Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2145435442

PHYSICS **0625/31**

Paper 3 Theory (Core) **May/June 2023**

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 **16** pages. Any blank pages are indicated.

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1 A cyclist is travelling along a straight road. Fig. 1.1 shows the speed–time graph for the cyclist. The graph is divided into four sections labelled P, Q, R and S.

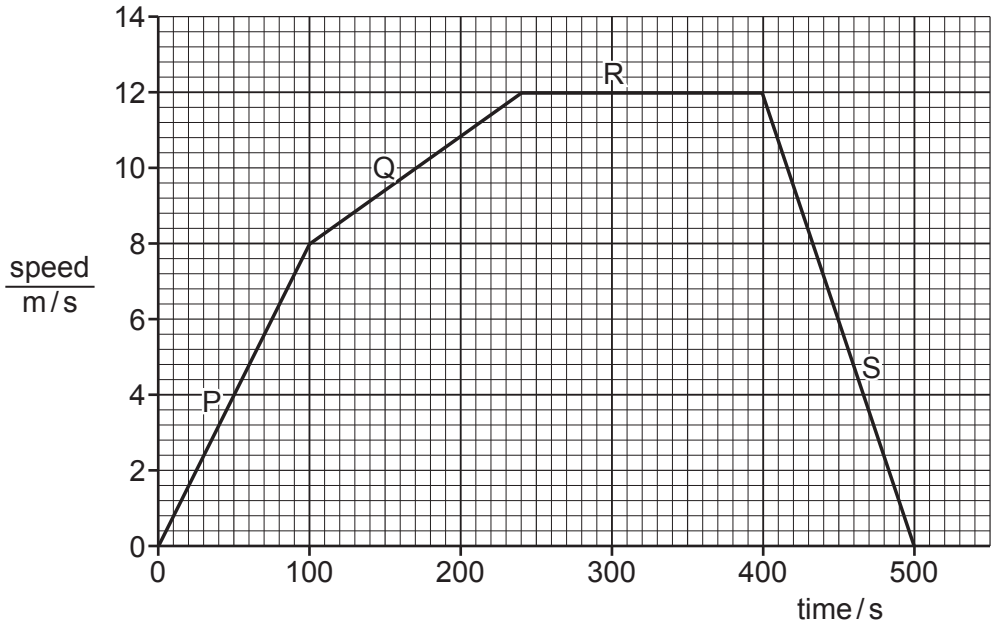


Fig. 1.1

(a) Calculate the distance travelled by the cyclist in section P from time = 0 to time = 100 s.

distance travelled = ... m [3]

(b) Describe the motion of the cyclist in each of sections Q, R and S shown in Fig. 1.1.

Q .....

R .....

S .....

[3]

(c) The cyclist is moving north along the road.

Determine the velocity of the cyclist at time = 300 s. Include the unit.

velocity of cyclist = ... [2]

[Total: 8]

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2 Fig. 2.1 shows a concrete beam resting on the ground.

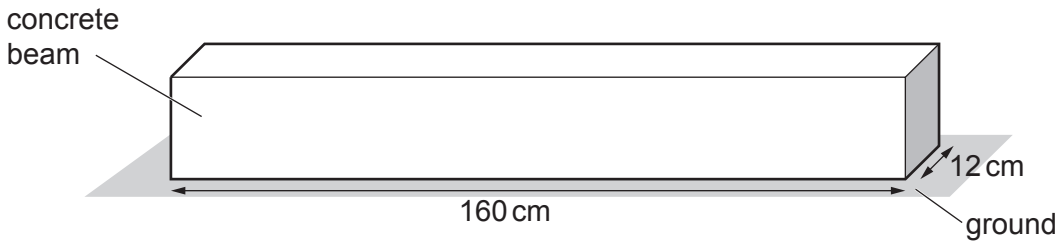


Fig. 2.1 (not to scale)

(a) The weight of the concrete beam is 1540 N.

Calculate the pressure on the ground due to the concrete beam.

pressure = ... N / cm^2 [4]

(b) A builder starts to raise one end of the beam.

He uses a force of 1030 N at a perpendicular distance of 120 cm from the pivot. Fig. 2.2 shows the arrangement.

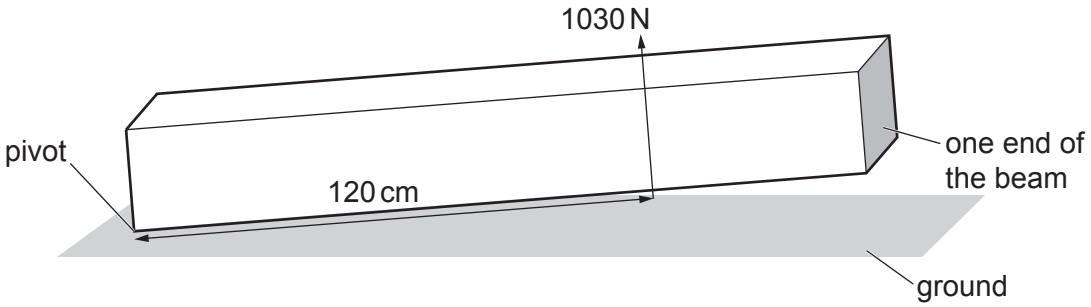


Fig. 2.2 (not to scale)

Calculate the moment of the 1030 N force about the pivot.

moment = ... N cm [3]

(c) Describe how the builder can use a smaller force to lift the beam.

..... [1]

(d) The builder positions the beam as shown in Fig. 2.3.

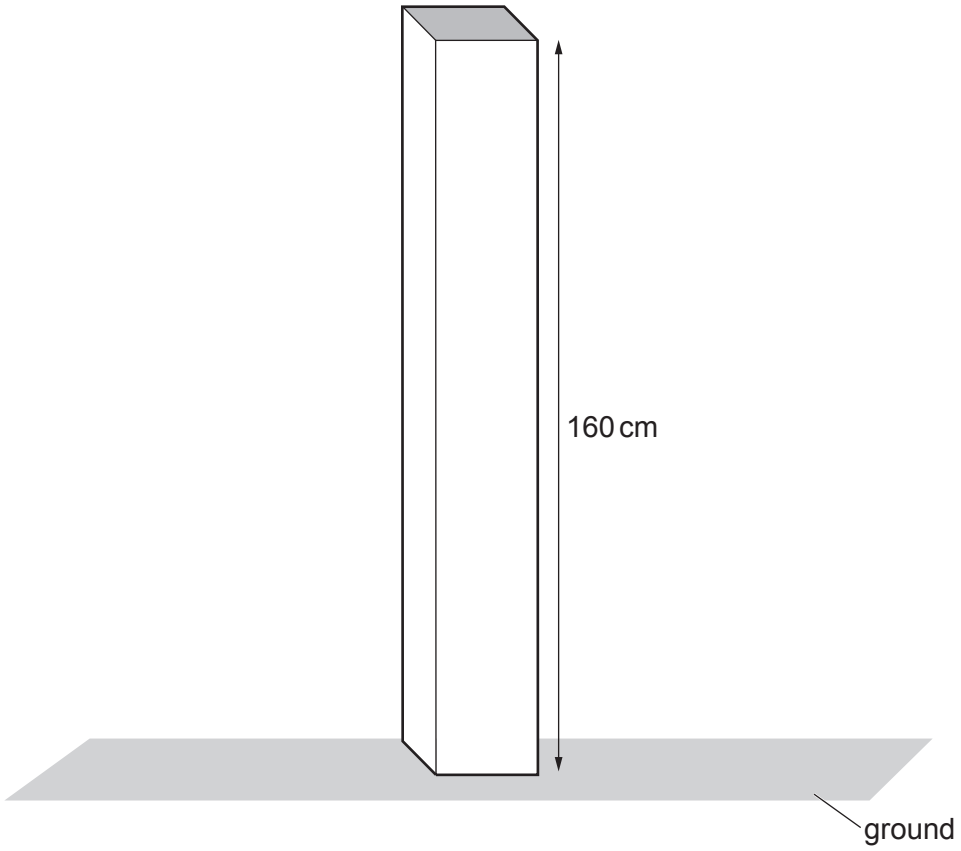


Fig. 2.3 (not to scale)

State why the beam shown in Fig. 2.3 is less stable than the beam shown in Fig. 2.1.

..... [1]

[Total: 9]

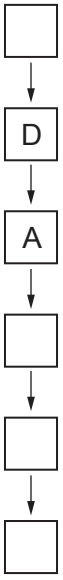
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3 Electricity is distributed from wind turbines to homes and industry.

(a) Statements A–F describe the main stages in the transfer of energy from the Sun to electrical energy in a wind turbine generator.
The statements A–F are **not** in the correct order.

A Air moves from regions of high pressure to regions of low pressure.
B The turbine blades turn a generator.
C Energy from the Sun heats the atmosphere unevenly.
D Uneven heating of the atmosphere produces regions of different atmospheric pressure.
E The generator produces electrical energy.
F Moving air turns the turbine blades.

Complete the flow chart to describe how a wind turbine uses energy from the Sun to generate electrical energy. Insert the missing letters in the empty boxes.



[3]

(b) State **two** disadvantages, apart from cost, of using wind turbines to produce electrical energy for homes and industry.

1 .....

2 .....

[2]

[Total: 5]

4 A student uses an electric motor to lift a load. Fig. 4.1 shows the arrangement.

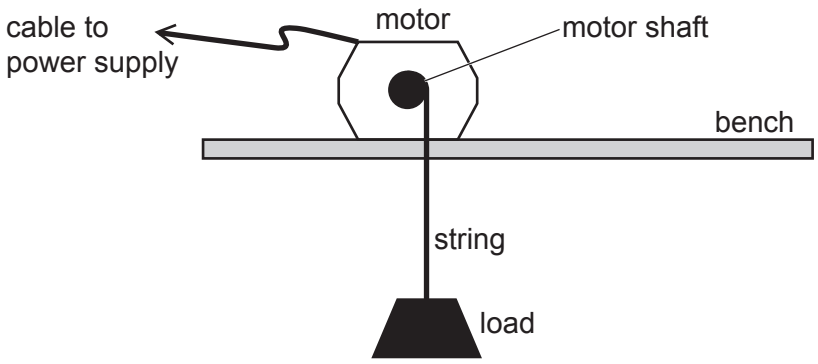


Fig. 4.1 (not to scale)

(a) (i) The motor exerts a force of 25 N on the load. It lifts the load a vertical distance of 2.0 m.

Calculate the work done by the motor on the load.

work done on the load = ... J [3]

(ii) State the useful energy output of the electric motor when it lifts the load 2.0 m.

useful energy output = ... J [1]

(iii) The useful energy output of the motor is less than the energy input to the motor.

Explain why the useful energy output is less than the energy input.

.....

..... [2]

(b) The student uses the motor to lift a different load. The motor does 80 J of work when it lifts this load. It takes 5.0 s to lift the load.

Calculate the power output of the electric motor.

power output = ... W [3]

[Total: 9]

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5 Fig. 5.1 represents some particles of a gas in a metal box. The arrows represent the directions of movement of the particles.

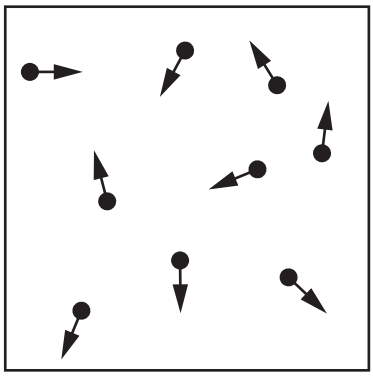


Fig. 5.1 (not to scale)

(a) Describe how the particles in Fig. 5.1 exert a pressure on the walls of the box.

.....

.....

..... [3]

(b) The number of gas particles in the box increases. The temperature of the gas does **not** change.

State and explain the effect, if any, on the pressure exerted by the gas particles on the walls of the box.

.....

.....

..... [2]

[Total: 5]

6 A student observes waves on the surface of water in a tank. The waves all have the same wavelength.

(a) The student measures the wavelength of the waves by measuring the distance between one peak and the next peak.

Describe a more accurate method for determining the wavelength.

.....

..... [2]

(b) The wavelength of the waves is 4.0 cm and their frequency is 6.0 Hz.

Calculate the wave speed.

wave speed = ... cm / s [3]

(c) Fig. 6.1 shows water waves in the tank travelling from deep water to shallow water.

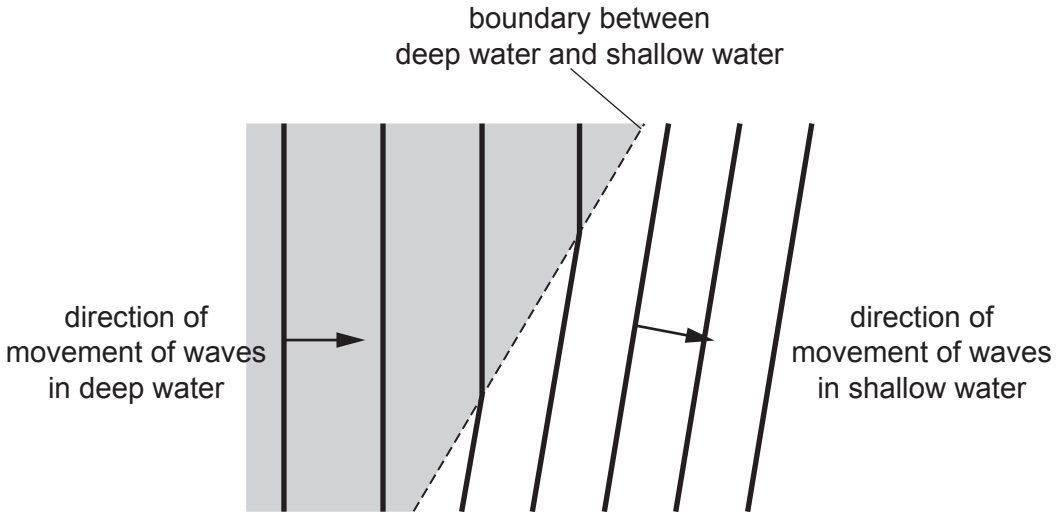


Fig. 6.1

State and explain what happens to the waves as they move from deep water to shallow water.

name of effect .....

explanation .....

.....
[2]

[Total: 7]

7 Fig. 7.1 represents two rays of light striking a thin converging lens. The rays are both parallel to the principal axis.
F_2 and F_1 are the focal points of the lens.

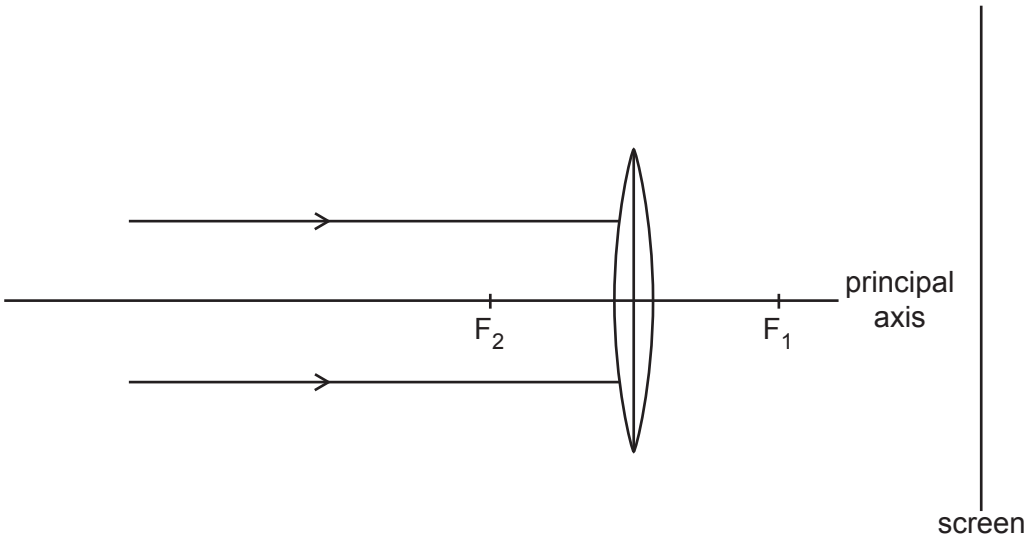


Fig. 7.1

(a) On Fig. 7.1, continue the path of each ray beyond the lens as far as the screen. [2]

(b) Visible light is a region of the electromagnetic spectrum.

State **one** region of the electromagnetic spectrum which has waves of longer wavelength than waves of visible light.

..... [1]

(c) Gamma rays are another region of the electromagnetic spectrum.

(i) Describe **one** use of gamma rays.

..... [1]

(ii) Describe **one** harmful effect on people of excessive exposure to gamma rays.

..... [1]

[Total: 5]

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8 Fig. 8.1 shows the magnetic field pattern around two permanent magnets. The magnets are repelling each other.

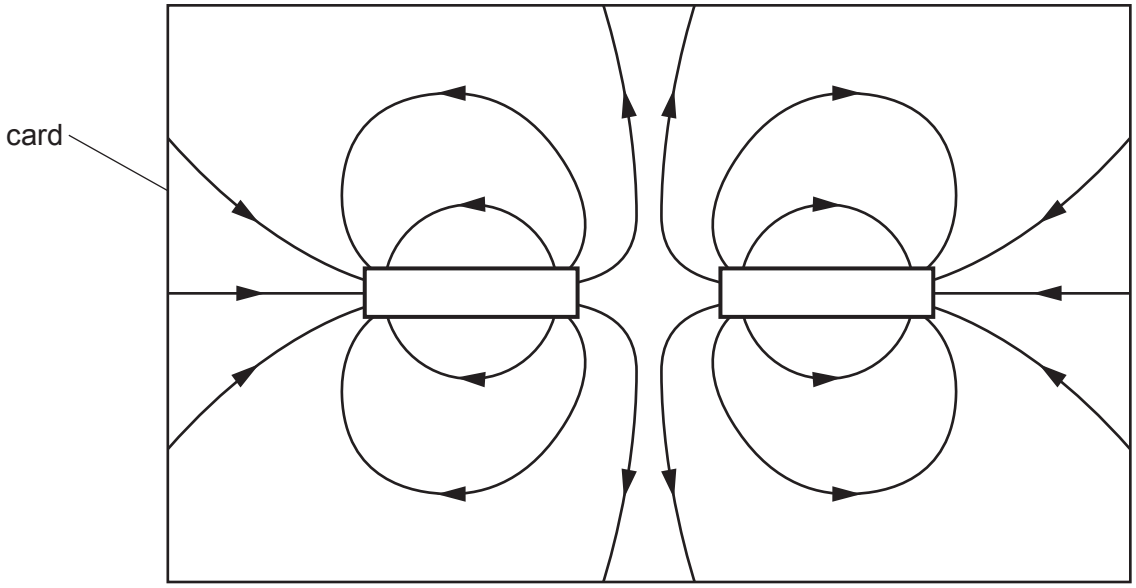


Fig. 8.1

(a) On Fig. 8.1, label both the poles on **each** magnet. [1]

(b) Describe how to plot the shape and direction of the magnetic field pattern shown in Fig. 8.1.

.....

.....

.....

.....

..... [4]

[Total: 5]

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9 Fig. 9.1 shows a series circuit. Two of the components in the circuit are labelled.

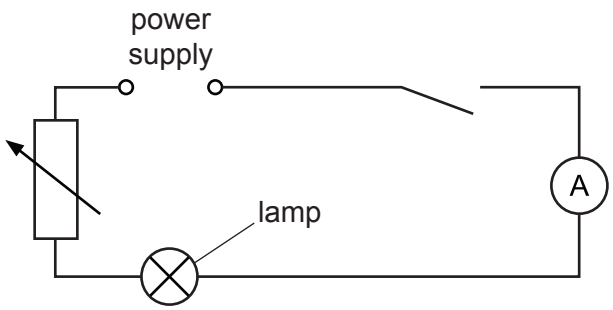


Fig. 9.1

(a) State the name of **two** other components in the circuit.

1 .....

2 .....
[2]

(b) The current in the lamp is 0.40 A. The potential difference (p.d.) across the lamp is 6.0 V.

Calculate the power dissipated in the lamp.

power = ... W [3]

(c) Draw on Fig. 9.1 to show a lamp connected in parallel with the lamp in the circuit. Use the correct symbol. [1]

[Total: 6]

10 **(a)** Fig. 10.1 shows an arrangement used to demonstrate electromagnetic induction.

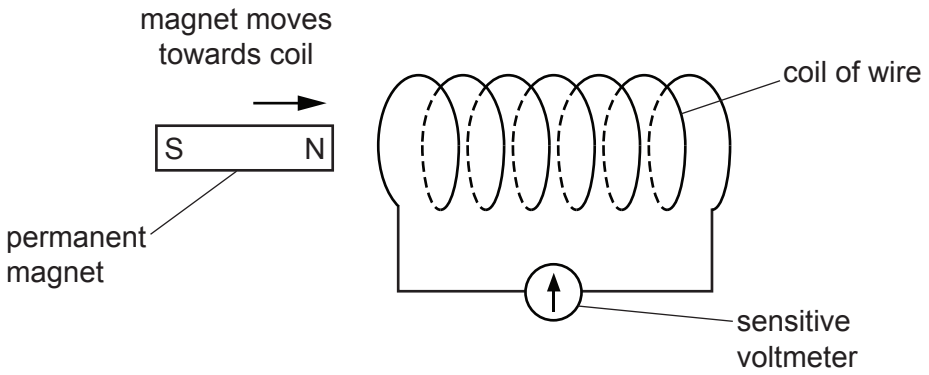


Fig. 10.1

(i) When the magnet moves towards the coil of wire, the pointer on the sensitive voltmeter deflects to the right.

Explain why the pointer deflects.

.....

..... [2]

(ii) State **two** changes that increase the deflection on the sensitive voltmeter.

1 .....

2 .....
[2]

(b) Fig. 10.2 shows the symbol for a transformer. The primary coil is connected to a voltage of 180 V a.c.

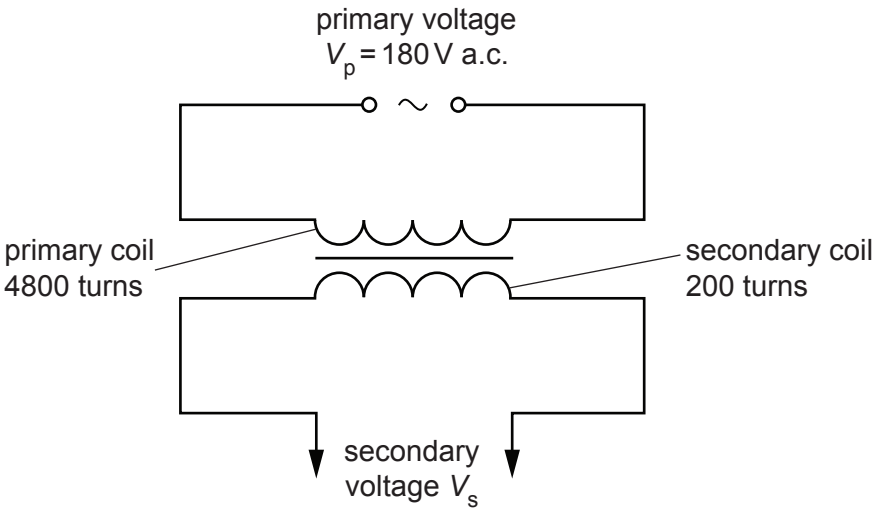


Fig. 10.2

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Calculate the secondary voltage V_s for the transformer.

V_s = ... V [3]

[Total: 7]

11 Fig. 11.1 represents all the particles in an atom which is a radioactive isotope of carbon.

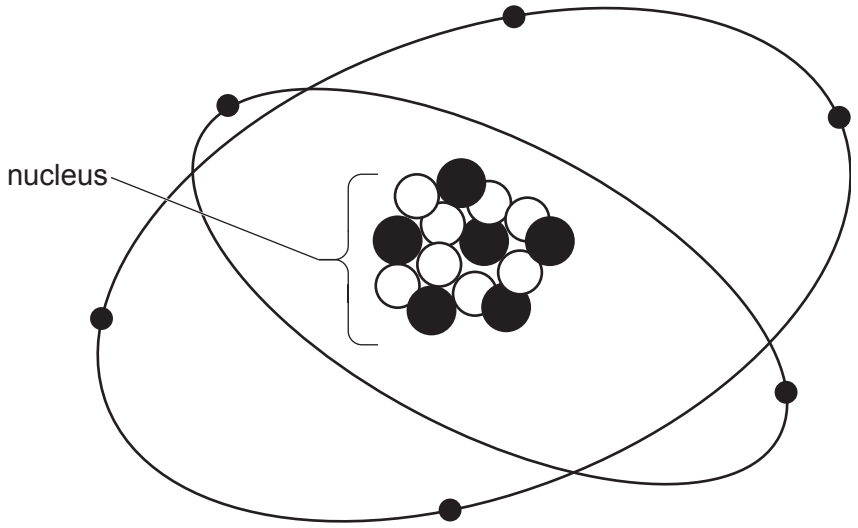


Fig. 11.1 (not to scale)

(a) Table 11.1 gives information about the particles shown in Fig. 11.1.

Using the information in Fig. 11.1, write in the empty boxes to complete Table 11.1.

Table 11.1

name of particle	number of particles	position of particle	relative charge of particle
electron			
neutron		in the nucleus	
	6		+1 (plus one)

[4]

(b) A museum displays an item made of ancient wood. When the wood was new, the item contained 8.00 mg of the isotope shown in Fig. 11.1. The item now contains 2.00 mg of the isotope. The half-life of the isotope is 5700 years.

Calculate the age of the wood in the item.

age of wood = ... years [3]

[Total: 7]

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12 **(a)** Fig. 12.1 represents the Earth and the Sun at one point in the Earth's orbit of the Sun.

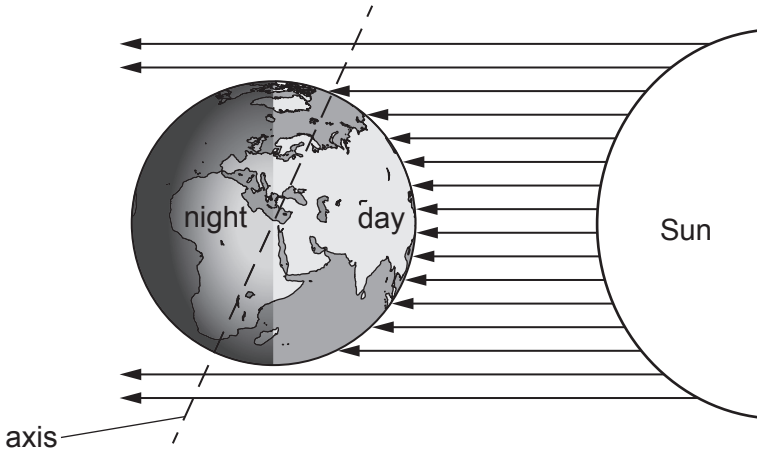


Fig. 12.1 (not to scale)

Explain the apparent daily motion of the Sun across the sky.

.....

.....

..... [2]

(b) List the four planets closest to the Sun in order of their distance from the Sun. One is done for you.

1 ..... 2 ..... 3 Earth ..... 4 ..... [2]

(c) The Sun mostly consists of two elements.

State the **two** elements.

1 .....

2 .....
[2]

(d) The Sun is a star in a galaxy.

State the name of the galaxy.

..... [1]

[Total: 7]

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