GradeMax

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6385861905

PHYSICS **0625/31**

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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[Turn over

1 Fig. 1.1 shows a measuring cylinder containing some water.

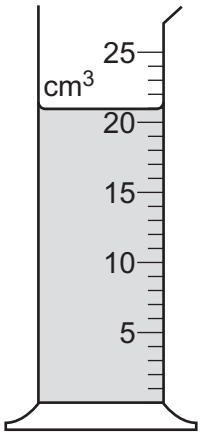


Fig. 1.1

(a) State the volume of the water in the measuring cylinder.

volume = ... cm^3 [1]

(b) A student adds 20 drops of water to the water that is in the measuring cylinder in Fig. 1.1. The new volume of water in the measuring cylinder is 25 cm^3.

Calculate the average volume of one drop of water.

average volume of one drop = ... cm^3 [4]

(c) A student has a measuring cylinder and a small, irregularly shaped piece of metal. The piece of metal can easily fit into the measuring cylinder.

Describe how the student can use the measuring cylinder and some water to find the volume of the metal.

.....

.....

.....

.....

..... [4]

[Total: 9]

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2 Fig. 2.1 shows the horizontal forces acting on a car.

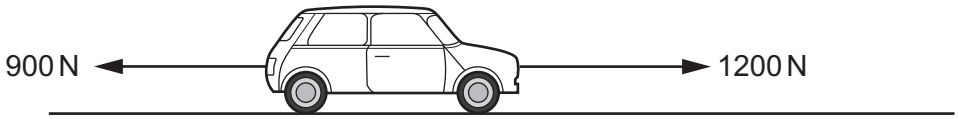


Fig. 2.1 (not to scale)

(a) Calculate the resultant horizontal force on the car.

size of force = ... N

direction .....

[3]

(b) A student uses a digital stop-watch to measure the time for the car to travel 100 m.

Fig. 2.2 shows the time reading on the stop-watch.



Fig. 2.2

(i) Using the information in Fig. 2.2, state the time taken to travel 100 m.

time to travel 100 m = ... s [1]

(ii) The car takes 12.8 s to travel the next 200 m.

Calculate the average speed of the car for this 200 m.

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

(c) Fig. 2.3 shows the speed–time graph for another car.

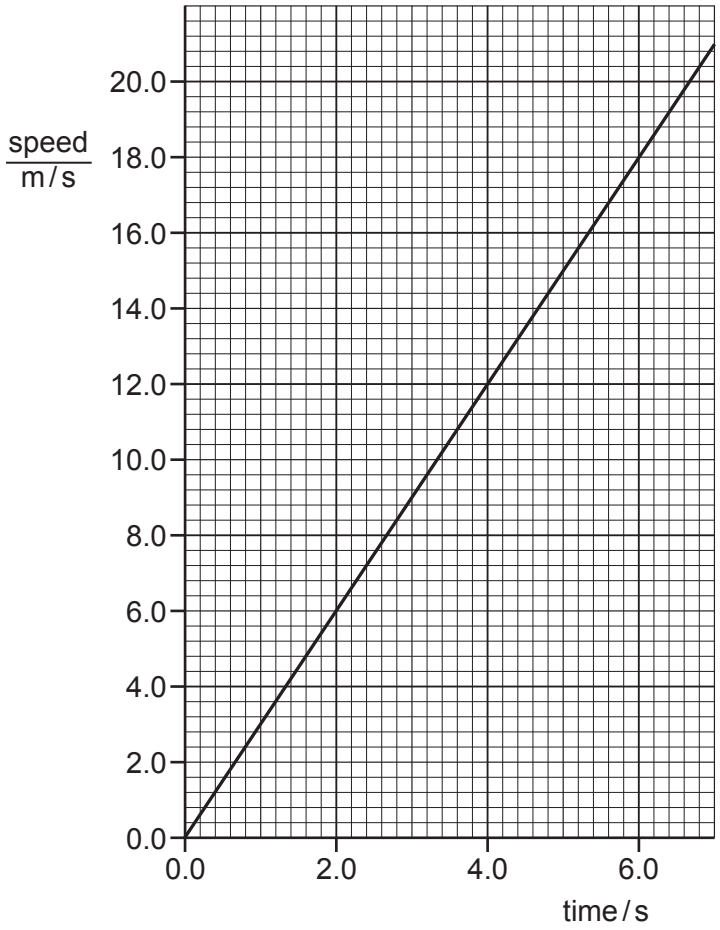


Fig. 2.3

Calculate the distance travelled by this car between time = 2.0 s and time = 6.0 s.

distance travelled = ... m [3]

[Total: 10]

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3 A sailor uses a winch to raise a sail on a boat. Fig. 3.1 shows the sailor turning the winch.

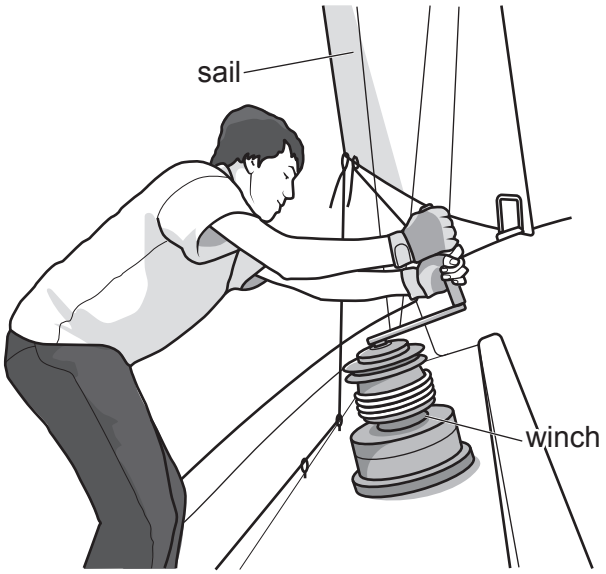


Fig. 3.1

(a) The sailor applies a force of 200 N at a distance of 30 cm from the pivot in the winch, as shown in Fig. 3.2.

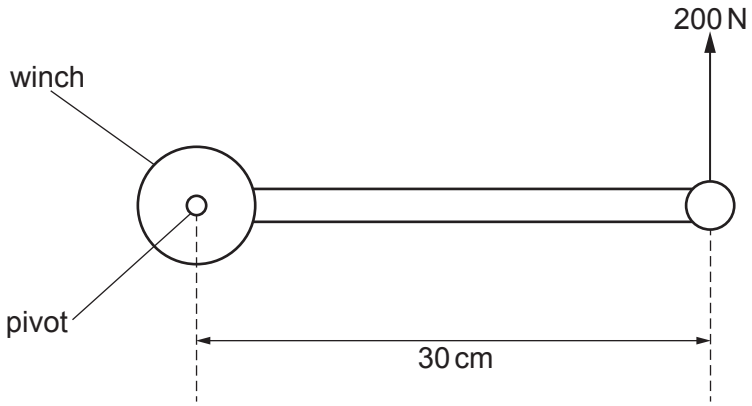


Fig. 3.2

Calculate the moment of this force about the pivot.

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

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(b) (i) Describe **two** useful energy transfers when the sailor uses the winch to raise the sail.

1 .....

2 .....
[2]

(ii) Describe **one** non-useful energy transfer when the sailor uses the winch to raise the sail.

..... [1]

[Total: 6]

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4 **(a)** A student has an object with a mass of 5.0 kg.

Calculate the weight of the object.

weight of object = ... N [2]

(b) The student lifts the 5.0 kg object from the floor onto a table. He does 75 J of work on the object in lifting it onto the table.

State the amount of gravitational potential energy gained by the object due to being lifted onto the table.

gravitational potential energy gained by object = ... J [1]

(c) The weight of a table is 280 N. The table has four legs. The area of each table leg in contact with the floor is 18 cm^2.

Calculate the pressure of the table on the floor. Give the correct unit.

pressure on the floor = ... unit ..... [5]

[Total: 8]

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5 An engineer measures the pressure of the gas in a gas bottle. Fig. 5.1 shows the measuring device he uses, connected to the gas bottle.

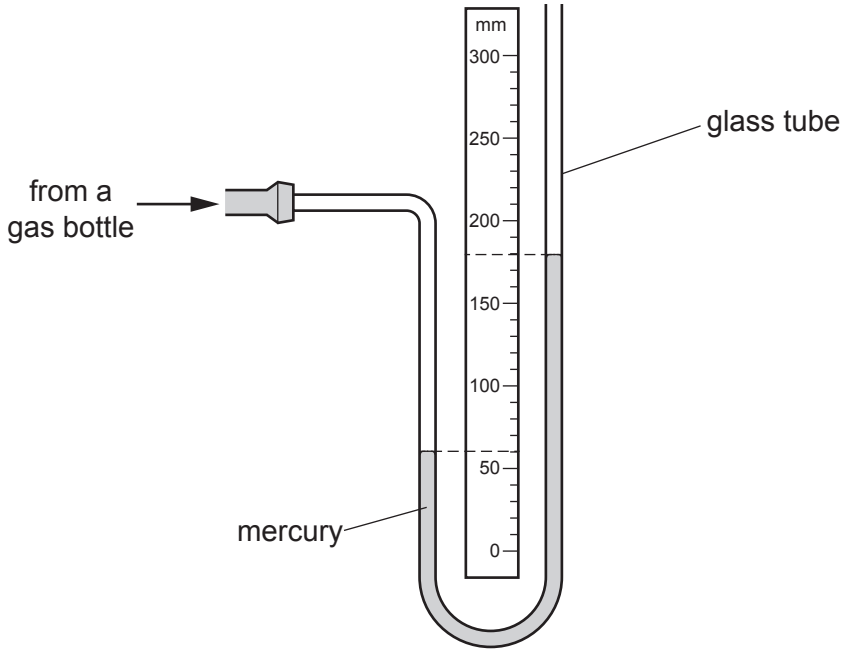


Fig. 5.1

(a) (i) Atmospheric pressure is 756 mm of mercury.

Calculate the pressure of the gas in the gas bottle.

pressure of gas = ... mm of mercury [3]

(ii) State the name of the measuring device shown in Fig. 5.1.

..... [1]

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(b) Some gas is trapped in a cylinder fitted with a moveable piston. Fig. 5.2 shows the arrangement.

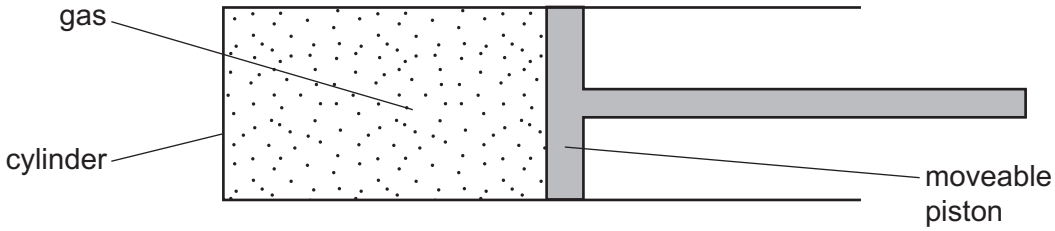


Fig. 5.2

(i) Describe how the gas exerts a pressure on the cylinder.

Use your ideas about molecules.

.....

..... [2]

(ii) The piston moves and increases the volume occupied by the gas. The temperature of the gas remains constant. Fig. 5.3 shows the new position of the piston.

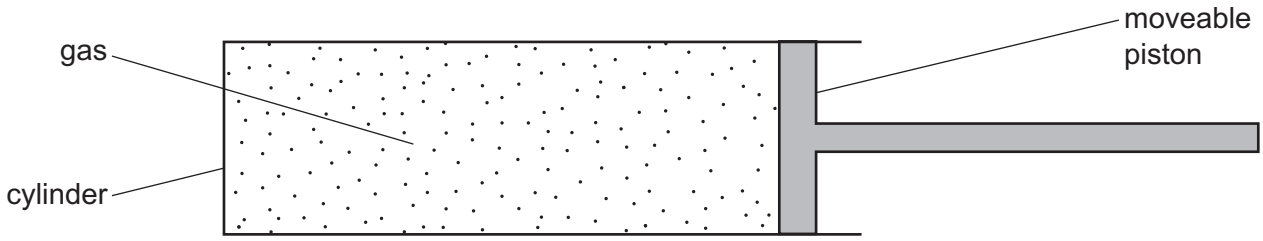


Fig. 5.3

State and explain what happens to the pressure of the gas on the cylinder.

.....

..... [2]

[Total: 8]

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6 A student investigates wave properties. He uses waves on the surface of a tank of water to show the properties.

(a) The waves move from deep water to shallow water. Fig. 6.1 shows the wavefronts.

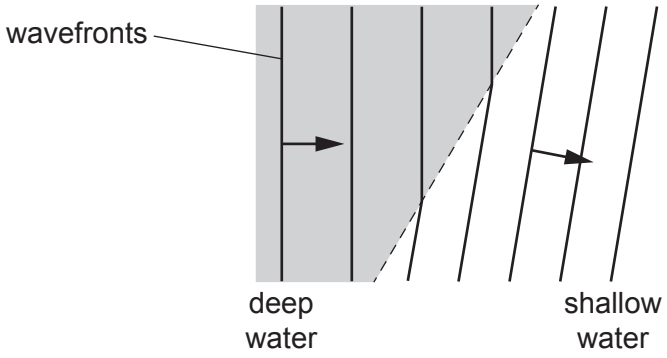


Fig. 6.1

(i) State the name of the effect shown in Fig. 6.1.

..... [1]

(ii) When the wave passes from deep water to shallow water, two of its properties change.

Describe how **one** of these properties changes.

property .....

change in property .....

[2]

(b) The student notes that it takes 10 s to produce 25 complete waves in the water tank.

Calculate the frequency of the waves.

frequency of waves = ... Hz [3]

(c) Waves on the surface of water are transverse waves.

(i) State **one** other example of a transverse wave.

..... [1]

(ii) Describe the vibration of particles in a transverse wave.

.....

..... [2]

[Total: 9]

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7 **(a)** A student has a bar magnet and a metal bar with ends X and Y. The student moves each pole of the bar magnet, in turn, to be close to end X of the metal bar.

Fig. 7.1 and Fig. 7.2 show the force between the magnet and the bar in each case.

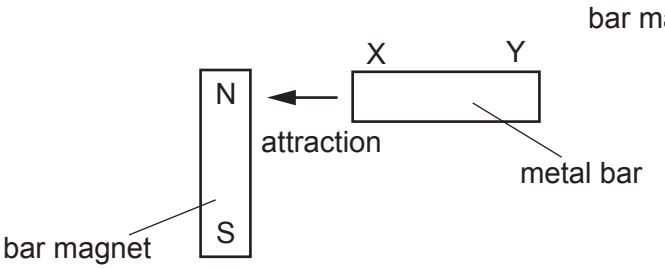


Fig. 7.1

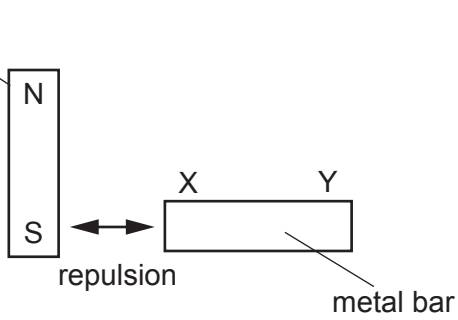


Fig. 7.2

State and explain what you can deduce about the metal bar.

Use the information shown in Fig. 7.1 and Fig. 7.2.

.....

.....

..... [2]

(b) Fig. 7.3 shows two bar magnets on a piece of card.

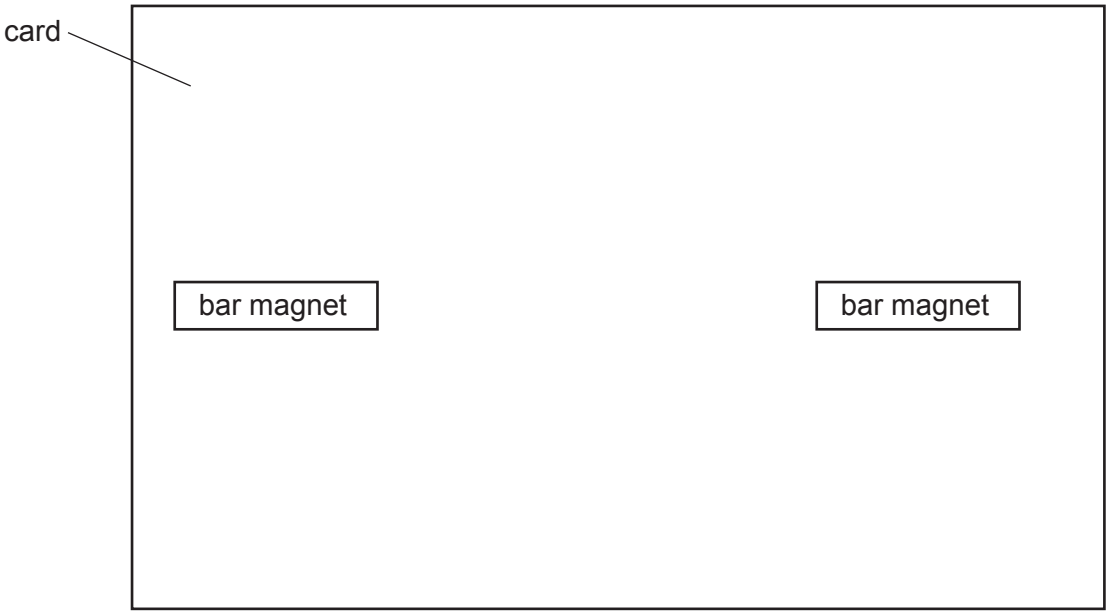


Fig. 7.3

Describe an experiment to show the pattern of the magnetic field between the bar magnets.

.....

.....

..... [3]

[Total: 5]

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8 Fig. 8.1 shows an electric circuit set up by a student.

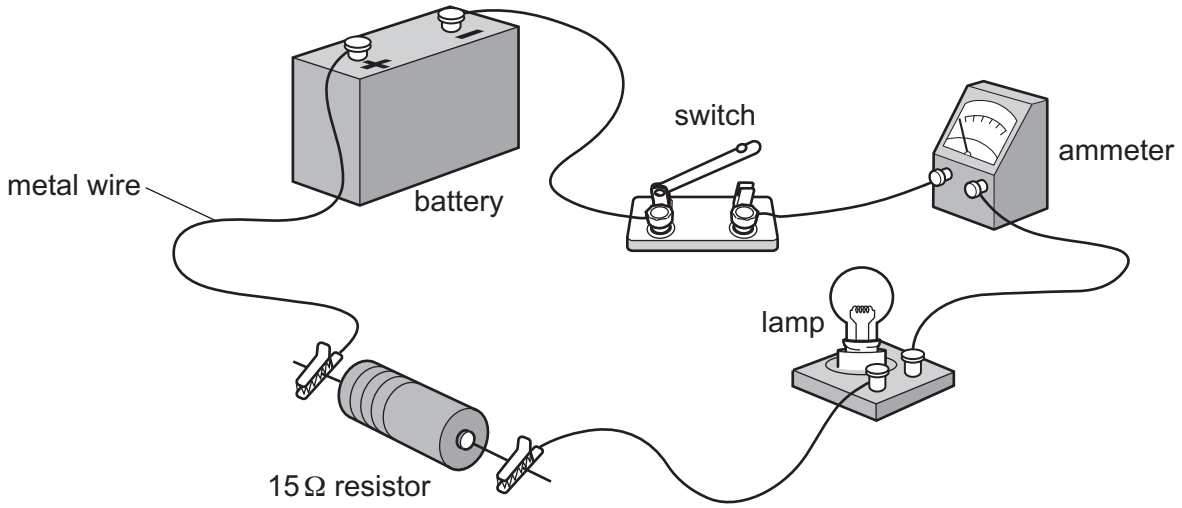


Fig. 8.1

(a) Using standard symbols, draw a circuit diagram for the student's circuit.

[4]

(b) When the switch is closed there is a current in the circuit.

State the name of the particles flowing in the metal wire.

..... [1]

(c) The current in the 15 Ω resistor in Fig. 8.1 is 0.40 A when the switch is closed.

Calculate the potential difference (p.d.) across the 15 Ω resistor.

p.d. across resistor = ... V [3]

[Total: 8]

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9 Fig. 9.1 shows a transformer used on a building site.

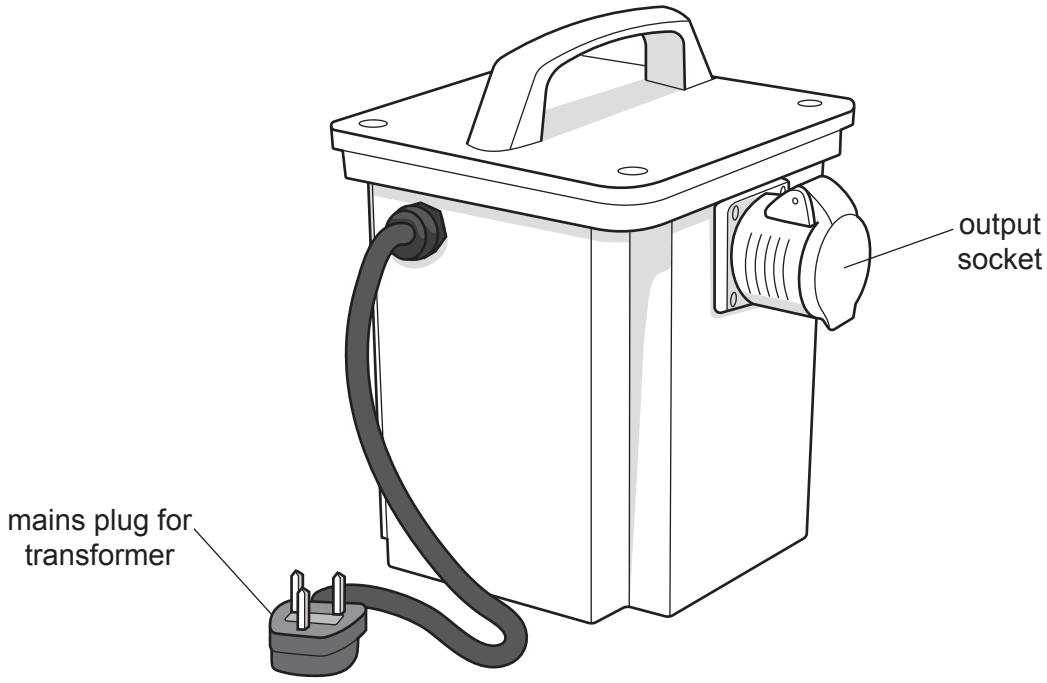


Fig. 9.1

(a) The mains plug for the transformer contains a fuse.

(i) Give a reason why the plug includes a fuse.

..... [1]

(ii) Explain how a fuse works.

.....

..... [2]

(b) The mains input (primary) potential difference (p.d.) to the transformer is 230 V a.c.

The number of turns on the input (primary) coil is 314. The number of turns on the output (secondary) coil is 150.

Calculate the output (secondary) p.d. from the transformer.

output p.d. = ... V [3]

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(c) Fig. 9.2 shows an outline of the transformer.

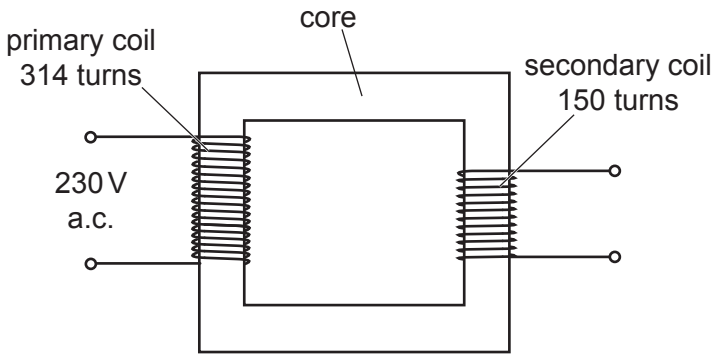


Fig. 9.2

(i) State a suitable material for the core of the transformer.

..... [1]

(ii) State a suitable material for the primary and secondary coils of the transformer.

..... [1]

(iii) Explain how Fig. 9.2 shows a step-down transformer.

..... [1]

[Total: 9]

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10 (a) α (alpha)-particles, β (beta)-particles and γ (gamma)-rays have different characteristics.

Complete Table 10.1 by indicating with a tick (✓) the correct type of radiation for each characteristic. The first row is done for you.

Table 10.1

characteristic	type of radiation		
	α (alpha)-particles	β (beta)-particles	γ (gamma)-rays
electromagnetic wave			✓
least ionising			
least penetrating			
a helium nucleus			
negatively charged			

[3]

(b) The nucleus of an isotope of plutonium has 94 protons and 147 neutrons. The chemical symbol for plutonium is Pu.

Write the nuclide notation that describes this nucleus.

[2]

(c) A sample contains 8.0×10^{12} atoms of a radioactive isotope of plutonium.
The half-life of this isotope of plutonium is 14 years.

Calculate the number of atoms of this isotope of plutonium remaining in the sample after 28 years.

number of atoms of plutonium remaining = ... [3]

[Total: 8]

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