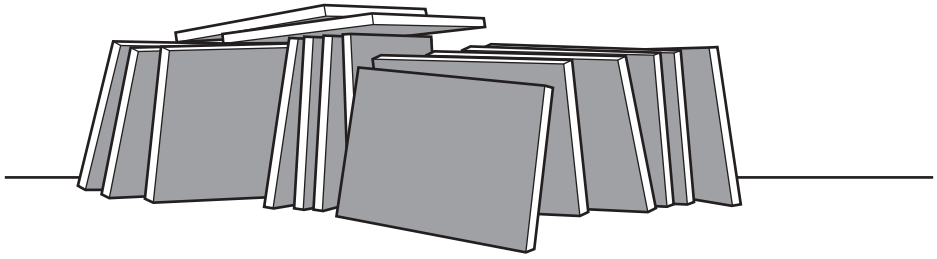


Fig. 2.1

(a) (i) State the name of a suitable instrument for measuring the length and width of each tile.

..... [1]

(ii) Describe how to determine the average thickness of **one** new tile.

.....

.....

..... [3]

(b) The dimensions of a tile are 25 cm × 20 cm × 0.30 cm.

The mass of the tile is 410 g.

(i) Calculate the volume of the tile.

volume = ... cm^3 [1]

(ii) Calculate the density of the tile. Include the unit in your answer.

density = ... unit ..... [4]

(iii) Calculate the weight of the tile.

weight = ... N [3]

[Total: 12]

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3 **(a)** Table 3.1 contains incomplete information about the input energy and the useful output energy for a number of devices. The table is only complete for the microphone.

Complete Table 3.1 by writing in each blank space.

Table 3.1

device	input energy	useful output energy
microphone	sound	electrical
electric fire	electrical	
wind turbine		electrical
	electrical	sound

[3]

(b) A tennis player hits a ball over the net and it bounces as shown in Fig. 3.1.

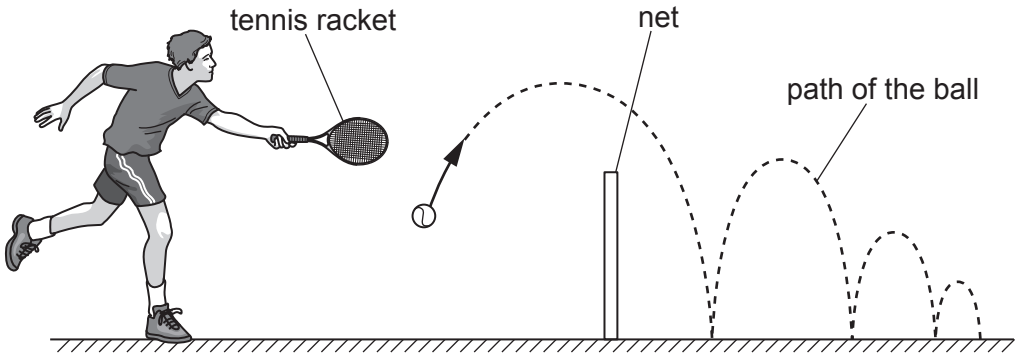


Fig. 3.1

(i) Complete the sentences about energy transfers.

1. When the player swings the tennis racket, his body converts .....

energy to ..... energy. [1]

2. When the tennis ball is moving upwards, the ball gains ..... energy. [1]

(ii) Explain why the height gained by the ball decreases with each successive bounce.

..... [1]

[Total: 6]

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4 **(a)** During an experiment, a heater supplies thermal energy to a substance. Initially, the substance is a solid. The substance is heated until it becomes a gas.
The temperature of the substance varies with time as shown in Fig. 4.1.

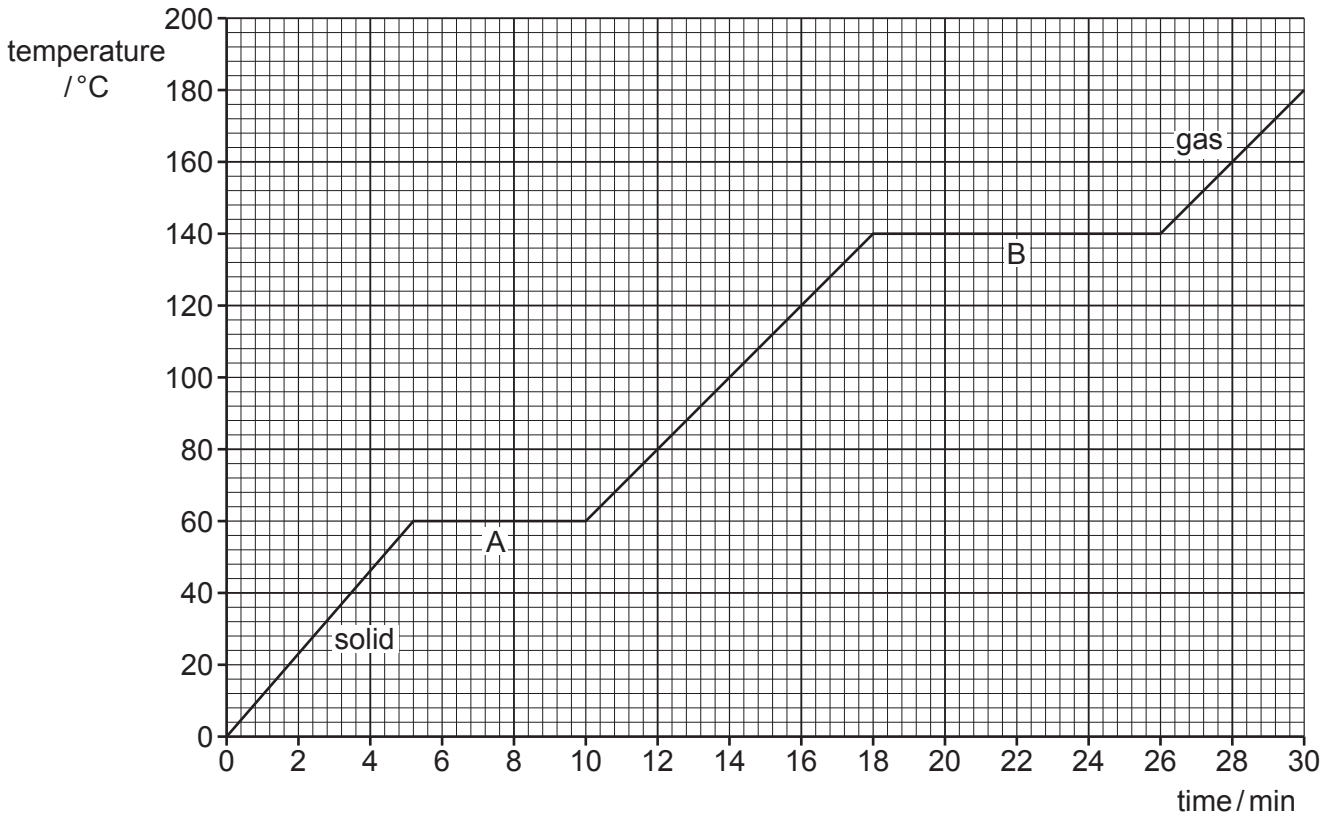


Fig. 4.1

(i) Give the state of the substance between A and B on Fig. 4.1.

..... [1]

(ii) State the process that is occurring at:

A .....

B .....

[2]

(b) The experiment is repeated using a heater with a greater power output. All other variables are kept constant.

Suggest how the temperature of the substance varies with time. Draw on Fig. 4.1. [3]

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(c) Describe the arrangement and movement of the molecules in a solid and in a gas. Write your answer in Table 4.1.

Table 4.1

	solid	gas
arrangement of molecules	....	....
movement of molecules	....	....

[4]

[Total: 10]

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5 **(a)** A student shines a ray of red light towards a large glass prism, as shown in Fig. 5.1.
The angles of the prism are 45°, 90° and 45°.
The critical angle for the glass is 42°.

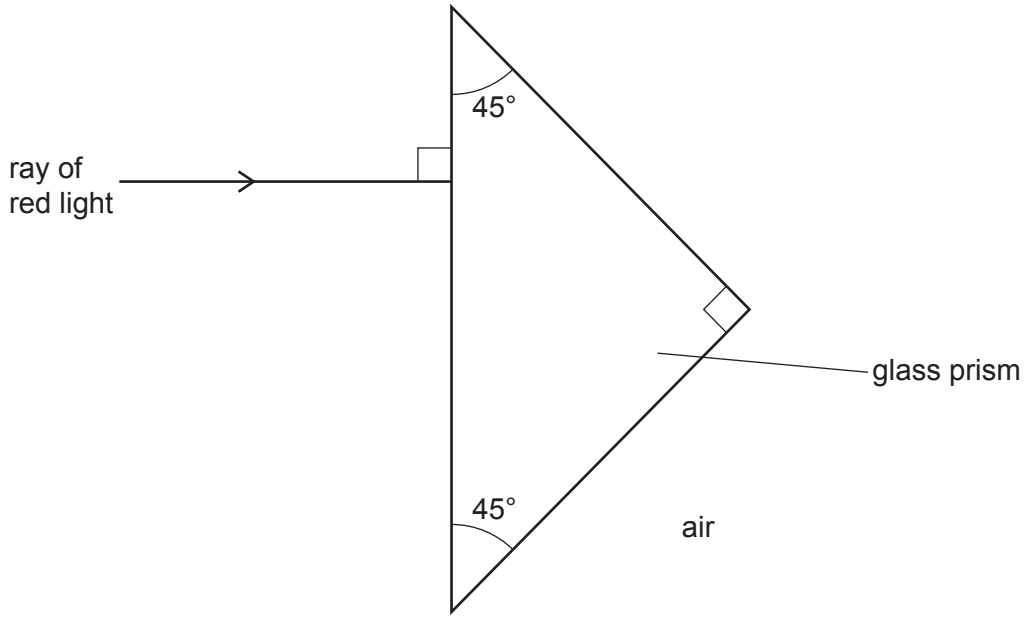


Fig. 5.1

On Fig. 5.1:

(i) continue the path of the ray in the glass prism to a boundary between glass and air [1]

(ii) draw and label the normal at the point your ray hits the boundary between glass and air [1]

(iii) continue your ray until it emerges into the air. [2]

(b) The spectrum of visible light is made up of seven colours.

Fig. 5.2 shows a partially completed spectrum for visible light.

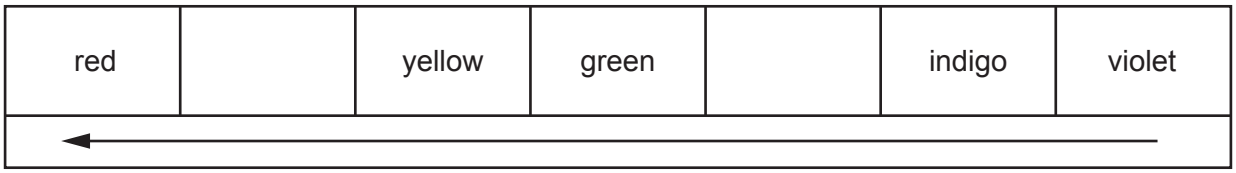


Fig. 5.2

(i) On Fig. 5.2, write the names of the missing colours. [2]

(ii) State the property of visible light that increases in the direction of the arrow in Fig. 5.2.

..... [1]

[Total: 7]

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6 A vertical arrow O is used as an object for a converging lens.

Fig. 6.1 shows a ray of light from the object passing through the lens.

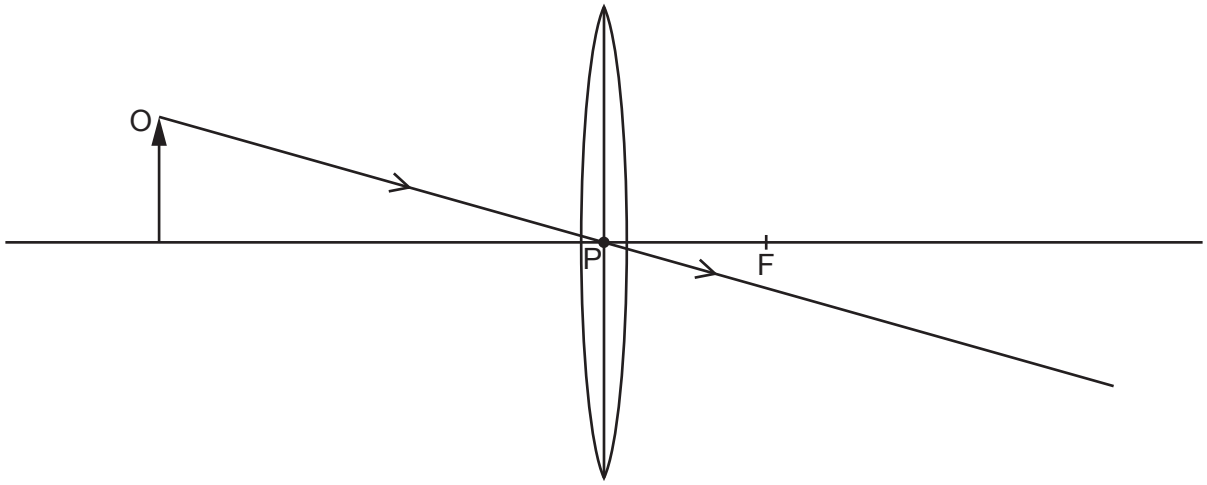


Fig. 6.1

The point labelled F is a principal focus of the lens.

(a) State the name of the distance labelled PF on Fig. 6.1.

..... [1]

(b) On Fig. 6.1, draw another ray that enables you to locate the image of O. [2]

(c) Draw an arrow to indicate the image. Label the image I. [1]

(d) Circle **two** words from the list which describe the image I.

enlarged **diminished** **same size** **inverted** **upright**

[2]

[Total: 6]

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7 Two students, A and B, determine the speed of sound.

They are standing side by side at a distance of 520 m from a wall, as shown in Fig. 7.1.

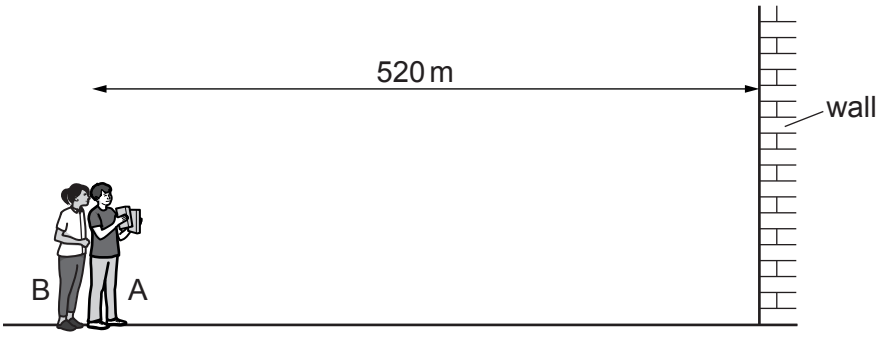


Fig. 7.1

Student A makes a loud sound by banging two blocks of wood together once. A short time later, both students hear the sound reflected from the wall.

(a) (i) State the term for the reflected sound.

..... [1]

(ii) Table 7.1 lists properties of a sound wave.
Compare the properties of the original sound and the reflected sound. For each property, place a tick (✓) in one column.

The first property is done for you.

Table 7.1

property	same	different
speed	✓	
wavelength		
loudness		
frequency		
amplitude		
longitudinal		

[3]

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(b) Student B measures the time between the original sound and the reflected sound.

(i) Suggest a suitable device for measuring the time interval between hearing the original sound and hearing the reflected sound.

..... [1]

(ii) The time interval between hearing the original sound and hearing the reflected sound is 3.1 s.
Use information shown in Fig. 7.1 to calculate the speed of sound.

speed of sound = ... m / s [3]

[Total: 8]

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8 Fig. 8.1 shows the security and waiting areas at an airport.



Fig. 8.1

(a) Fig. 8.1 shows several situations in which regions of the electromagnetic (EM) spectrum are being used.

Table 8.1 gives **three** of these situations.

State the name of the region of the EM spectrum which is being used in each situation.

Table 8.1

	situation	region of EM spectrum
1	girl listening to radio	
2	boy using mobile phone	
3	security guard checking bags	

[3]

(b) All waves can be reflected, refracted and diffracted.

State **two** other properties of waves in the electromagnetic spectrum.

property 1 .....

property 2 .....

[2]

(c) State **two** safety precautions for working with sources that emit γ (gamma)-radiation.

1. .....

2. .....

[2]

[Total: 7]

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9 **(a)** Fig. 9.1 shows a hazardous scenario of using electricity in a kitchen.

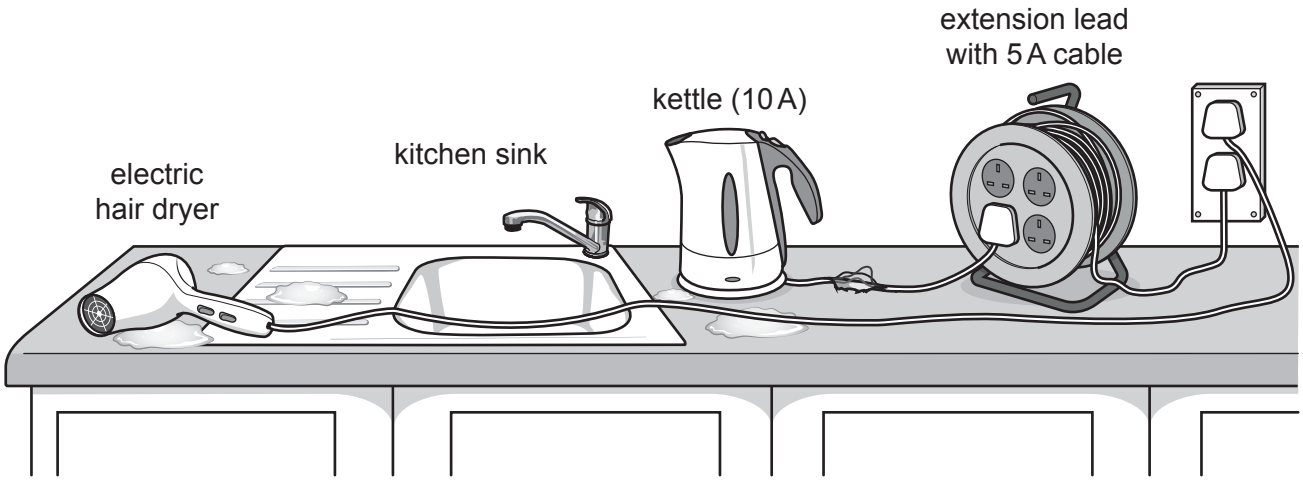


Fig. 9.1

(i) Identify **three** electrical hazards in Fig. 9.1.

1. .....

2. .....

3. .....

[3]

(ii) Give **two** possible consequences of the electrical hazards in Fig. 9.1.

1. .....

.....

2. .....

.....

[2]

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(b) Fig. 9.2 shows the circuit for a hair dryer.

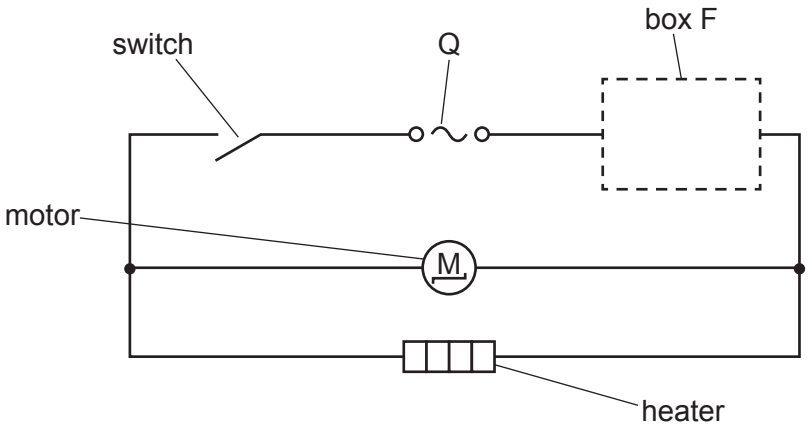


Fig. 9.2

(i) State the name of the component labelled Q in Fig. 9.2. ..... [1]

(ii) On Fig. 9.2, in the dashed box F, draw the circuit symbol for a fuse. [1]

(iii) State the purpose of a fuse.

..... [1]

(iv) State an advantage of using a circuit breaker instead of a fuse.

..... [1]

(c) A different hair dryer has a fuse and two heat settings.

When the hair dryer is used on the low heat setting, the current in the hair dryer is 5.2 A.
When the hair dryer is used on the high heat setting, the current in the hair dryer is 8.9 A.

Circle **one** correct fuse rating for this hair dryer.

5A **10A** **13A** **15A** **30A** [1]

[Total: 10]

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10 **(a)** State which radioactive emission:

(i) is the most penetrating ..... [1]

(ii) is the most ionising ..... [1]

(iii) has a positive charge. ..... [1]

(b) Iodine-131 is a radioactive isotope that is commonly used in medicine.

The nuclide notation for a nucleus of iodine-131 is:

$$^{131}_{53}\mathrm{I}$$

(i) Determine the number of protons in one nucleus of iodine-131. ..... [1]

(ii) Determine the number of neutrons in one nucleus of iodine-131. ..... [1]

(c) Radioactive iodine-131 has a half-life of 8 days.

The activity of a sample of iodine-131 is 1600 counts / s.

Calculate the activity of this sample after 24 days.

activity = ... counts / s [2]

[Total: 7]

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