

**Paper Reference(s)      1PH0 / 1F**

**Pearson Edexcel Level 1/Level 2 GCSE (9–1)**

**Physics**

**Paper 1**

**Foundation Tier**

**Wednesday 22 May 2019 – Afternoon**

**Time: 1 hour 45 minutes plus your additional  
time allowance**

**INSTRUCTIONS TO CANDIDATES**

**Write your centre number, candidate number,  
surname, other names and your signature in  
the boxes below. Check that you have the  
correct question paper.**

<b>Centre No.</b>					
<b>Candidate No.</b>					
<b>Surname</b>					
<b>Other names</b>					
<b>Signature</b>					
<b>Paper Reference</b>	<b>1</b>	<b>P</b>	<b>H</b>	<b>0</b>	<b>/ 1 F</b>



**Y56429A**

**Pearson**

**(Turn over)**

- **Use BLACK ink or ball-point pen.**
- **Answer ALL questions.**
- **Answer the questions in the spaces provided – there may be more space than you need.**
- **Calculators may be used.**
- **Any diagrams may NOT be accurately drawn, unless otherwise indicated.**
- **You must show all your working out with your answer clearly identified at the end of your solution.**

## **MATERIALS REQUIRED FOR EXAMINATION**

**Calculator, ruler**

## **ITEMS INCLUDED WITH QUESTION PAPERS**

**Equations booklet**

## **INFORMATION FOR CANDIDATES**

- **The total mark for this paper is 100.**
- **The marks for EACH question are shown in brackets – use this as a guide as to how much time to spend on each question.**

**(Instructions continue on next page)**

**(Turn over)**

- In questions marked with an asterisk (\*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.
- An equations booklet is provided.

### **ADVICE TO CANDIDATES**

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

**(Turn over)**

**Answer ALL questions. Write your answers in the spaces provided.**

**Some questions must be answered with a cross in a box ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.**

**(Questions begin on next page)**

**(Turn over)**

1 (a) Figure 1 shows a speed/time graph for a car.

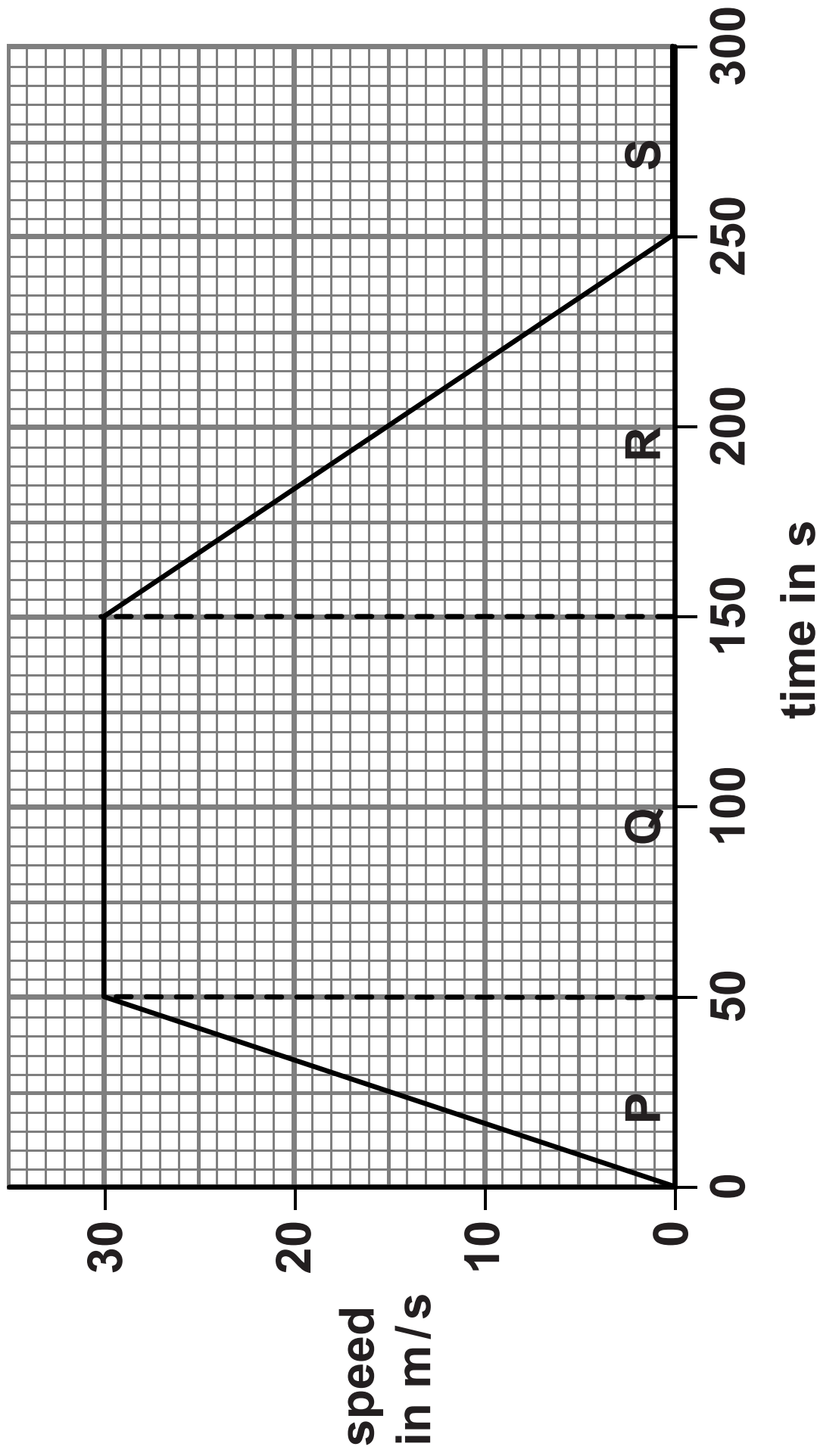


Figure 1

(Question continues on next page)

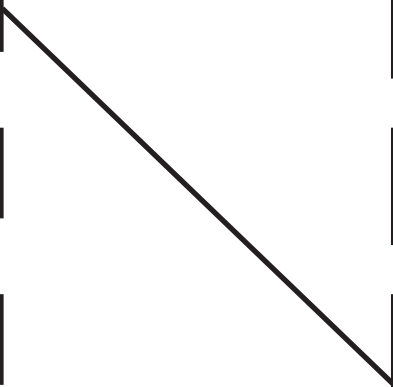
(Turn over)

- (i) The graph in Figure 1 is divided into four parts, P, Q, R and S.

Draw a line from the letter for each PART to the correct DESCRIPTION OF THE MOTION during that part.

One line has been drawn for you.  
(2 marks)

part	description of the motion
P	the car is standing still
Q	the car is accelerating
R	the car is decelerating
S	the car is travelling at constant speed



(Question continues on next page)

(Turn over)

- (ii) In two parts of the graph in Figure 1 the forces are balanced.**

**State the letters of the two parts of the graph where the horizontal forces acting on the car are balanced. (2 marks)**

**part \_\_\_\_\_ and part \_\_\_\_\_**

**(Question continues on next page)**

**(Turn over)**

**(iii) Calculate the distance travelled by the car in part Q. (2 marks)**

**Use the equation**

**distance travelled = average speed  $\times$  time**

**distance travelled = \_\_\_\_\_m**

**(Question continues on next page)**

**(Turn over)**



- (b) A car with a mass of 1800 kg is accelerating at  $1.2 \text{ m/s}^2$ .

Calculate the force used to accelerate the car. (2 marks)

Use the equation

**force = mass  $\times$  acceleration**

**force = \_\_\_\_\_ N**

**(TOTAL FOR QUESTION 1 = 8 MARKS)**

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**(Questions continue on next page)**

**(Turn over)**

- 2 (a) Figure 2 shows an energy transfer diagram for a steam engine.

The diagram shows the amounts of energy transferred each second by the steam engine.



Figure 2

- (i) Calculate the amount of wasted energy. (1 mark)

wasted energy = \_\_\_\_\_ J

(Question continues on next page)

(Turn over)

- (ii) Calculate the efficiency of the steam engine. (2 marks)**

**Use the equation**

$$\text{efficiency} = \frac{\text{(useful energy transferred by the steam engine)}}{\text{(total energy supplied to the steam engine)}}$$

**efficiency = \_\_\_\_\_**

**(Question continues on next page)**

**(Turn over)**

**(iii) State what happens to the wasted energy. (1 mark)**

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**(Question continues on next page)**

**(iv) Coal is a fossil fuel that is burnt in some steam engines.**

**State TWO ways that the use of coal might be harmful to the environment. (2 marks)**

**1** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**(Question continues on next page)**

**(Turn over)**

- (b) A model train has a mass of 8·0 kg.  
It travels at a speed of 1·5 m/s.**

**Calculate the kinetic energy of the  
model train. (3 marks)**

**Use the equation**

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times (\text{speed})^2$$

**kinetic energy = \_\_\_\_\_ J**

**(TOTAL FOR QUESTION 2 = 9 MARKS)**

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**(Questions continue on next page)**

**(Turn over)**

- 3 (a) Figure 3 shows a ray of light going from air to glass.

Fill in the labels in Figure 3 using words from the box. (3 marks)

critical	incident	normal
reflected	refracted	

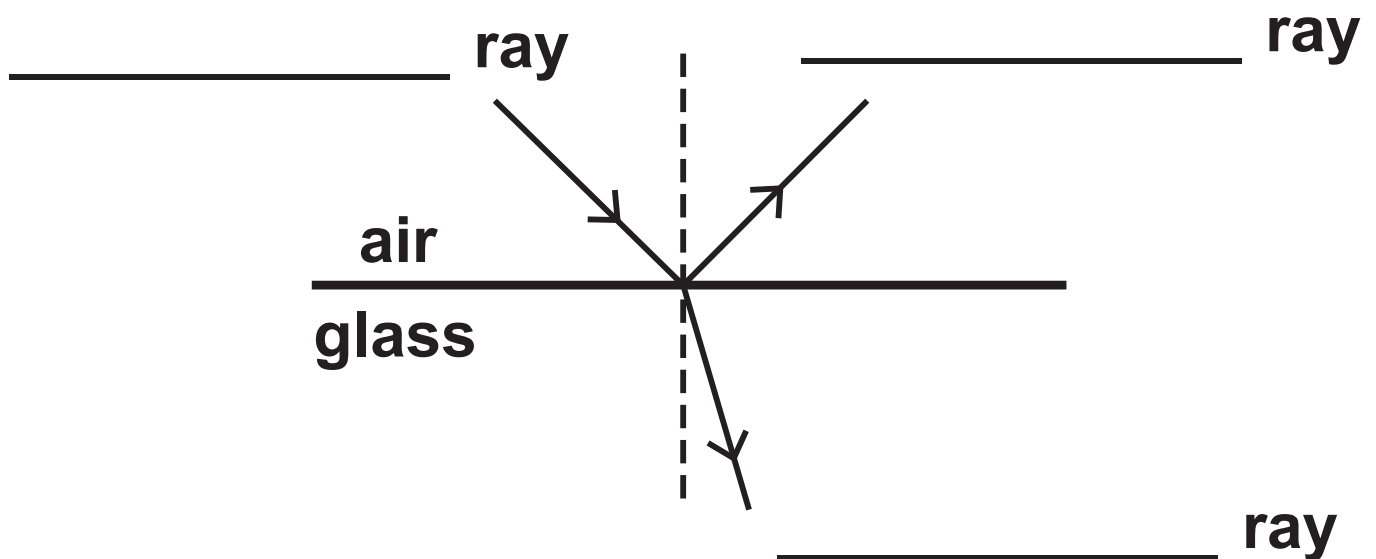


Figure 3

(Question continues on next page)

(Turn over)

- (b) (i) An astronomer observes light from a distant galaxy.**

**As the galaxy moves away from us, the spectrum of the light is  
(1 mark)**

- ☐ **A blue-shifted**
- ☐ **B green-shifted**
- ☐ **C red-shifted**
- ☐ **D violet-shifted**

- (ii) The shift in the spectrum of light from the distant galaxy provides evidence for the expansion of the  
(1 mark)**

- ☐ **A Earth**
- ☐ **B Milky Way Galaxy**
- ☐ **C Solar System**
- ☐ **D Universe**

**(Question continues on next page)**

**(Turn over)**



**(c) The speed of sound in air is 300 m/s.**

**The speed of sound in water is  
1500 m/s.**

**Calculate the ratio of the speed of  
sound in air to the speed of sound in  
water. (2 marks)**

**ratio of speed of sound  
in air to the speed  
of sound in water = \_\_\_\_\_**

**(TOTAL FOR QUESTION 3 = 7 MARKS)**

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**(Questions continue on next page)**

**(Turn over)**

- 4 (a) (i) Use words from the box to complete the sentences below about ions. (2 marks)

absorbing	gaining
inner	losing
	outer

Atoms may form positive ions by  
\_\_\_\_\_ electrons.

The electrons involved in  
forming positive ions are the  
\_\_\_\_\_ electrons.

(Question continues on next page)

(Turn over)

**(ii) Which of these radiations is both electromagnetic and ionising?  
(1 mark)**

- ☐ **A     alpha**
- ☐ **B     beta minus**
- ☐ **C     gamma**
- ☐ **D     neutron**

**(iii) Which type of radiation will travel the shortest distance in air?  
(1 mark)**

- ☐ **A     alpha**
- ☐ **B     beta minus**
- ☐ **C     beta plus**
- ☐ **D     gamma**

**(Question continues on next page)**

**(Turn over)**

**(b) Lead-214 is a radioactive isotope.**

- (i) State ONE way in which radioactive isotopes can be harmful to people. (1 mark)**

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**(Question continues on next page)**

**(Turn over)**

(ii) Lead-214 emits  $\beta^-$  particles.

**Describe what happens to the nucleus of a lead-214 atom when it emits a  $\beta^-$  particle. (2 marks)**

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**(Question continues on next page)**

**(Turn over)**

**(c) The typical size of an atom is  
(1 mark)**

☐ A  $10^{-5}$  m

☐ B  $10^{-10}$  m

☐ C  $10^{-15}$  m

☐ D  $10^{-20}$  m

**(Question continues on next page)**

**(Turn over)**

(d) The mass of a proton is

$$1.6726 \times 10^{-27} \text{ kg.}$$

The mass of an electron is

$$9.1094 \times 10^{-31} \text{ kg.}$$

Calculate how many times the mass of a proton is greater than the mass of an electron.

Give your answer to two significant figures. (3 marks)

\_\_\_\_\_ times

**(TOTAL FOR QUESTION 4 = 11 MARKS)**

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(Questions continue on next page)

(Turn over)

**5 (a) Radioactivity is used in PET scanners in hospitals.**

**(i) Describe ONE use of PET scanners in hospitals. (2 marks)**

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**(Question continues on next page)**

**(Turn over)**



- (ii) State TWO precautions that hospital staff should take when working with radioactivity.  
(2 marks)

1 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**(Question continues on next page)**

**(Turn over)**

- (b) (i) X-rays can be used in diagnosis and treatment from outside the body. Some x-rays are absorbed by bone as they travel through the body.**

**Figure 4 shows how the intensity of the x-ray beam gets less as the x-rays travel further through the bone.**

**(Question continues on next page)**

percentage intensity  
of x-ray beam

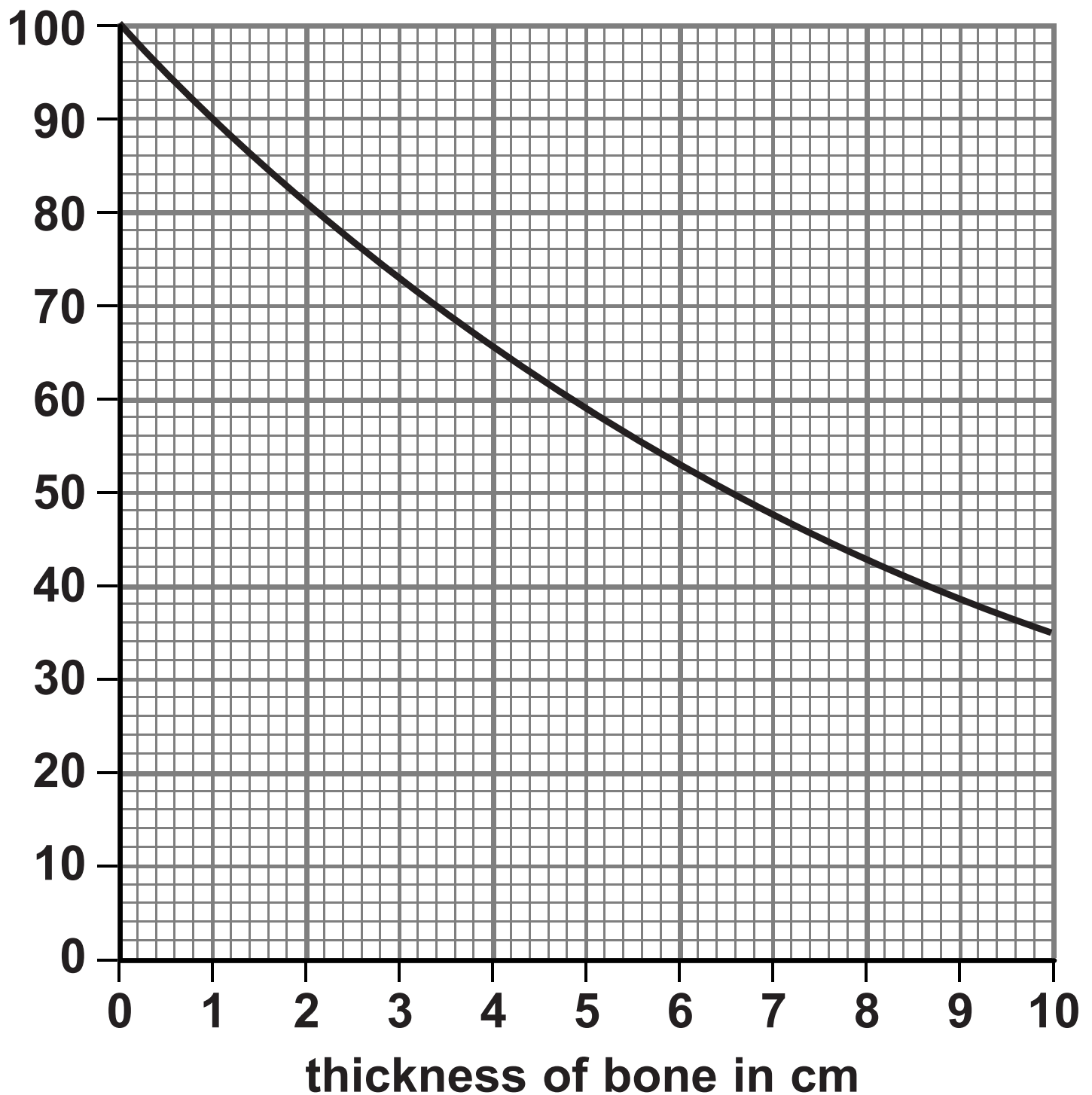


Figure 4

(Question continues on next page)

(Turn over)

**Use the graph to determine the thickness of bone that will reduce the percentage intensity of the x-ray beam by half. (2 marks)**

**thickness = \_\_\_\_\_ cm**

**(Question continues on next page)**

**(Turn over)**

- (ii) Radioactive isotopes may be placed inside the body for treatment. The energy absorbed by tissue in the body needs to be known.

The number of joules of energy absorbed by each kilogram of tissue is measured in one of the units shown.

This unit is (1 mark)

☐ A     $\text{kg/W}$

☐ B     $\text{J/kg}$

☐ C     $\text{kg/J}$

☐ D     $\text{W/kg}$

(Question continues on next page)

(Turn over)

**(c) Nuclear power is used for generating electricity.**

**(i) State TWO advantages of generating electricity using nuclear power compared with generating electricity from gas-fired power stations.  
(2 marks)**

**1** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**(Question continues on next page)**

**(Turn over)**

- (ii) Using nuclear power stations to generate electricity is unpopular with many people.

**State TWO reasons why nuclear power stations are unpopular.  
(2 marks)**

1 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**(TOTAL FOR QUESTION 5 = 11 MARKS)**

**(Questions continue on next page)**

**(Turn over)**

- 6 (a) (i) Which of these would be a typical speed for a racing cyclist travelling down a steep straight slope? (1 mark)**

☐ **A      0.2 m/s**

☐ **B      2 m/s**

☐ **C      20 m/s**

☐ **D      200 m/s**

**(Question continues on next page)**

**(Turn over)**



- (ii) A cyclist travels down a slope.  
The top of the slope is 20 m  
vertically above the bottom of the  
slope.  
The cyclist has a mass of 75 kg.

Calculate the change in  
gravitational potential energy of  
the cyclist between the top and  
the bottom of the slope.

The gravitational field strength,  $g$ ,  
is 10 N/kg. (3 marks)

change  
in gravitational  
potential energy = \_\_\_\_\_ J

(Question continues on next page)

(Turn over)

- (b) An aircraft waits at the start of a runway. The aircraft accelerates from a speed of 0 m/s to a speed of 80 m/s. The acceleration of the aircraft is 4 m/s<sup>2</sup>.

Calculate the distance,  $x$ , travelled by the aircraft while it is accelerating.

(2 marks)

Use the equation

$$x = \frac{v^2 - u^2}{2a}$$

$x =$  \_\_\_\_\_ m

(Question continues on next page)

(Turn over)

- (c) A student needs to measure the average speed of an accelerating trolley between two marks on a bench.**

**Figure 5 on page 36 shows the arrangement of some apparatus that the student can use.**

**(Question continues on next page)**

**(Turn over)**

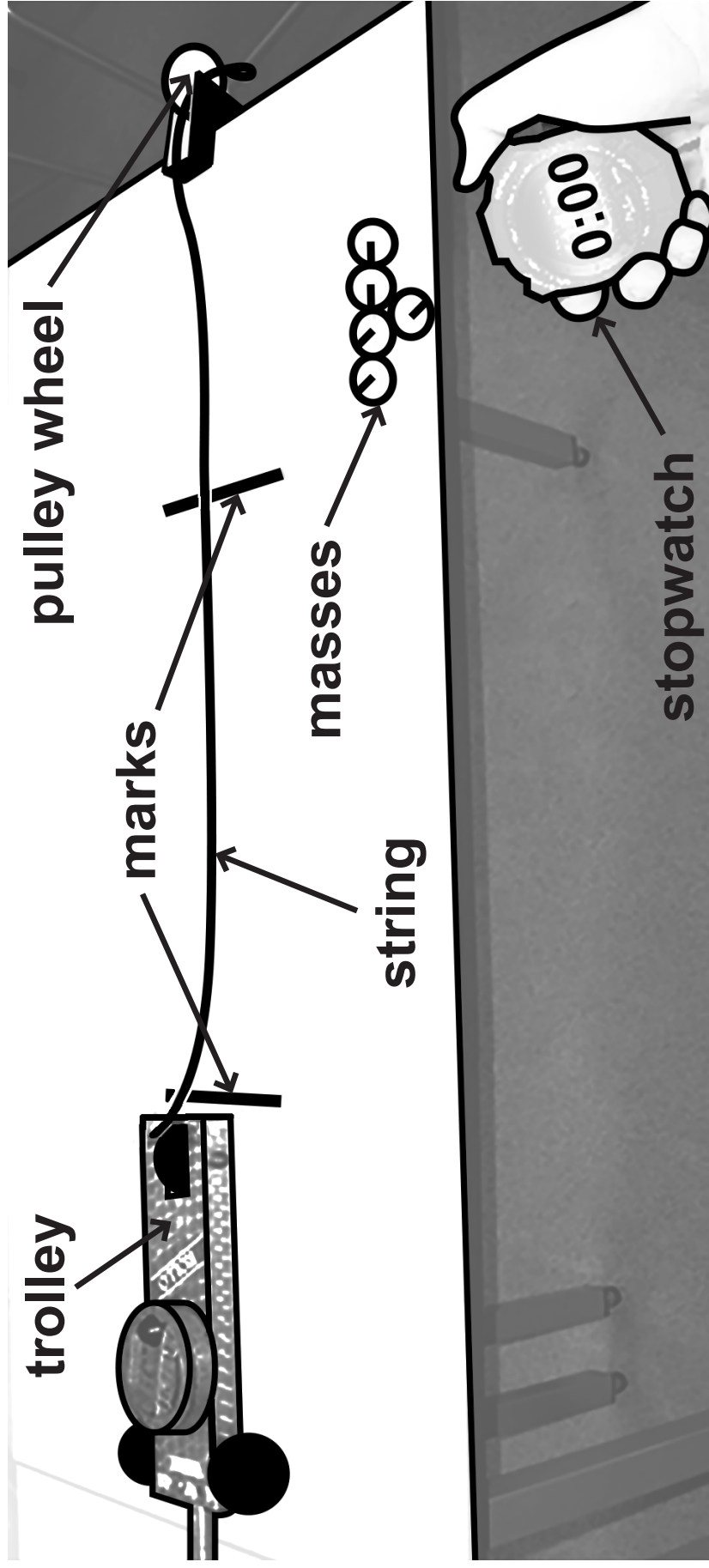


Figure 5

(Question continues on next page)

(Turn over)

- (i) One piece of apparatus is missing from the diagram. This piece of apparatus is needed to determine the average speed.

State the extra piece of apparatus needed to determine the average speed. (1 mark)

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(Question continues on next page)

- (ii) Describe how the student can make the trolley accelerate along the bench. (2 marks)**

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**(Question continues on next page)**

**(Turn over)**

- (iii) The student wishes to develop the experiment to determine the acceleration of the trolley.

**State ONE OTHER measurement that the student must make to determine the acceleration of the trolley. (1 mark)**

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**(TOTAL FOR QUESTION 6 = 10 MARKS)**

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**(Questions continue on next page)**

**(Turn over)**

- 7 (a) Equal volumes of hot water are added to two cans.  
The cans are identical apart from their surfaces.  
One can has a black surface and the other can has a silver surface.**

**The cans are left to cool and their temperatures are monitored.**

**(Question continues on next page)**



The graph in Figure 6 shows the results.

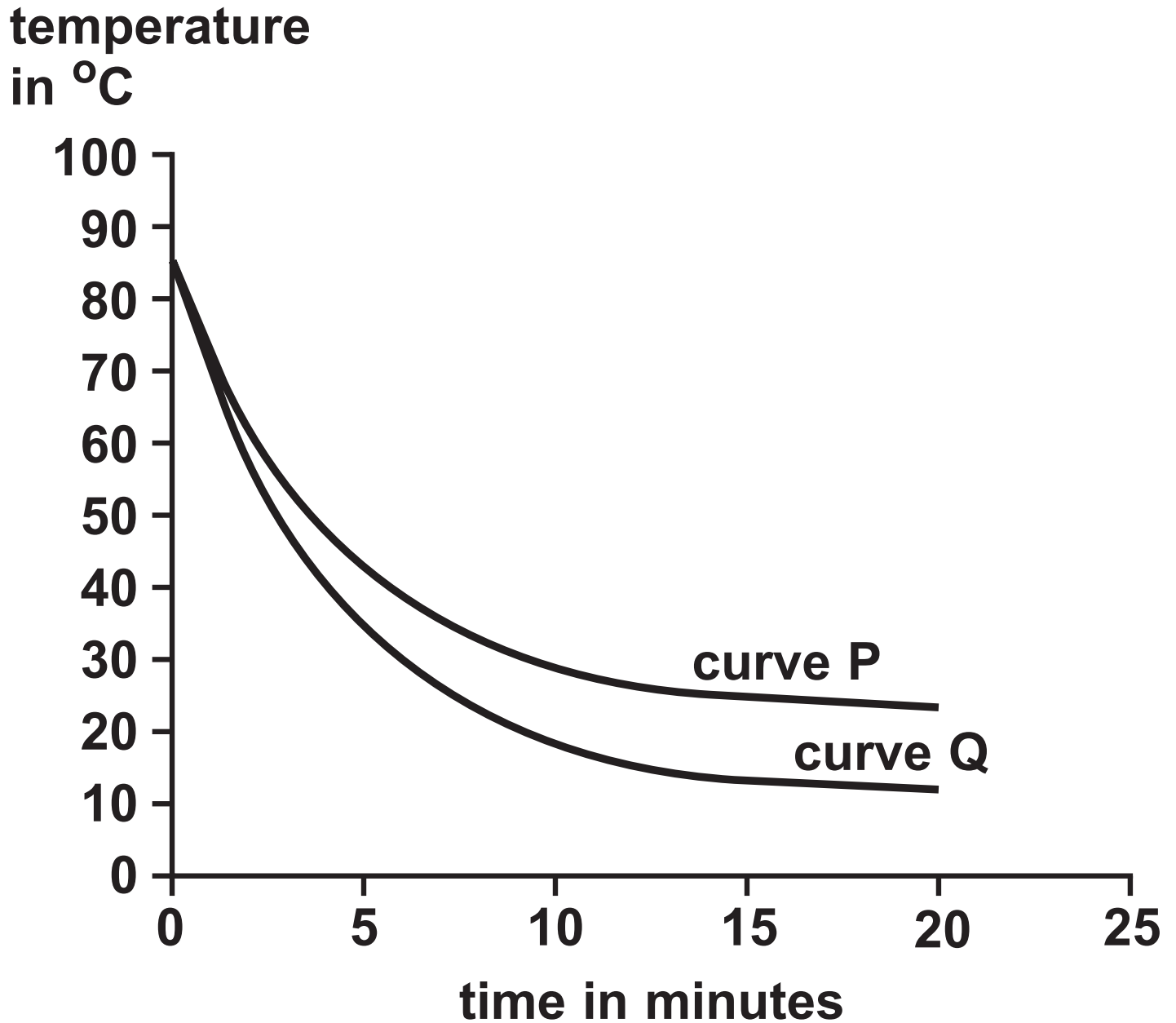


Figure 6

(Question continues on next page)

(Turn over)

**Explain, using evidence from the graph, which curve is for the black can and which curve is for the silver can. (2 marks)**

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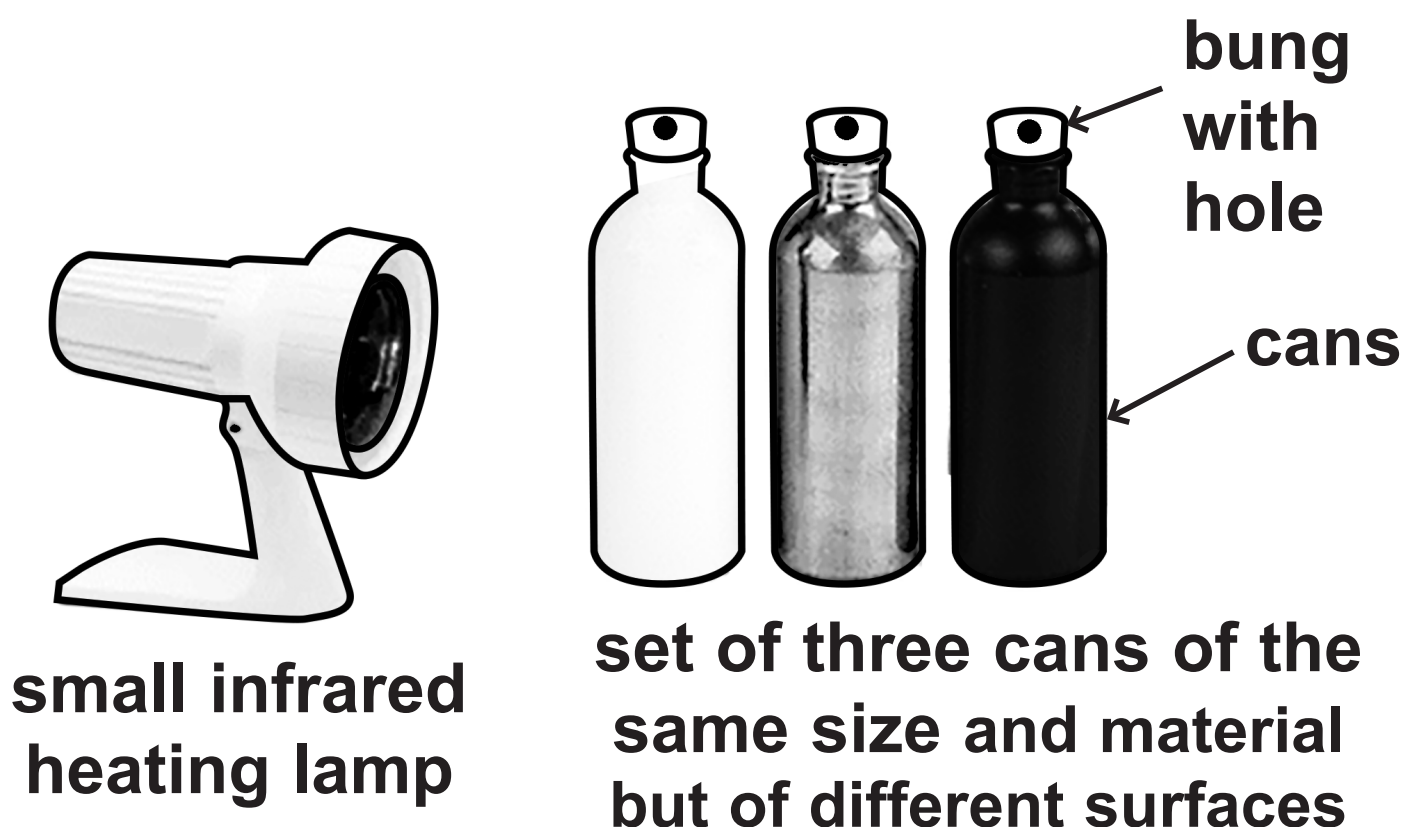
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**(Question continues on next page)**

**(Turn over)**

**\*(b) Figure 7 shows some apparatus.**



**Figure 7**

**Describe an investigation to find out how the nature of a surface affects the amount of thermal energy absorbed by the surface.**

**You should use the apparatus in Figure 7 and any additional items you choose.**

**Each can in Figure 7 has a bung in the top with a hole in it.**

**(Question continues on next page)**

**(Turn over)**

**You may use a diagram if it helps  
your answer. (6 marks)**

**(Continue your answer on next page)  
(Turn over)**

**(Turn over)**

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**(Question continues on next page)**

**(Turn over)**

(c) Figure 8 shows a section of the electromagnetic spectrum.

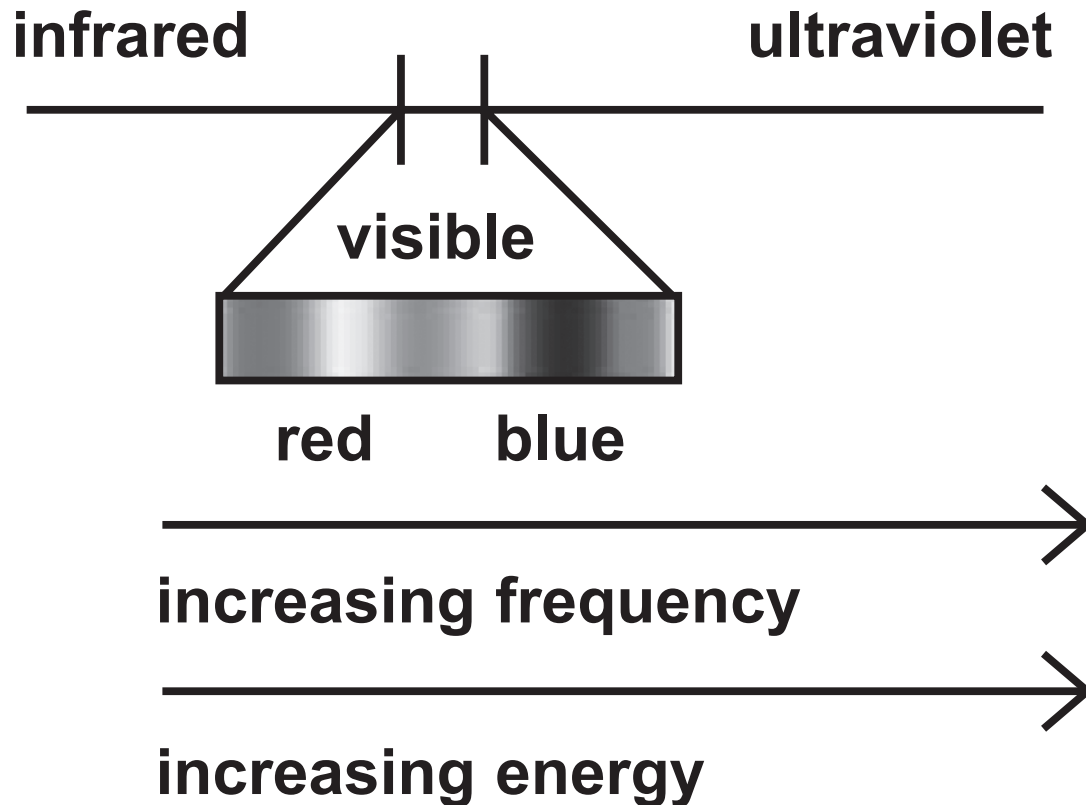


Figure 8

- (i) State ONE type of electromagnetic radiation that has a higher frequency than ultraviolet. (1 mark)

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(Question continues on next page)

(Turn over)

- (ii) One star is blue and another star is red.

**Explain why an astronomer expects the blue star to be hotter than the red star. (2 marks)**

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**(TOTAL FOR QUESTION 7 = 11 MARKS)**

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**(Questions continue on next page)**

**(Turn over)**



**8 (a) Which colour of visible light has the longest wavelength? (1 mark)**

- ☐ **A blue**
- ☐ **B green**
- ☐ **C red**
- ☐ **D yellow**

**(Question continues on next page)**

**(Turn over)**

- (b) Some television remote controls use infrared radiation and other remote controls use radio waves.**

**Explain why an infrared remote control may not switch on the television from behind an armchair but a radio wave remote control always will. (2 marks)**

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**(Question continues on next page)**

**(Turn over)**

(c) Figure 9 is a diagram of a water wave.

A cork is floating on the water.

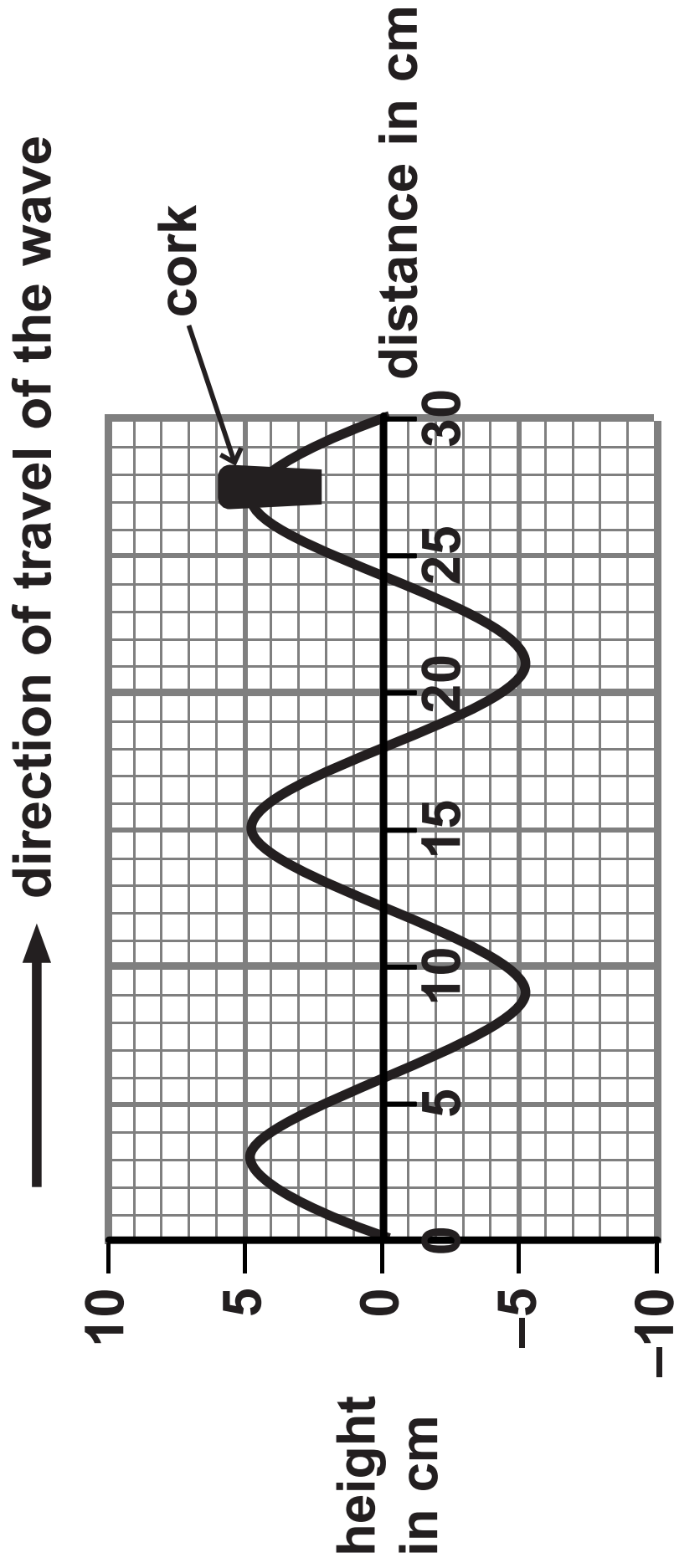


Figure 9

(Question continues on next page)

(Turn over)

- (i) Use the scale on the diagram to measure the wavelength of the wave. (2 marks)

wavelength = \_\_\_\_\_ cm

- (ii) Describe the motion of the cork.

You should include how the cork moves relative to the direction of travel of the wave. (2 marks)

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(Question continues on next page)

(Turn over)

- (d) A different water wave has a wavelength of 0.25m and a frequency of 1.5 Hz.

Calculate the wave speed. (2 marks)

wave speed = \_\_\_\_\_ m/s

**(TOTAL FOR QUESTION 8 = 9 MARKS)**

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**(Questions continue on next page)**

**(Turn over)**

- 9 (a) Carbon-13 and carbon-14 are isotopes of carbon.

Nuclei of carbon-13 and carbon-14 can be represented by these symbols



Complete the table for an atom of carbon-13 and an atom of carbon-14.  
(2 marks)

	number of neutrons in the nucleus	number of electrons in orbit around the nucleus
carbon-13		
carbon-14		

(Question continues on next page)

(Turn over)

- (b) (i) State the name of an instrument that can be used to measure radioactivity. (1 mark)**
- 

- (ii) State TWO sources of background radiation. (2 marks)**

**1** \_\_\_\_\_

**2** \_\_\_\_\_

**(Question continues on next page)**

**(Turn over)**

- (c) Carbon-14 is radioactive and has a half-life of 5 700 years.**

**The number of radioactive carbon-14 atoms in a very old piece of wood is found to have decreased from 1 000 000 to 125 000.**

**Determine the age of the piece of wood. (2 marks)**

**age of wood = \_\_\_\_\_ years**

**(Question continues on next page)**

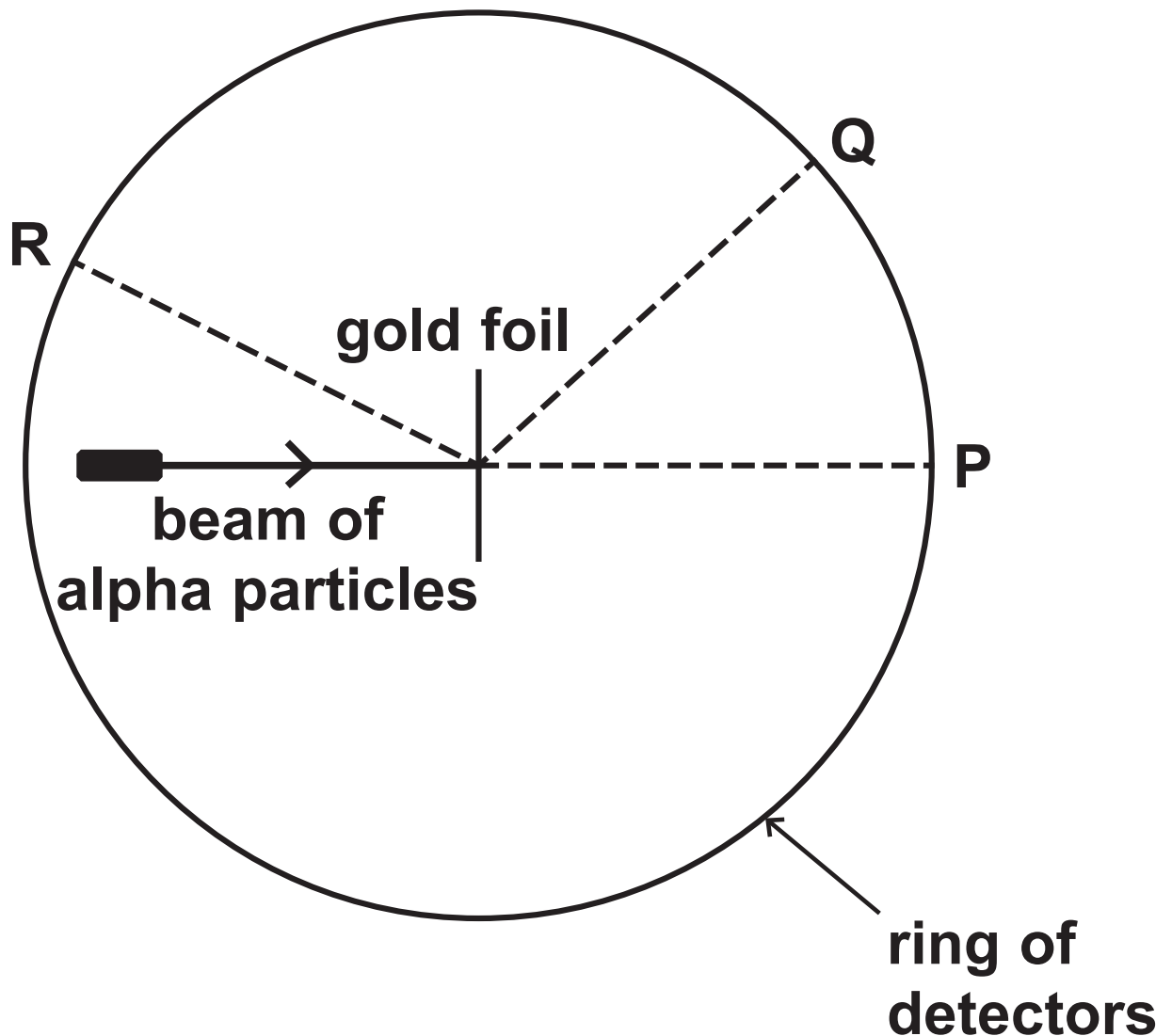
**(Turn over)**



**\*(d) In 1908 a scientist called Rutherford was investigating ideas about atoms.**

**His students fired a beam of alpha particles at a thin piece of gold foil.**

**Figure 10 shows the arrangement of the experiment.**



**Figure 10**

**(Question continues on next page)**

**(Turn over)**

**Some alpha particles were found at all parts of the ring of detectors.**

**The table in Figure 11 shows how many alpha particles were detected at P, at Q and at R, in one experiment.**

<b>position</b>	<b>number of alpha particles detected</b>
<b>P</b>	<b>72340</b>
<b>Q</b>	<b>25</b>
<b>R</b>	<b>2</b>

**Figure 11**

**Explain what the information in Figure 10 and Figure 11 shows about the structure of an atom. (6 marks)**

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**(Continue your answer on next page)**

**(Turn over)**

**(Turn over)**

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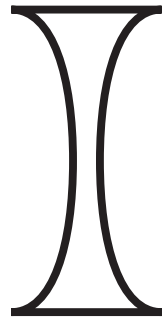
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**(TOTAL FOR QUESTION 9 = 13 MARKS)**

**(Questions continue on next page)**

**(Turn over)**

**10 (a) (i) Which lens is a converging lens with the greatest power?  
(1 mark)**

**A****B****C****D**

**(Question continues on next page)**

**(Turn over)**

- (ii) The equation that relates the power of a lens to the focal length of the lens is

$$\text{power (in dioptres)} = \frac{1}{\text{focal length (in metres)}}$$

The power of a lens is 5 dioptres.

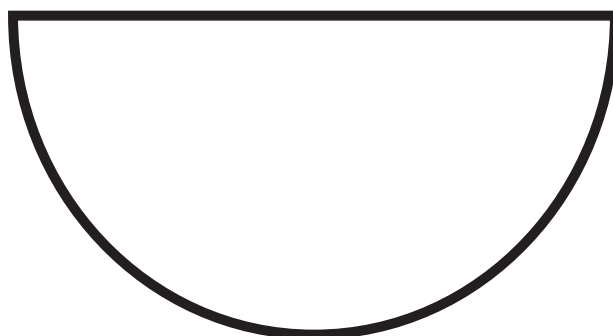
Use the equation to calculate the focal length of the lens in cm.  
(2 marks)

focal length = \_\_\_\_\_ cm

(Question continues on next page)

(Turn over)

**(b) Figure 12 shows a semicircular glass block.**



**Figure 12**

**Describe how a student could use the semicircular glass block and other apparatus to determine the critical angle for a glass-air boundary.**

**(Question continues on next page)**

**(Turn over)**

**You should add to the diagram in  
Figure 12 to help with your answer.  
(4 marks)**

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**(Question continues on next page)**

**(Turn over)**



- (c) (i) A long time ago, scientists believed that the Earth was at the centre of the Solar System.**

**Evidence has since proved that the Sun is at the centre of the Solar System.**

**State ONE OTHER idea about the Solar System that HAS changed over time. (1 mark)**

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- (ii) Figure 13 shows data for some of the planets of the Solar System.**

**(Question continues on next page)**

**(Turn over)**

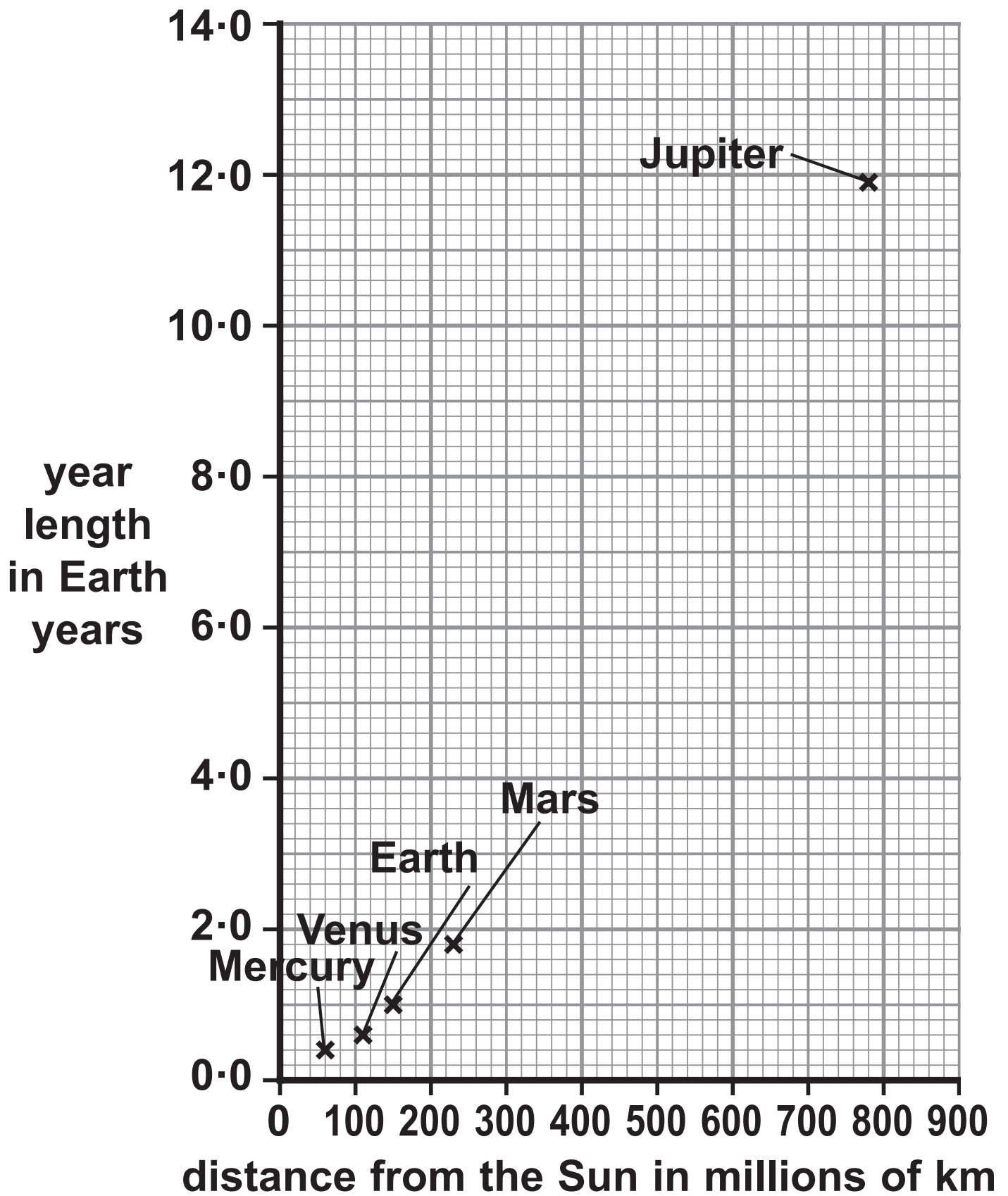


Figure 13

(Question continues on next page)

(Turn over)

**Ceres is an asteroid that orbits the Sun between Mars and Jupiter.**

**It takes Ceres 4.6 Earth years to make one orbit of the Sun.**

**Use the graph to estimate the distance of Ceres from the Sun.**

**Show your working. (3 marks)**

**distance of  
Ceres from  
the Sun = \_\_\_\_\_ millions of km**

**(TOTAL FOR QUESTION 10 = 11 MARKS)**

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**TOTAL FOR PAPER = 100 MARKS  
END**