Cambridge Assessment International Education

Cambridge IGCSE™

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CENTRE NUMBER						CANDIDATE NUMBER				

PHYSICS **0625/31**

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

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1 Fig. 1.1 shows a distance–time graph for a cyclist.

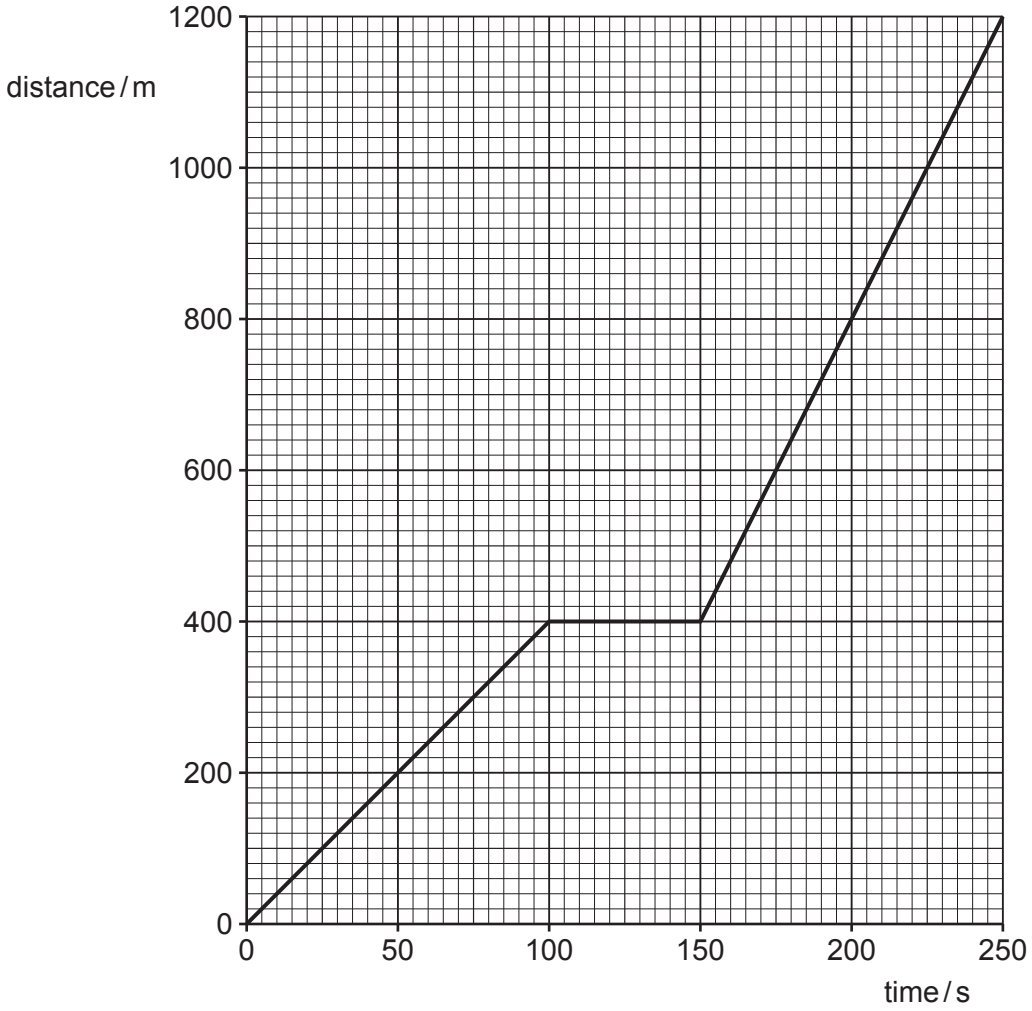

Fig. 1.1

(a) (i) Determine the distance travelled by the cyclist between time = 0 and time = 100 s.

View solution

distance travelled = ... m [1]

(ii) Calculate the speed of the cyclist between time = 0 and time = 100 s.

View solution

speed = ... m / s [3]

(iii) Describe the motion of the cyclist between time = 100 s and time = 250 s.

View solution

.....

..... [2]

(b) Fig. 1.2 shows the cyclist riding along a long straight road.

View solution

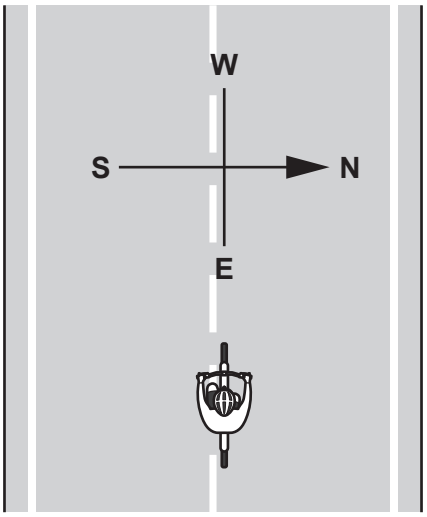

Fig. 1.2

The speed of the cyclist is 15 m / s. Determine the velocity of the cyclist.

velocity = ... m / s

direction .....

[1]

[Total: 7]

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2 The mass of a solid metal cylinder is 400 g and its volume is 52 cm^3.

(a) Calculate the density of the metal. Include the unit.

View solution

density = ... [4]

(b) The cylinder is falling at constant speed through the air. Fig. 2.1 shows the vertical forces acting on the cylinder.

View solution

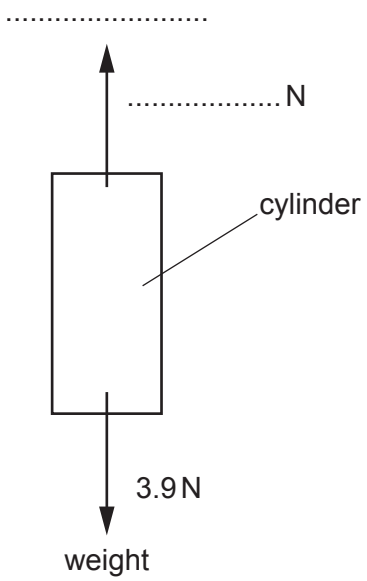


Fig. 2.1 (not to scale)

On Fig. 2.1, write the name and the size of the upward force on the cylinder. [2]

(c) The student balances a beam on a pivot. On the beam, he positions the cylinder and a block so that the beam remains balanced. The arrangement is shown in Fig. 2.2.

View solution

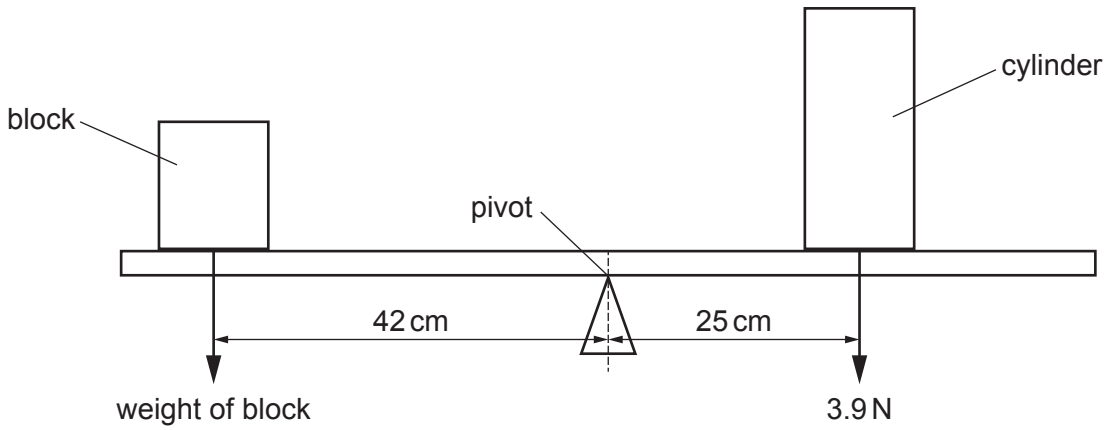


Fig. 2.2 (not to scale)

Calculate the weight of the block.

weight of block = ... N [4]

[Total: 10]

3 Fig. 3.1 represents the arrangement and separation of particles in a liquid. Each circle represents a particle.

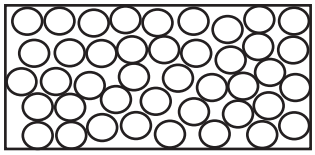


Fig. 3.1

(a) In the box in Fig. 3.2, draw at least **four** circles to show the arrangement and separation of particles in a **gas**.

View solution



Fig. 3.2

[2]

(b) Describe the arrangement, separation and motion of particles in a **solid**.

View solution

.....

.....

..... [3]

(c) Fig. 3.3 shows a fire heating water in a metal pan.

View solution

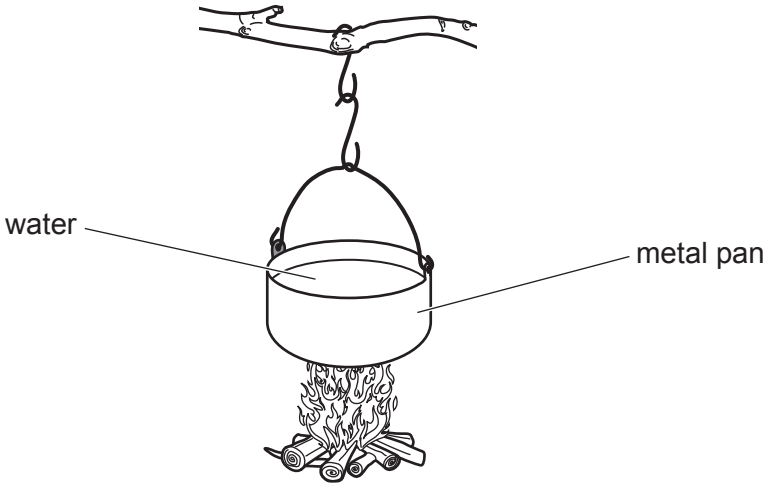


Fig. 3.3

(i) State the name of the process of thermal energy transfer through the metal of the pan.

..... [1]

(ii) Describe how thermal energy is transferred through the water by convection.

View solution

.....

.....

..... [3]

(iii) State the temperature at which the water boils at standard atmospheric pressure.

temperature = ... °C [1]

[Total: 10]

View solution

4 Fig. 4.1 represents a wave on the surface of water.

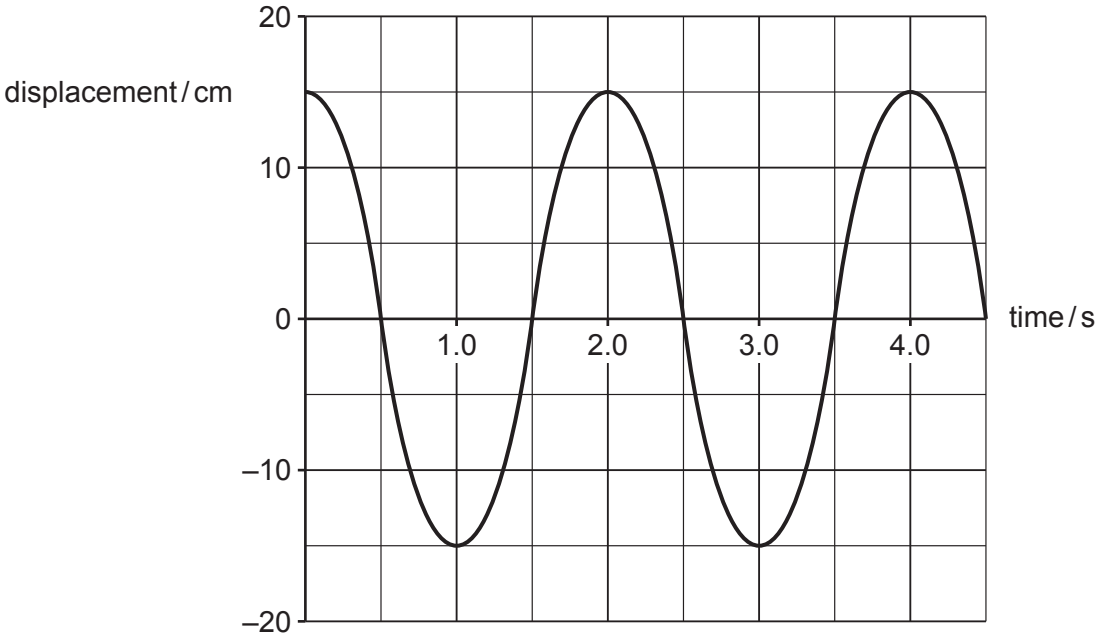


Fig. 4.1

(a) (i) Determine the amplitude of the wave in Fig. 4.1.

View solution

amplitude = ... cm [1]

(ii) Determine the frequency of the wave in Fig. 4.1.

View solution

frequency = ... Hz [2]

(b) Fig. 4.2 shows wavefronts passing through a small gap in a barrier.
The arrows on the diagram show the directions of propagation of the wavefronts.

View solution

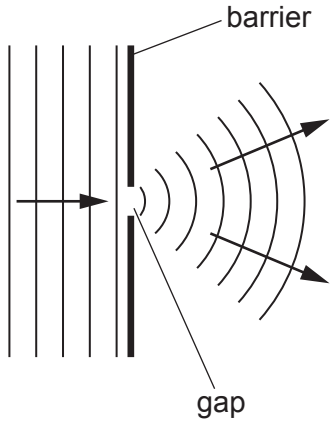


Fig. 4.2

State the name of the wave property shown in Fig. 4.2.

..... [1]

(c) Fig. 4.3 shows wavefronts changing direction as they pass from shallow water to deep water.
The arrows on the diagram show the directions of propagation of the wavefronts.

View solution

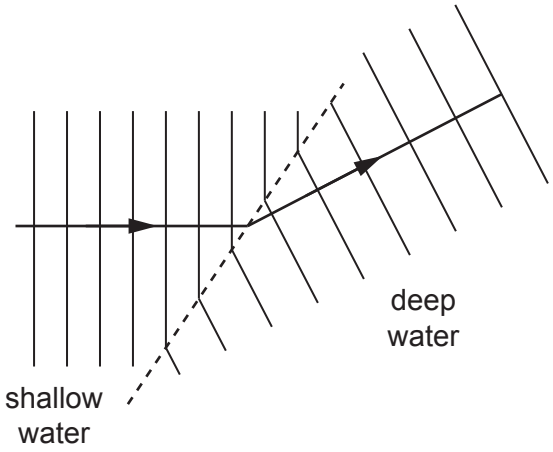


Fig. 4.3

(i) State the name of the wave property shown in Fig. 4.3.

..... [1]

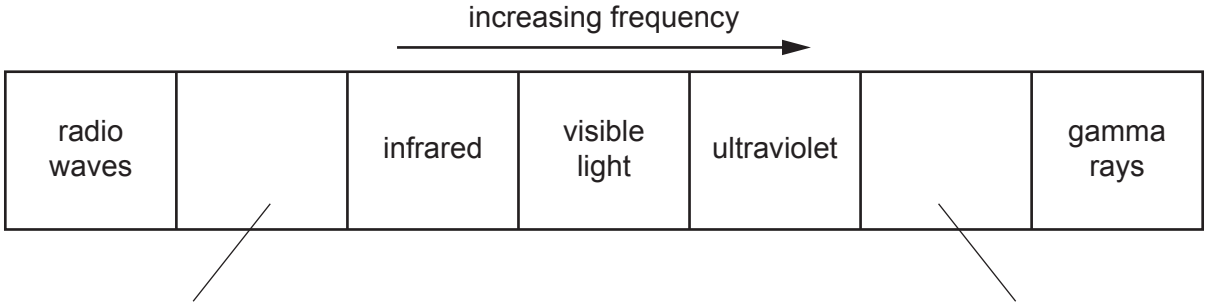
(ii) State **one** property of the water wave, other than direction, that changes as it moves from shallow water to deep water.

..... [1]

[Total: 6]

View solution

5 Fig. 5.1 shows the main regions of the electromagnetic spectrum in order of increasing frequency.



....

Fig. 5.1

(a) Two of the regions are unlabelled.

Add the correct label to each of the unlabelled regions in Fig. 5.1. [2]

(b) State **one** use of infrared radiation and **one** use of ultraviolet radiation.

infrared radiation

.....

ultraviolet radiation

.....

[2]

(c) Describe possible harmful effects of excessive exposure to:

infrared radiation

.....

ultraviolet radiation

.....

[2]

[Total: 6]

6 Fig. 6.1 shows four wind turbines.

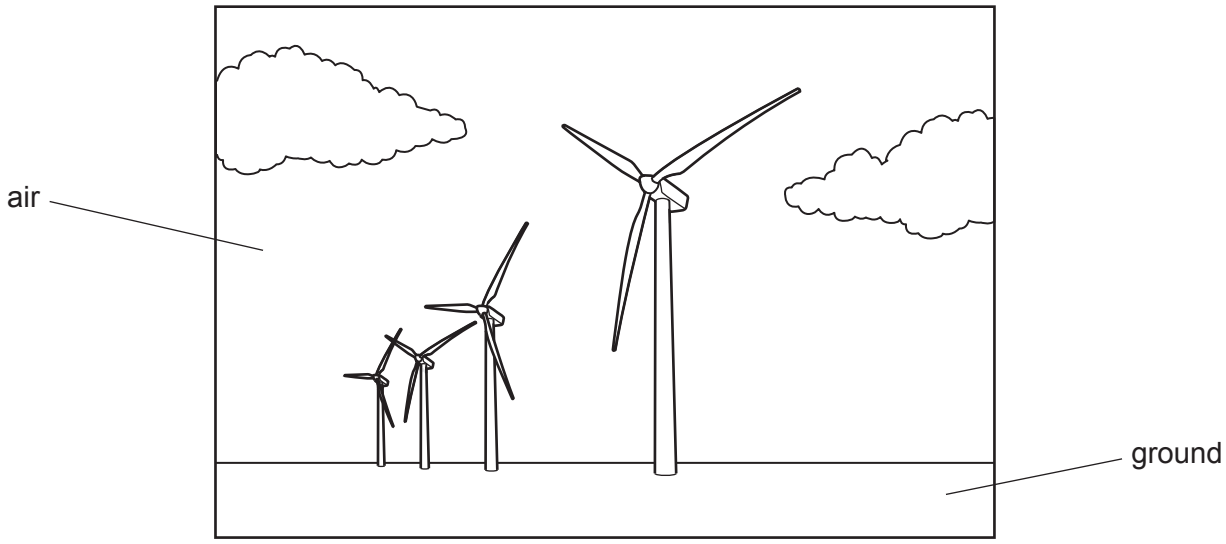


Fig. 6.1

(a) Describe how a wind turbine generates electrical power.

View solution

.....

.....

..... [3]

(b) The electrical power output of a wind turbine is 624 kW. The output current is 520 A.

View solution

Calculate the output voltage of the wind turbine.

output voltage = ... V [4]

(c) For transmission, the output voltage is increased to 132 kV.

View solution

State **two** advantages of transmitting electrical power at high voltage.

1 .....

2 .....

[2]

[Total: 9]

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7 Fig. 7.1 shows a ray diagram for an object positioned on the principal axis of a thin converging lens.

F_1 and F_2 are the focal points of the lens and C is the centre of the converging lens.

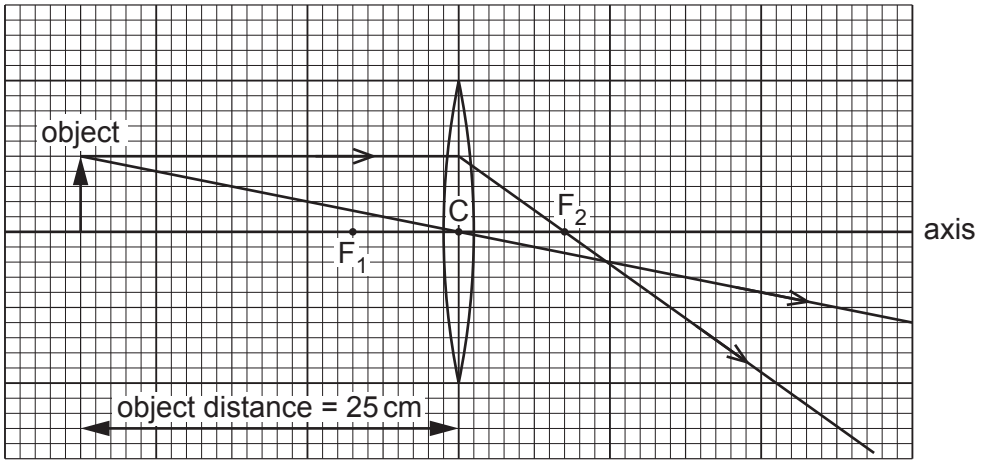

Fig. 7.1

(a) On Fig. 7.1, each small square of the grid represents 1.0 cm.

Determine the focal length of the converging lens.

focal length = ... cm [1]

(b) On Fig. 7.1, draw an arrow to show the position of the image formed by the converging lens. [1]

(c) State **three** characteristics of the image formed by the converging lens.

1 .....

2 .....

3 .....

[3]

[Total: 5]

8 Fig. 8.1 shows a solenoid (long coil of wire) connected in a circuit. When the switch is closed, there is a large current in the circuit.

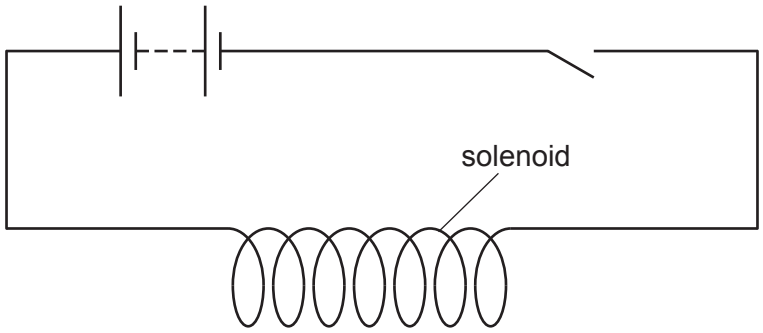

Fig. 8.1

(a) Describe an experiment to identify the pattern **and** direction of the magnetic field around the solenoid.

You may draw on Fig. 8.1 as part of your description.

View solution

.....

.....

..... [3]

(b) A solenoid P is placed close to another solenoid Q. Solenoid Q is connected to a sensitive voltmeter.
The arrangement is shown in Fig. 8.2.

View solution

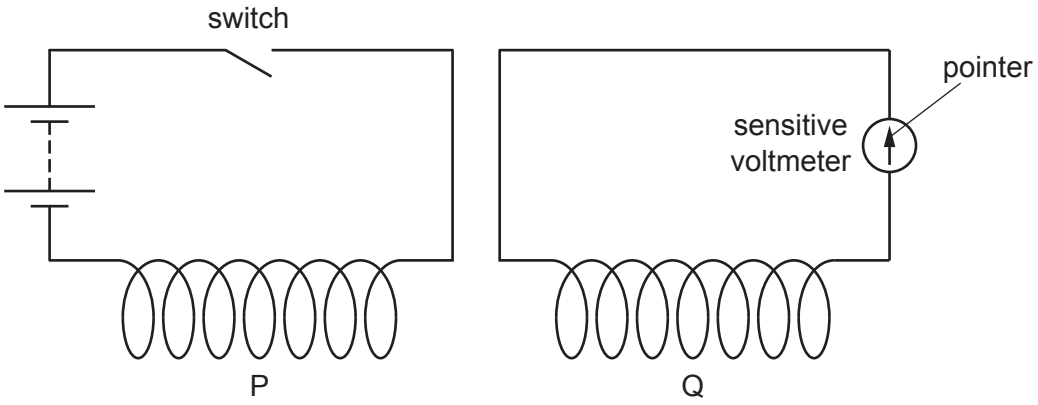

Fig. 8.2

Describe and explain what happens when the switch is closed.

.....

.....

.....

..... [4]

[Total: 7]

9 A student investigates an electric circuit. Fig. 9.1 shows the student's circuit.

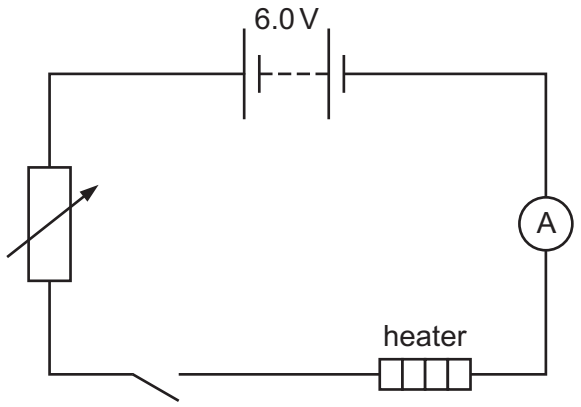

Fig. 9.1

(a) (i) Describe the purpose of the variable resistor in Fig. 9.1.

View solution

.....

..... [1]

(ii) The student uses cells with an electromotive force (e.m.f.) of 1.5 V.

Determine the number of cells needed for the 6.0 V battery in Fig. 9.1.

number of cells needed = ... [1]

(iii) The student connects another component to measure the potential difference (p.d.) across the heater.

On Fig. 9.1, draw the electrical symbol and connections for this component. [2]

(b) The p.d. across the heater is 4.0 V. The current in the heater is 1.6 A.

View solution

Calculate the energy transferred electrically by the heater in 40 s.

energy transferred = ... J [3]

[Total: 7]

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10 A nucleus of an isotope of actinium contains 89 protons and 136 neutrons.
The chemical symbol for actinium is Ac.

(a) **(i)** Complete the nuclide notation for this isotope of actinium.

View solution

.....
.....Ac

[1]

(ii) State the number of electrons orbiting the nucleus of a neutral atom of this isotope.

number of electrons = ... [1]

(b) A sample contains 8.0 mg of this isotope of actinium.

View solution

The isotope of actinium has a half-life of 10.0 days.

The graph in Fig. 10.1 shows the original mass of the actinium in the sample and its mass after 10 days.

On Fig. 10.1, plot **two** more points for the mass remaining after 20 days and 30 days. Draw the decay curve for the sample over 30 days.

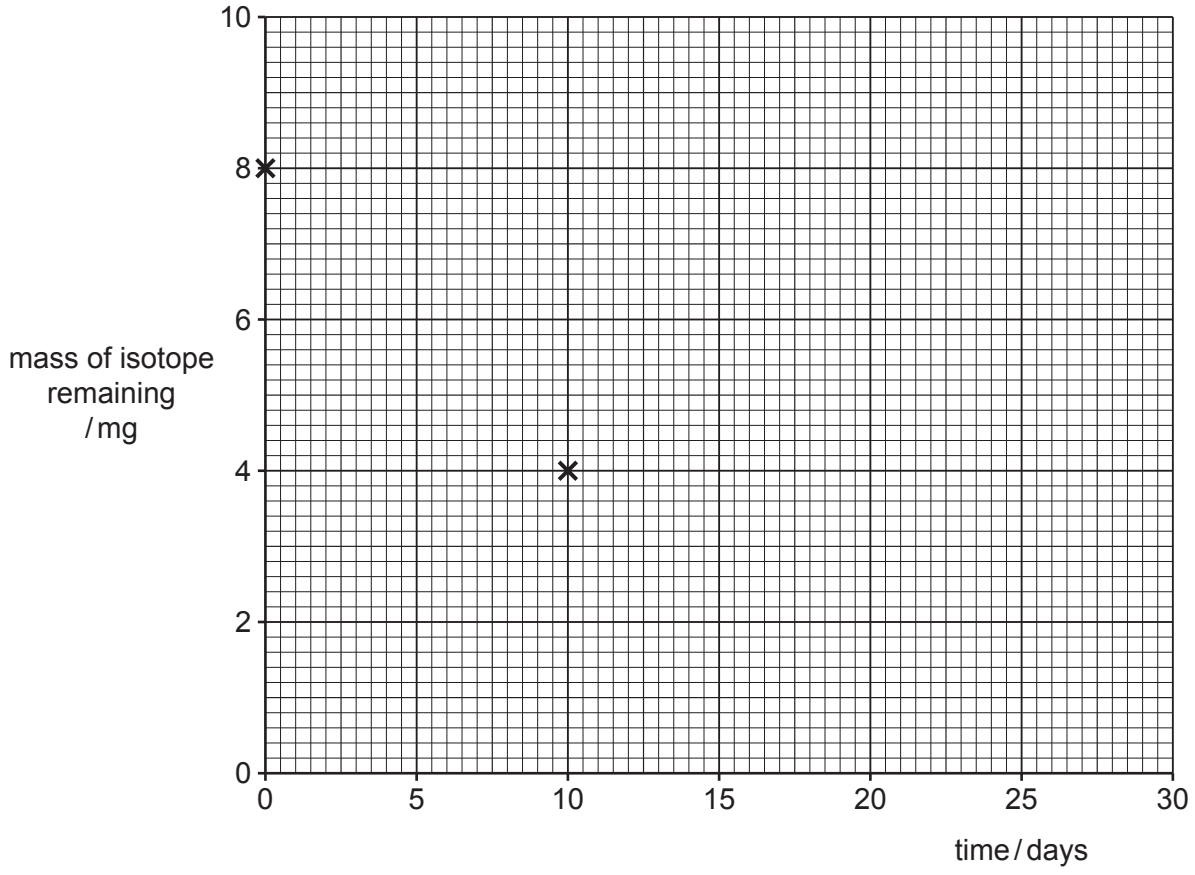

Fig. 10.1

[3]

[Total: 5]

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11 Fig. 11.1 represents the Sun and part of the Solar System.

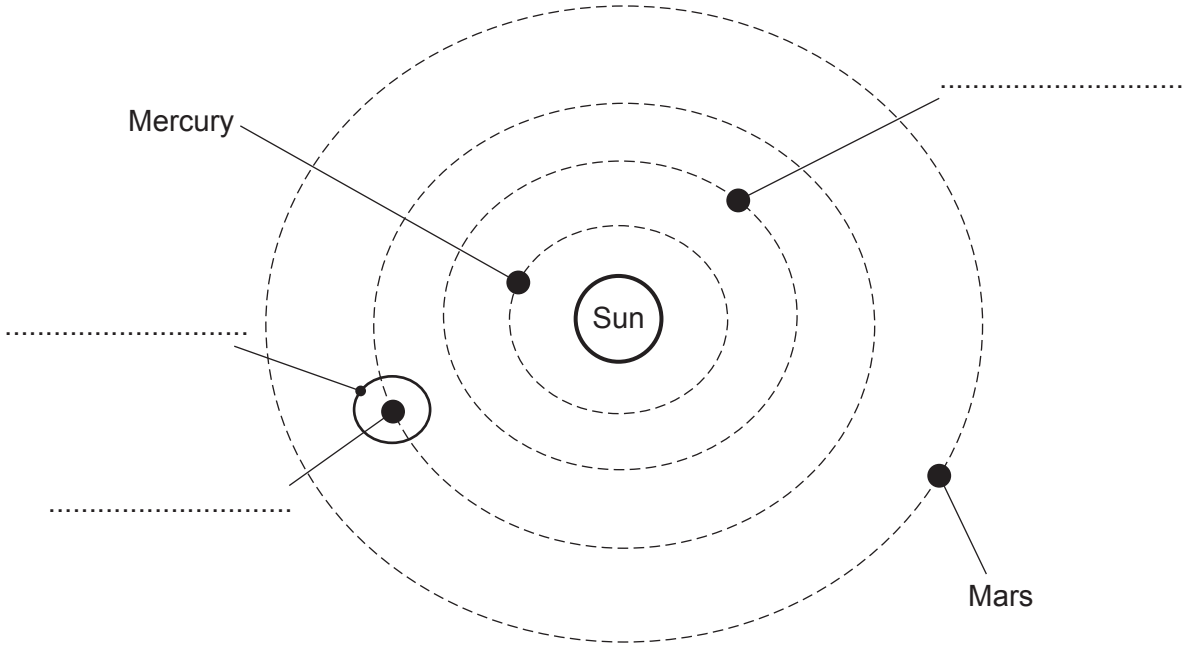

Fig. 11.1 (not to scale)

View solution

(a) Complete the labels on Fig. 11.1 by writing on the dotted lines. [3]

(b) Complete the sentences about the Sun.

The Sun consists mostly of the elements ..... and

..... .

View solution

Most of the Sun's energy is radiated in the infrared, ...

and ..... regions of the electromagnetic spectrum.

[4]

(c) Give an estimate for the diameter of the Milky Way galaxy.

diameter = ... light-years [1]

[Total: 8]

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