

Write your name here

Surname

Other names

Pearson
Edexcel GCSE

Centre Number

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Candidate Number

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Physics/Science

Unit P1: Universal Physics

Higher Tier

Wednesday 20 May 2015 – Afternoon

Time: 1 hour

Paper Reference

5PH1H/01

You must have:

Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

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

Turn over ►

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FORMULAE

You may find the following formulae useful.

wave speed = frequency $\times$ wavelength

$$v = f \times \lambda$$

wave speed = $\frac{\text{distance}}{\text{time}}$

$$v = \frac{x}{t}$$

electrical power = current $\times$ potential difference

$$P = I \times V$$

cost of electricity = power $\times$ time $\times$ cost of 1 kilowatt-hour

power = $\frac{\text{energy used}}{\text{time taken}}$

$$P = \frac{E}{t}$$

efficiency = $\frac{(\text{useful energy transferred by the device})}{(\text{total energy supplied to the device})} \times 100\%$



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Questions begin on next page.

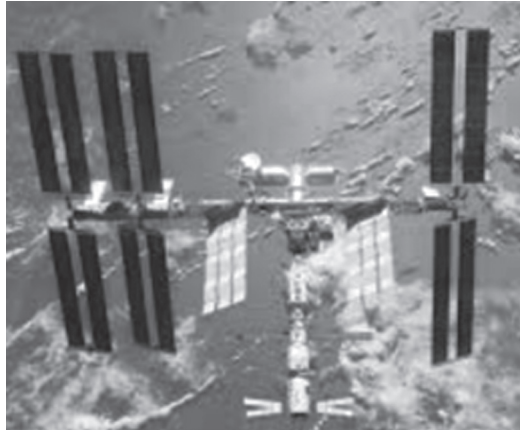


Answer ALL questions.

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 ☐.

Energy from the Sun

- 1** The International Space Station (ISS) has several solar panels called wings.



The wings convert energy from the Sun into a form useful in the ISS.

- (a) The energy reaching the ISS from the Sun is carried by waves which are

(1)

- ☐ **A** transverse and electromagnetic
- ☐ **B** electromagnetic but not transverse
- ☐ **C** transverse but not electromagnetic
- ☐ **D** neither transverse nor electromagnetic

- (b) In one second, the useful energy available from one wing is 34.3 kJ.
The energy incident on the wing from the Sun is five times this amount.

What is the percentage efficiency of the wing?

(3)

efficiency = ... %

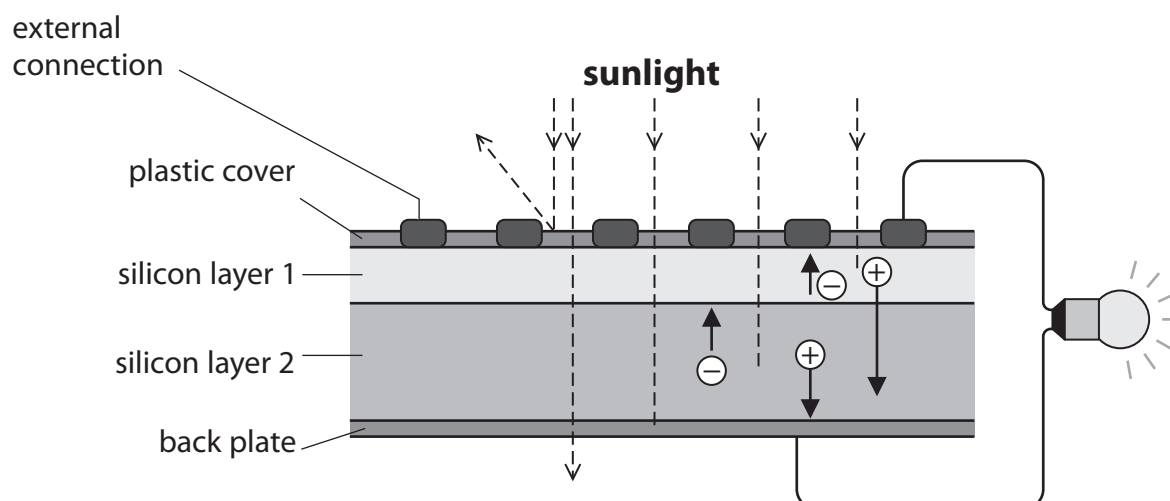


- (c) A wing is in direct sunlight.
The ISS is not receiving energy from the wing.
The temperature of the wing remains constant.

Explain why the temperature of the wing remains constant in these conditions.

(2)

- (d) The diagram shows how a solar cell produces electricity when receiving energy from the Sun.
When energy from the Sun is absorbed in a silicon layer, it makes charges move.
This movement of charges produces a current.



Suggest **two** reasons why the efficiency of this solar cell at producing electricity from sunlight is less than 100%.

(2)

1

2

(Total for Question 1 = 8 marks)



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Stars and the Universe

- 2** (a) Our Sun is a main sequence star.
It will stay as a main sequence star for millions of years, continuing to radiate energy.

- (i) Our Sun was formed from a nebula.

Describe the formation of our Sun from nebula to main sequence.

(2)

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- (ii) Our Sun will go through many stages.

Which of these stages will our Sun go through?

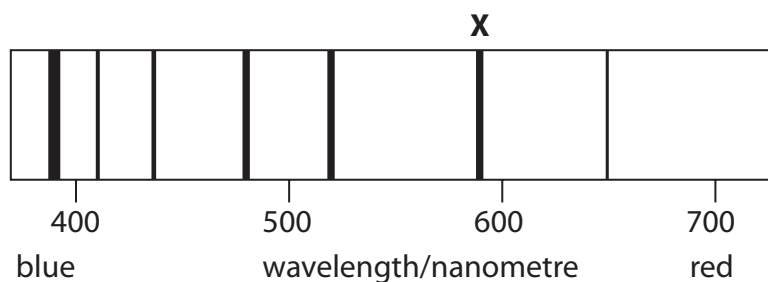
Put a cross (X) in the box next to your answer.

(1)

- ☐ **A** a black hole
- ☐ **B** a neutron star
- ☐ **C** a supernova
- ☐ **D** a white dwarf



- (b) The diagram shows some lines in the spectrum of light from a nearby galaxy. One of the lines is marked **X**.



- (i) Line **X** will be in a different position in the spectrum of light from a much more distant galaxy.

Draw a line on the diagram to show a possible new position for line **X** in the spectrum of light from a much more distant galaxy.

Label this new line **Y**.

(1)

- (ii) Explain why you have drawn line **Y** in this position on the diagram.

(2)

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(c) Two theories about the Universe are the Steady State Theory and The Big Bang Theory.

(i) The table shows some ideas about the Universe.

Which row of the table applies to the Steady State Theory?

Put a cross (X) in the box next to your answer.

(1)

	the Universe.....	the Universe.....
☐ A	... is not expanding	... had a beginning
☐ B	... is expanding	... had a beginning
☐ C	... is not expanding	... did not have a beginning
☐ D	... is expanding	... did not have a beginning

(ii) State the name of the discovery that persuaded most scientists to prefer the Big Bang Theory to the Steady State Theory.

(1)

(Total for Question 2 = 8 marks)

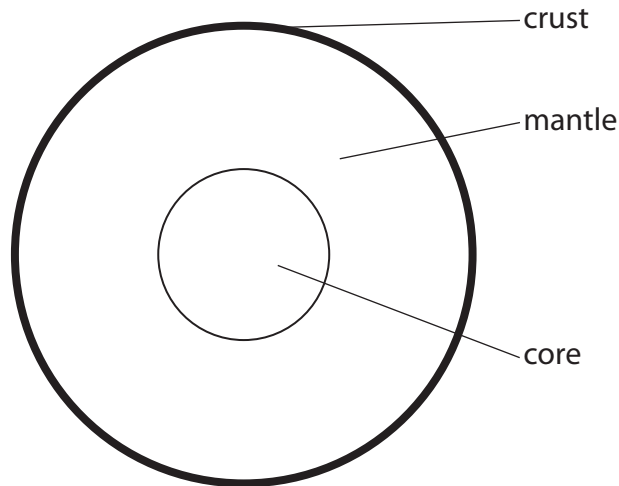


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Earthquakes

- 3 (a) The diagram shows a cross-section of the Earth.



The mantle is hotter near the core than near the crust.

- (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

One reason for the mantle being hotter near the core is that

(1)

- ☐ **A** the Earth's crust is a solid
- ☐ **B** the Earth's core is a liquid
- ☐ **C** the Earth is radiating heat to space
- ☐ **D** the Earth is absorbing heat from space

- (ii) Explain how this temperature difference causes the tectonic plates in the Earth's crust to move.

(2)

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(b) All earthquakes emit S-waves and P-waves.

Scientists determine the position of earthquakes by detecting these seismic waves.

(i) The S-waves and P-waves do not always travel in straight lines.

Explain why the S-waves and P-waves do not always travel in straight lines.

(2)

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(ii) S-waves and P-waves travel at different speeds.

The scientists use the (S–P) time to estimate how far away the earthquake is.

Suggest what is meant by (S–P) time.

(2)

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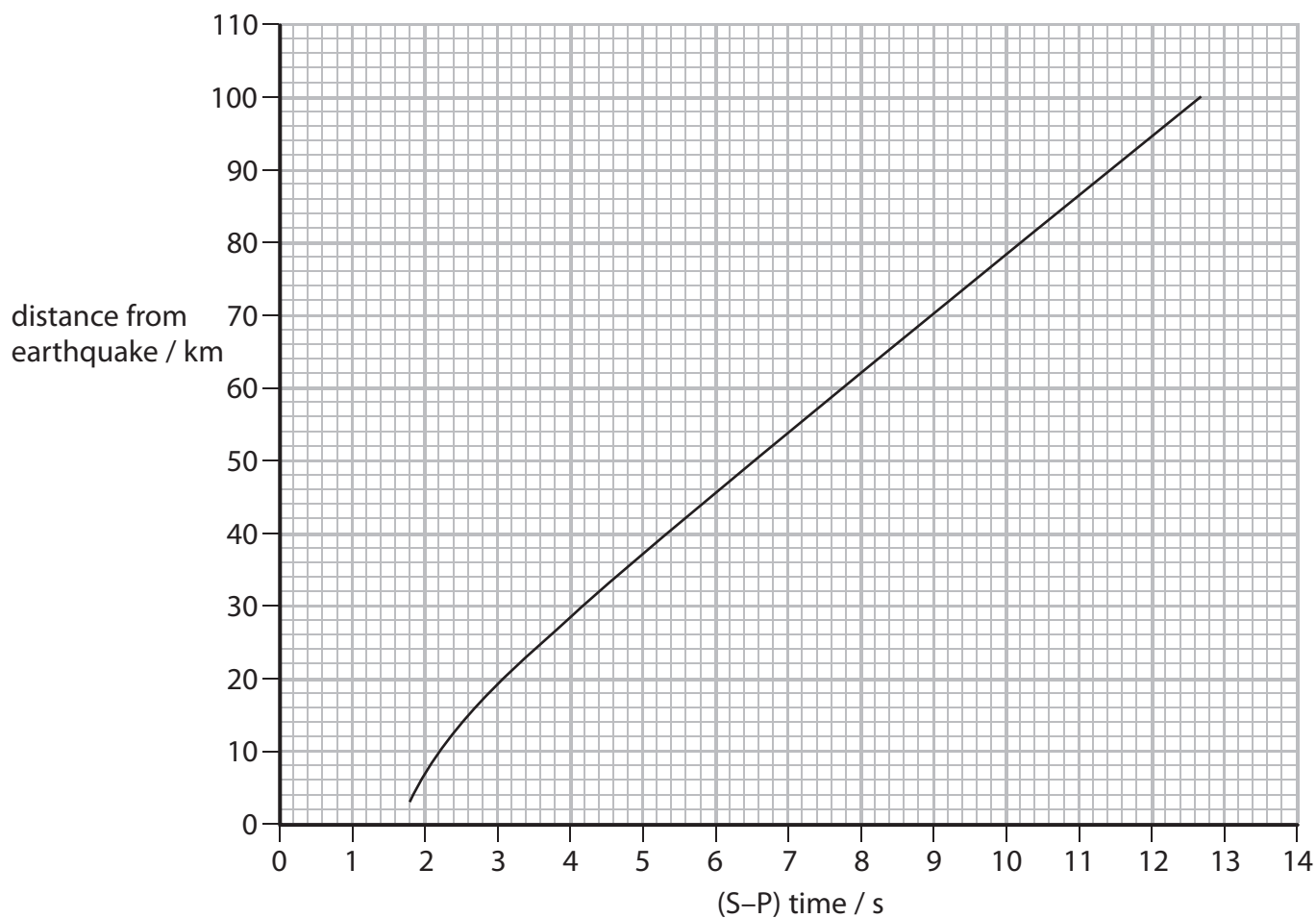
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- (iii) Some scientists use the following equation to get a quick estimate of how far away an earthquake happened.

$$\text{distance from earthquake in km} = 8 \times (\text{S-P time in seconds})$$

The graph shows the relationship between the (S-P) time and the distance from the earthquake, measured along the Earth's surface.



Use values from the graph to evaluate the range of distances for which this estimate is reasonable.

(3)

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(Total for Question 3 = 10 marks)



Using lenses

- 4 (a) State **two** advantages of using a camera, rather than the unaided eye, for studying stars.

(2)

1

2

- (b) Galileo observed the moons of Jupiter.
Explain how these observations helped to change scientists' ideas about the Universe.

(3)

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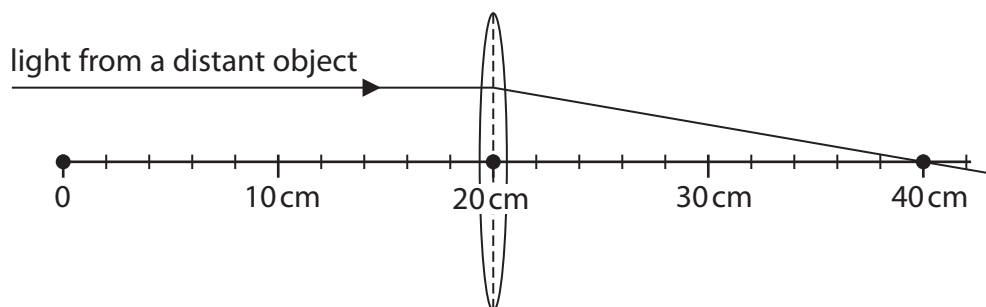
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- (c) The diagram shows a thin lens placed at the 20 cm mark of a metre rule.



A ray has been drawn from a distant object.
Complete the sentence by putting a cross (☒) in the box next to your answer.

The focal length of the lens is

(1)

- ☐ A 10 cm
- ☐ B 20 cm
- ☐ C 30 cm
- ☐ D 40 cm



- (d) The linear magnification of a thin lens is given the symbol M .
The following equation for M is used for lenses in cameras.

$$M = \frac{f}{(d - f)}$$

where f is the focal length of the lens and d is the distance between the lens and an object.

A lens has a focal length of 12 cm.

- (i) Use the equation to calculate M when the distance from an object to the lens is 14 cm

(2)

$M = \dots\dots\dots$

- (ii) Use the equation to calculate M when the distance from an object to the lens is 11 cm

(1)

$M = \dots\dots\dots$

- (iii) The table shows the magnifications produced by this lens for different distances between object and lens.

d / cm	M
3.0	-1.3
9.0	-4.0
15	4.0
21	1.3

Suggest what the sign of M indicates about the image produced by the lens.

(1)

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(Total for Question 4 = 10 marks)



Using electromagnetic radiation

- 5 (a) A specific electromagnetic wave has a frequency greater than visible light. The wavelength of this wave is longer than that of X-rays.

Complete the sentence by putting a cross (X) in the box next to your answer.

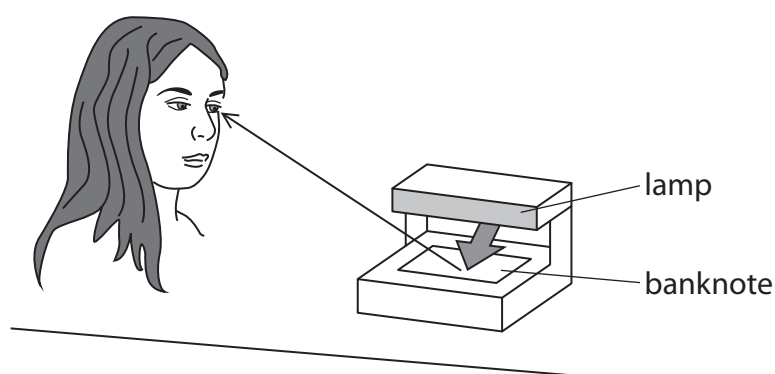
This electromagnetic wave is

(1)

- ☐ A a gamma wave
- ☐ B an infrared wave
- ☐ C a microwave
- ☐ D an ultraviolet wave

- (b) The picture shows a woman checking that a banknote is genuine.

She is using a lamp which emits a radiation which is part of the electromagnetic spectrum.



Explain how **two** different electromagnetic radiations enable the woman to check the banknote.

(2)

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- (c) A light wave from a star has a frequency of 6.67×10^{14} Hz and a wavelength of 4.50×10^{-7} m.

The star is 4.00×10^{16} m away from Earth.

Calculate the time it takes light from the star to reach the Earth.

(3)

time to reach Earth = ... s

- *(d) Explain the differences between longitudinal and transverse waves.
Your explanation should refer to ultraviolet, ultrasound and seismic waves.

(6)

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(Total for Question 5 = 12 marks)



Electricity

- 6 (a) A man monitors how much money he spends on electricity.
He uses a device which calculates the cost of electrical energy used.
He connects his 2.9 kW electric kettle to the 230 V mains supply.

(i) Calculate the current in the kettle element.

(3)

current = ... A

- (ii) The device shows that in one week the total cost of the electrical energy used by the kettle is 97 p.
1 kW h of electrical energy costs 17 p.

Calculate the length of time for which the kettle has been switched on during the week.

(3)

time = ... hours

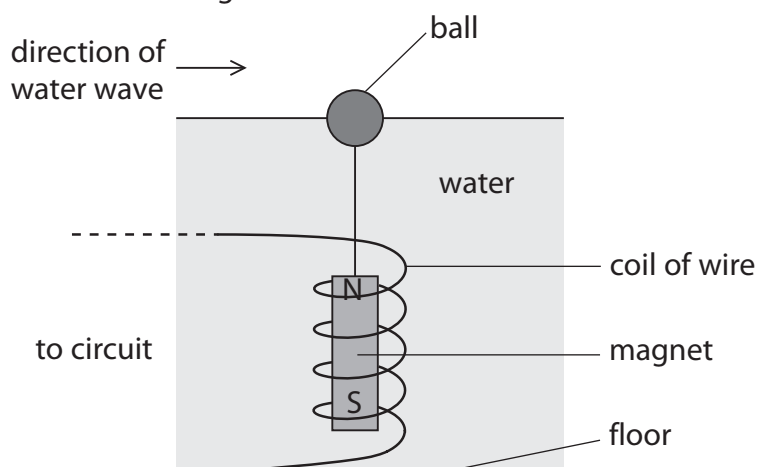
- *(b) The diagram shows a model used to generate electricity from water waves in a tank.

A ball floats on the surface of the water in the tank.

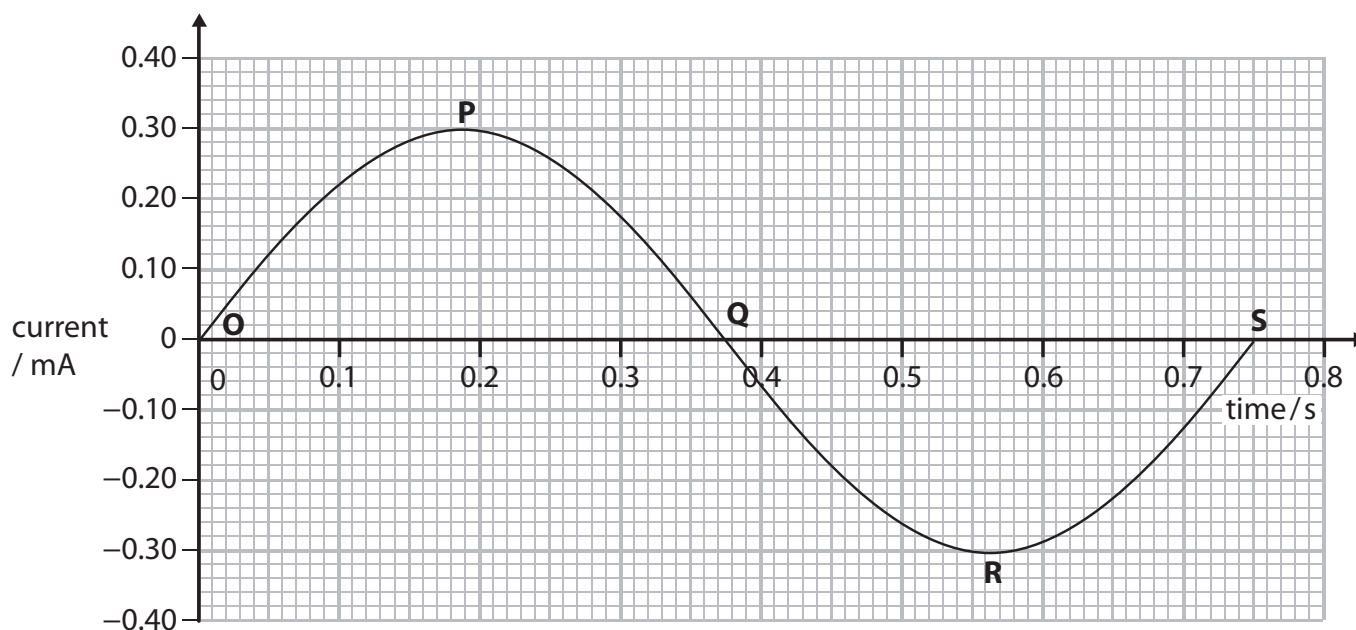
A coil of wire is fixed to the floor of the tank.

A magnet is suspended from the ball inside the coil.

When a wave is sent along the surface of the water the ball moves up and down.



The graph shows the current induced in the coil.



Explain how this current is induced in the coil in the model.

You should refer to the model and to the labelled points on the graph in your answer.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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