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Cambridge Assessment International Education

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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

3928208808

PHYSICS **0625/32**

Paper 3 Theory (Core) **October/November 2024**

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 [ ].

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

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1 Fig. 1.1 shows the distance–time graph for a student's journey.

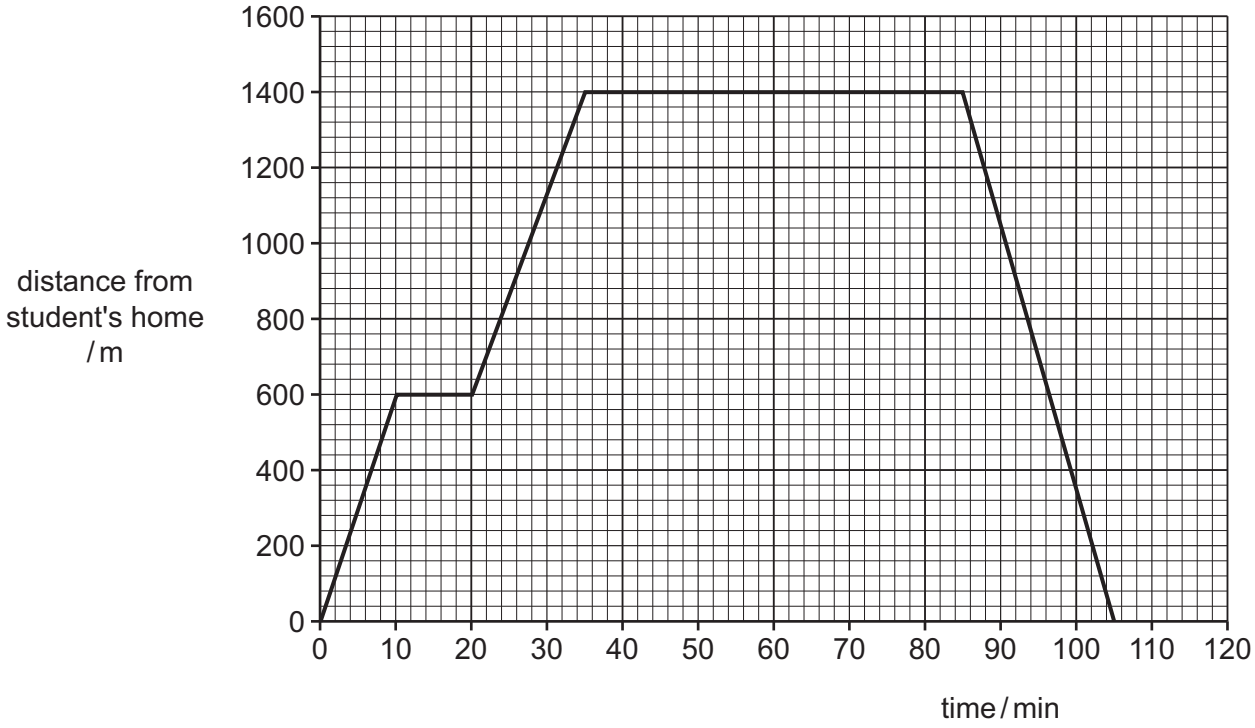


Fig. 1.1

The student walks from his home to a shop. He stops at the shop.
Then he walks to his friend's house and stops there for 50 minutes.
Then he walks back to his home without stopping.

(a) (i) Determine the distance between the student's home and his friend's house.

distance = ... m [1]

(ii) Calculate the distance between the shop and the friend's house.

distance = ... m [1]

(b) Calculate the total time for which the student is walking.

time = ... min [1]

(c) Calculate the average speed of the student when he walks back to his home.

speed = ... m / s [4]

[Total: 7]

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2 A student wants to measure the diameter of a wire. The wire is thinner than a single gradation on her ruler. She coils the wire carefully and makes 12 loops as shown in Fig. 2.1.

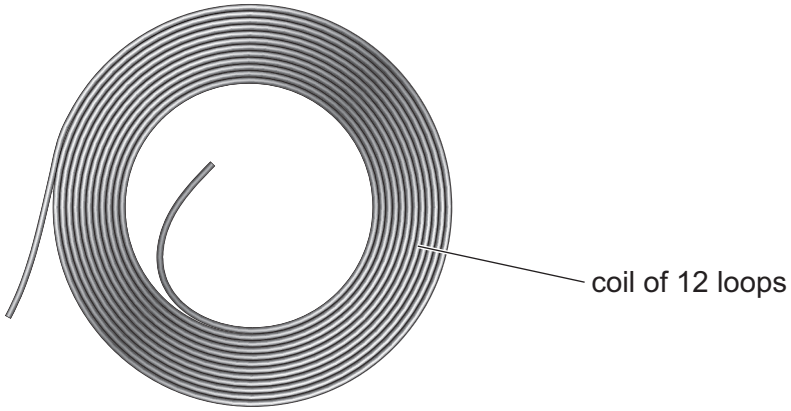


Fig. 2.1

(a) Describe how she can use her ruler to determine the diameter of the wire accurately.
You may draw on Fig. 2.1 as part of your answer.

.....

.....

.....

..... [3]

(b) The student determines the density of the metal of the wire.
She folds some of the wire into a small shape as shown in Fig. 2.2.

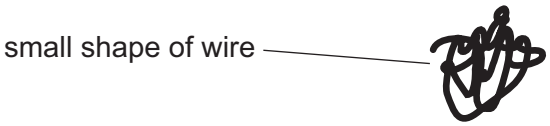


Fig. 2.2

She then puts this small shape of wire into a measuring cylinder containing water. The measuring cylinder is on an electric balance.

This procedure is shown in Fig. 2.3.

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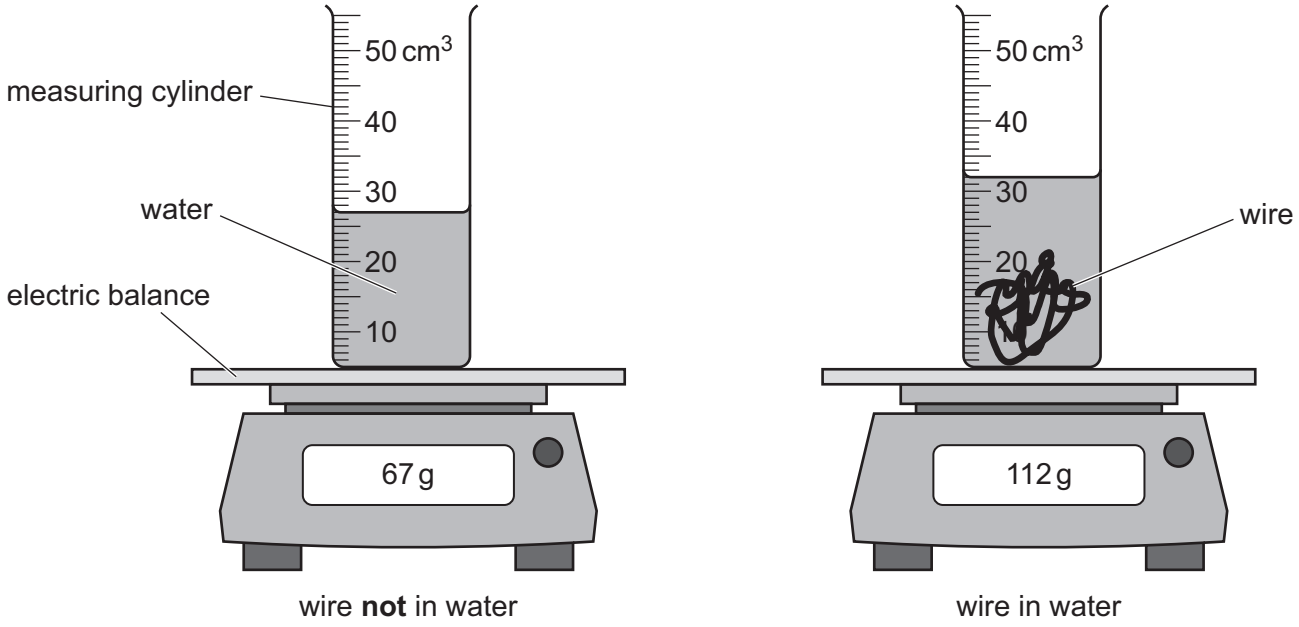


Fig. 2.3

Using the information in Fig. 2.3, calculate:

(i) the mass of the wire

mass of the wire = ... g [1]

(ii) the volume of the wire.

volume of the wire = ... cm^3 [2]

(c) The mass of a different wire is 64 g. The volume of this wire is 7.2 cm^3.
Using this information, calculate the density of this wire.

density = ... g/cm^3 [3]

[Total: 9]

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3 A car has a fault. A mechanic uses a machine to pull the car onto a recovery vehicle as shown in Fig. 3.1.

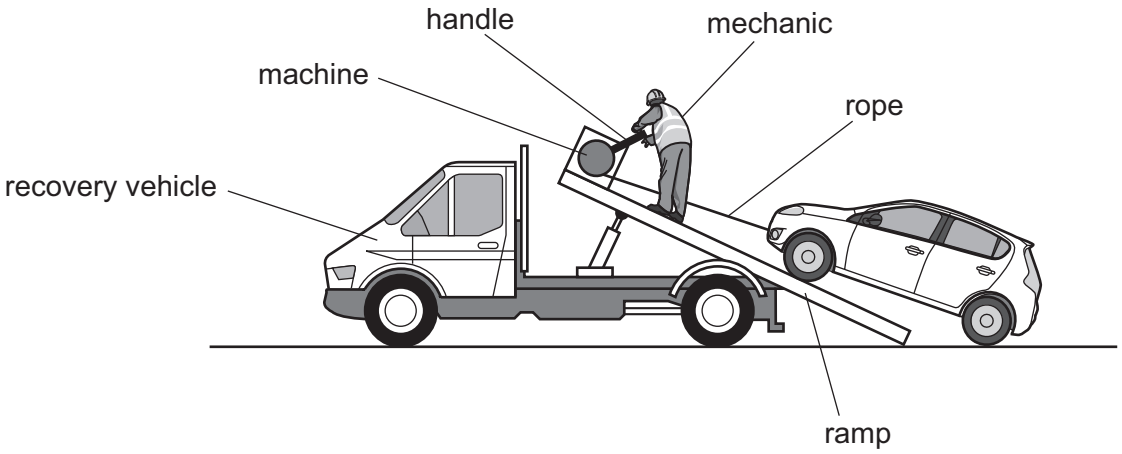


Fig. 3.1

(a) Fig. 3.2 shows how the mechanic applies a force to the handle of the machine.

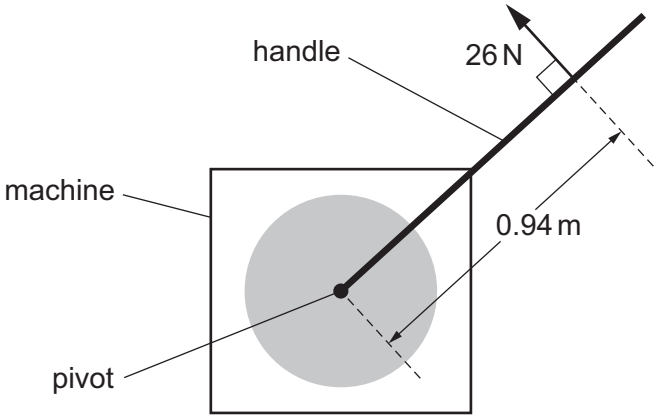


Fig. 3.2

(i) Calculate the moment of the 26 N force about the pivot. Use the information in Fig. 3.2.

moment = ... N m [3]

(ii) Describe **one** way the mechanic can increase the moment of the 26 N force about the pivot.

..... [1]

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(b) The car is lifted vertically 0.78 m onto the recovery vehicle, as shown in Fig. 3.3.

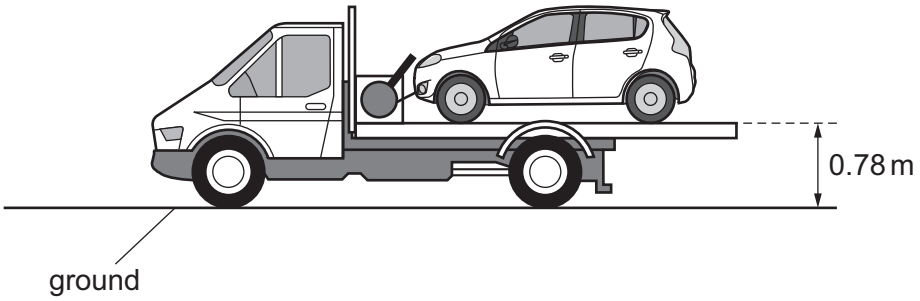


Fig. 3.3

The weight of the car is 14 000 N.
Calculate the minimum work done on the car in lifting it onto the recovery vehicle from the ground.
Include the unit.

work done = ... unit ..... [4]

[Total: 8]

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4 **(a)** Energy stored in the water behind hydroelectric dams is an example of a renewable energy source.

(i) State what is meant by a renewable energy source.

..... [1]

(ii) State the name of **one other** renewable energy source.

..... [1]

(b) Electrical power is generated from the energy store in nuclear fuels.
Fig. 4.1 shows an energy flow diagram for transferring energy from the nuclear store.

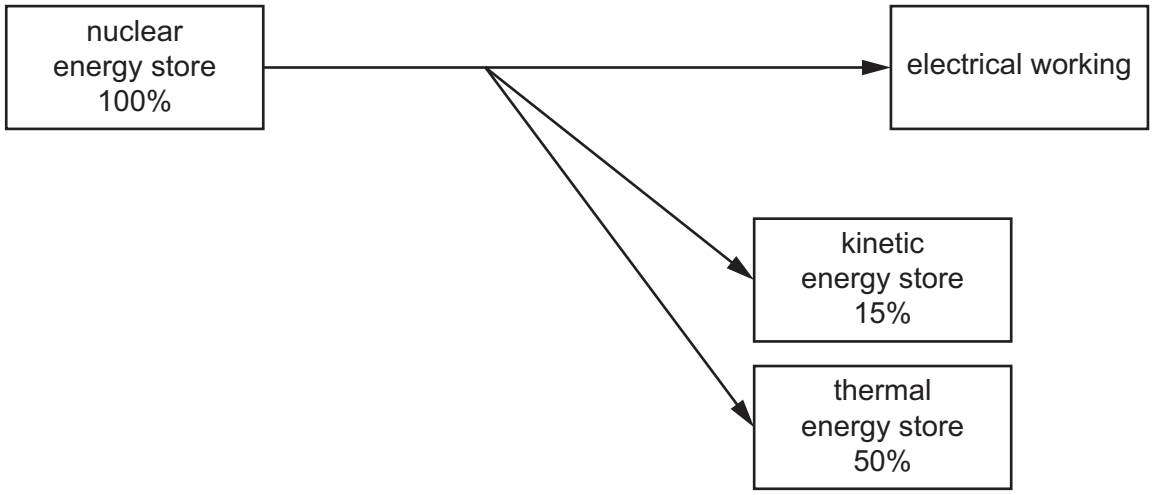


Fig. 4.1

Using the information in Fig. 4.1, calculate:

(i) the percentage of energy wasted to thermal and kinetic energy stores

energy wasted = ... % [1]

(ii) the percentage of energy transferred as electrical working.

electrical working = ... % [1]

(c) Electrical power is also generated from the water behind hydroelectric dams.

State **two disadvantages** of generating electricity from the water behind hydroelectric dams compared with using the energy store in nuclear fuels. Ignore costs of construction and maintenance.

1 .....

2 .....
[2]

[Total: 6]

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5 A sealed glass bottle contains air.
The temperature of the air is 21 °C.

(a) Calculate the temperature of the air in kelvin.

temperature = ... K [2]

(b) The temperature of the air in the bottle decreases to 14 °C.
State and explain what happens to the pressure inside the bottle. Use your ideas about gas particles.

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..... [4]

[Total: 6]

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6 Fig. 6.1 shows a wood burner in a cabin. The wood burner keeps the inside of the cabin warm when it is cold outside.

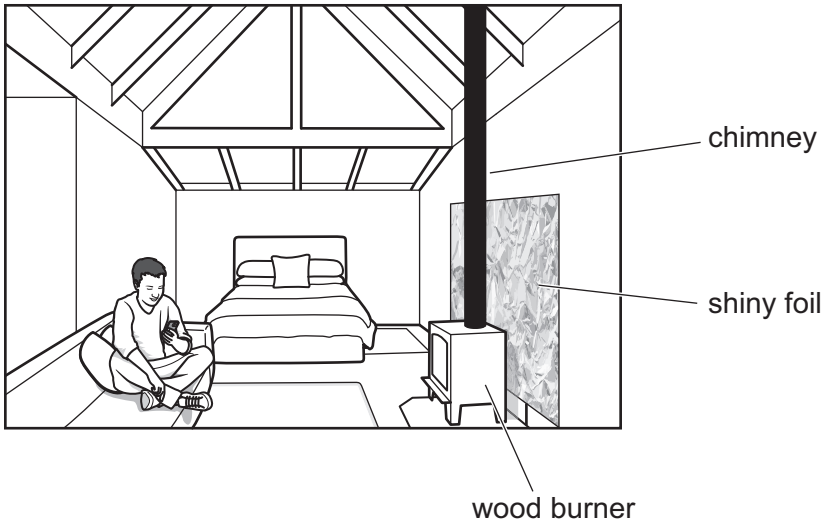


Fig. 6.1

(a) Explain how thermal energy from the wood burner warms the cabin by convection.
Use your ideas about the density of air. You may draw on Fig. 6.1 as part of your answer.

.....

.....

.....

.....

..... [3]

(b) **(i)** The outer surface of the chimney is dull and black.
Explain how the dull black surface helps to warm the cabin.

.....

.....

..... [2]

(ii) There is shiny foil on the wall.
Explain how the shiny foil helps to warm the cabin.

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..... [2]

[Total: 7]

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7 **(a)** The direction of vibration in a type of wave is parallel to the direction in which the wave is moving.
State the name of this type of wave.

type of wave ..... [1]

(b) Fig. 7.1 represents a ripple tank showing diffraction. The ripple tank is viewed from above.
The wavefronts move from left to right until they reach a barrier. They are diffracted at a gap in the barrier.

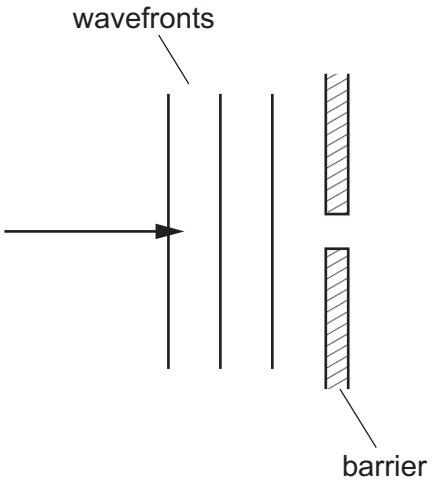


Fig. 7.1

On Fig. 7.1:

(i) draw **three** wavefronts to the right of the barrier [2]

(ii) indicate and label **one** wavelength. [1]

(c) The wavelength of the wave is 4.6 cm.
The speed of the wave is 38 cm / s.
Determine the frequency of the wave.

frequency = ...Hz [3]

[Total: 7]

8 **(a)** Fig. 8.1 represents charges on an acetate strip and on a dry cloth.
Both the acetate strip and the dry cloth are electrically neutral.

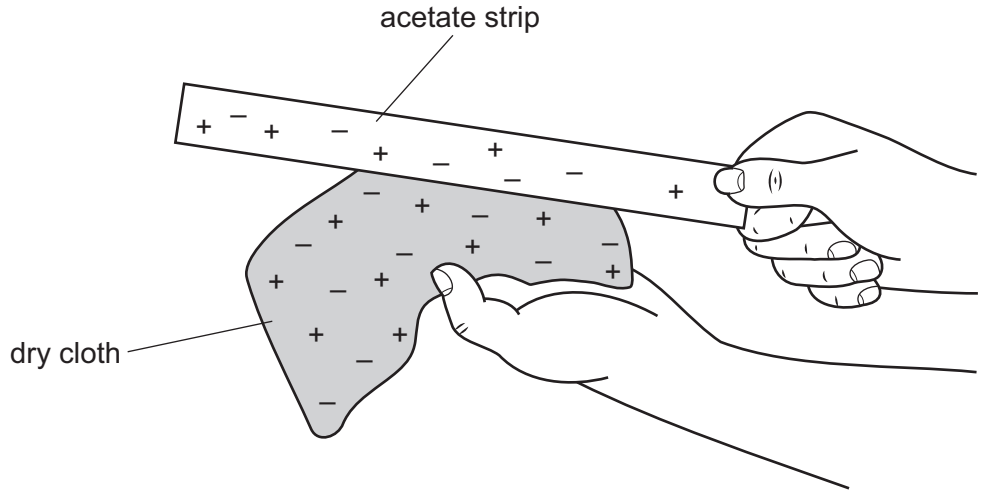


Fig. 8.1

The student charges the acetate strip by using the dry cloth. The acetate strip becomes positively charged.
Explain how the acetate strip becomes positively charged.

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..... [3]

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(b) The student brings the positively charged acetate strip close to another positively charged acetate strip. Fig. 8.2 shows this situation.

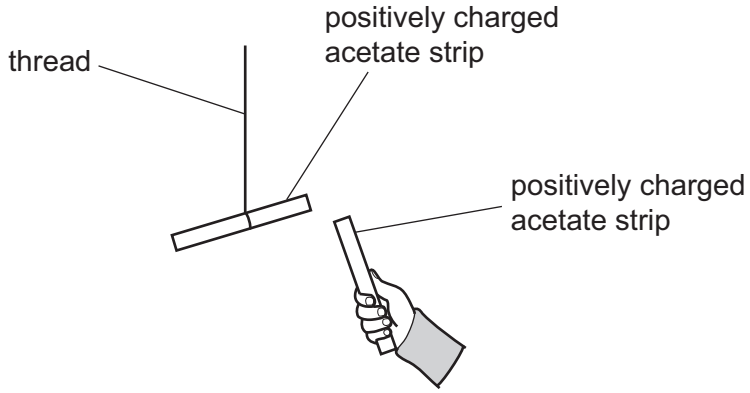


Fig. 8.2

Describe and explain what happens when the two positively charged acetate strips are close to each other.

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..... [2]

[Total: 5]

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9 **(a)** Fig. 9.1 represents part of a d.c. electric motor. The coil of wire rotates at a steady speed.

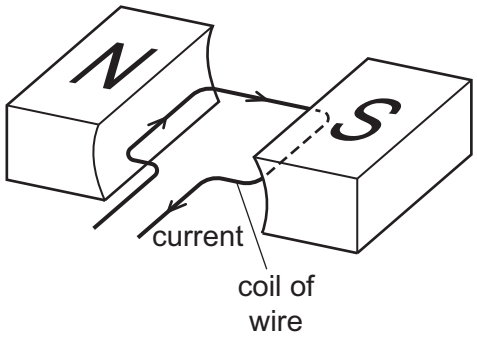


Fig. 9.1

State **two** ways to make the coil rotate faster.

1 .....

2 .....

[2]

(b) Fig. 9.2 shows an electric fan.

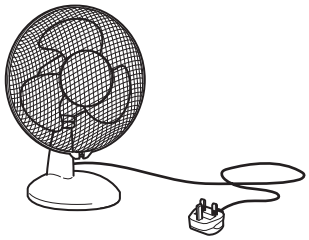


Fig. 9.2

The electric motor for the fan requires 120 V a.c. The mains voltage is 220 V a.c.
A transformer steps down the mains voltage as shown in Fig. 9.3.

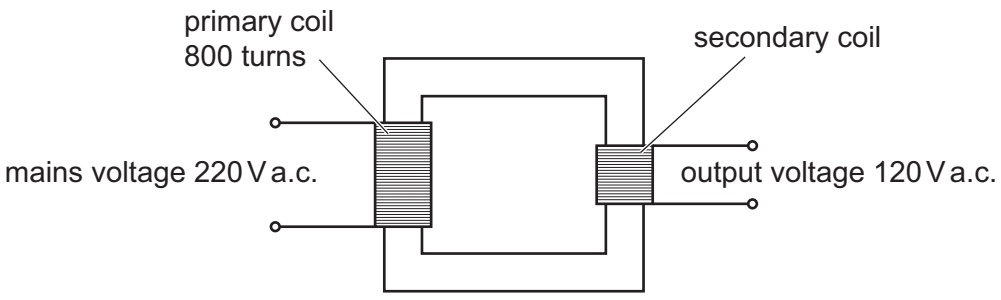


Fig. 9.3

Calculate the number of turns on the secondary coil. Use the information in Fig. 9.3.

number of turns on the secondary coil = ... [3]

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(c) A plug connects the transformer to the mains supply. There is a fuse in the plug. Describe how a fuse works.

.....

.....

..... [2]

[Total: 7]

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10 (a) (i) Name **three** types of nuclear emission from radioactive sources.

1 .....

2 .....

3 .....

[2]

(ii) State the type of nuclear emission which has a relative charge of +2.

..... [1]

(iii) State the type of nuclear emission which is part of the electromagnetic spectrum.

..... [1]

(b) The isotope technetium-99m decays to technetium-99.

(i) The half-life of technetium-99m is 6 hours.

Determine the fraction of technetium-99m remaining in a sample after 18 hours.

fraction remaining = ... [2]

(ii) The nuclide notation for technetium-99 is:

$$^{99}_{43}\mathrm{Tc}$$

Complete the table below to show the number of each type of particle in a neutral atom of technetium-99.

type of particle	number
electron	
neutron	
proton	

[2]

[Total: 8]

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11 **(a)** Fig. 11.1 represents part of the Solar System.

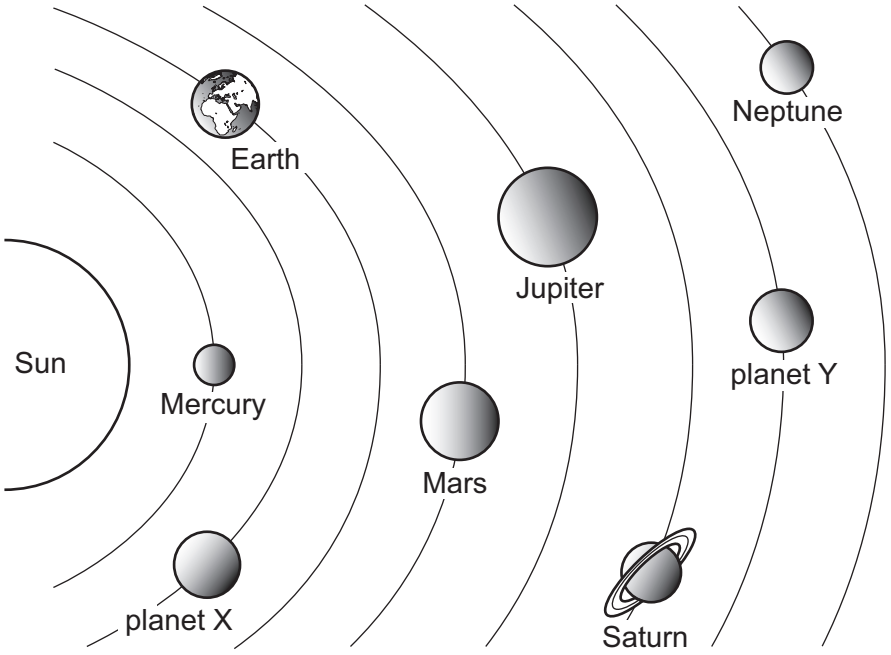


Fig. 11.1 (not to scale)

(i) State the name of planet X and the name of planet Y.

planet X .....

planet Y .....

[2]

(ii) Mercury is nearer to the Sun than Jupiter is.
State **two** other ways in which Mercury is different from Jupiter.

1 .....

2 .....

[2]

(iii) Complete the sentences about the Solar System.

The accretion model states that the Solar System was formed from clouds of dust and

..... .

The material of the Solar System was pulled together by ..... .

The galaxy that includes the Solar System is called ..... .

[3]

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(b) Complete the following statements by adding the missing units.

(i) The Earth orbits the Sun in approximately 365 ..... . [1]

(ii) The Moon orbits the Earth in approximately one ..... . [1]

(iii) The diameter of the Milky Way is approximately 100 000 ..... . [1]

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