

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

Physics/Science

Unit P1: Universal Physics

Higher Tier

Friday 2 March 2012 – Morning

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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PEARSON

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

$\frac{\text{primary voltage}}{\text{secondary voltage}} = \frac{\text{number of turns on primary coil}}{\text{number of turns on secondary coil}}$

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$



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Turn over for Question 1



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 transfers

1 Some students carry out investigations with an electric motor.

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

The students read the statement: 'All the energy supplied to the motor eventually ends up as thermal energy in the surroundings.'

This statement best describes the idea of

(1)

- A** renewable energy
- B** energy efficiency
- C** sustainable energy sources
- D** conservation of energy

(b) The students use the electric motor to lift a weight.

The current in the motor is 0.5 A.

The potential difference (voltage) across the motor is 6 V.

Calculate the input power to the motor.

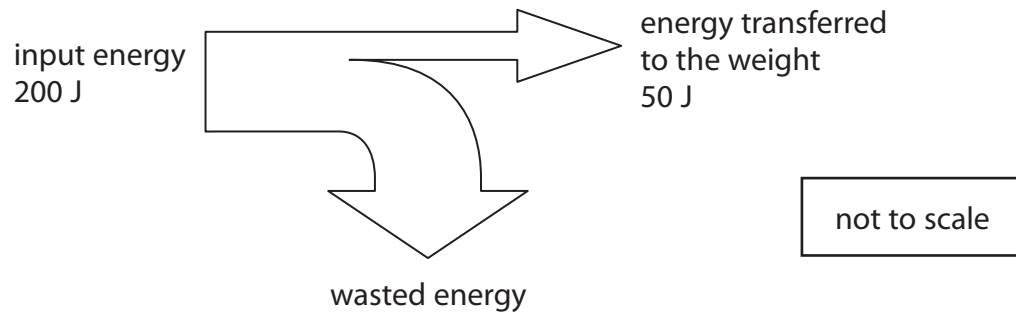
State the unit.

(3)

input power = unit =



(c) The diagram represents the energy transfers in the electric motor.



(i) How much energy is wasted?

(1)

wasted energy = J

(ii) Calculate the efficiency of the motor.

(2)

efficiency =

(d) The case of the motor is painted black.

Give a scientific reason why the case of the motor is painted black.

(1)

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(Total for Question 1 = 8 marks)



Earthquakes and seismic waves

2 (a) Earthquakes produce seismic waves and infrasound waves.

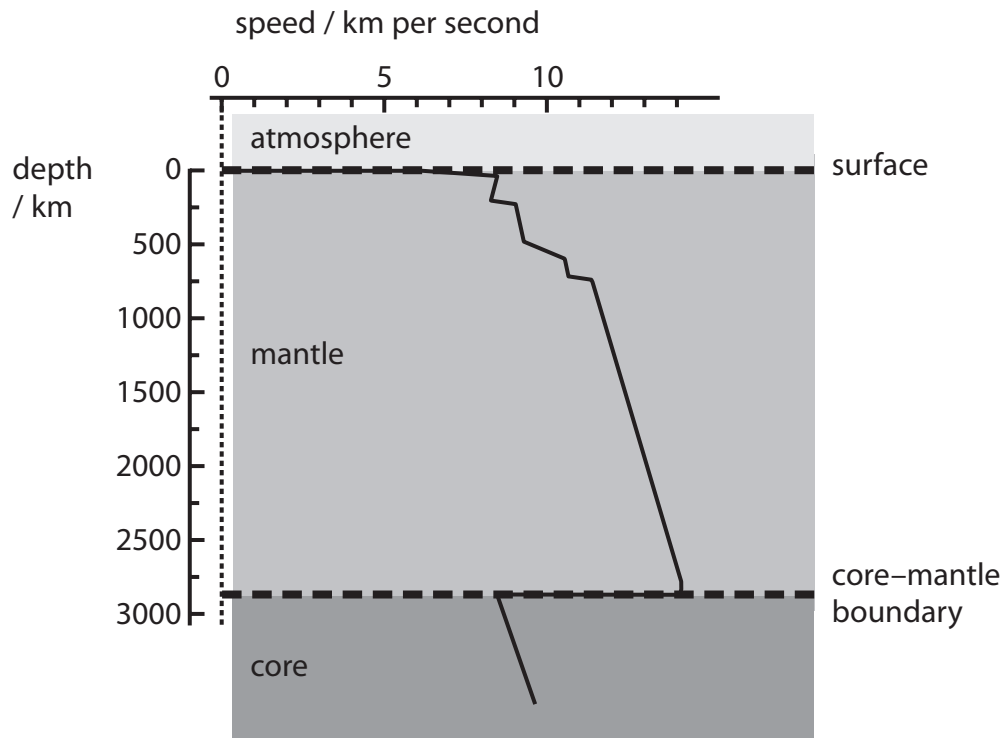
Which row of the table is correct for these waves?

Put a cross (☒) in a box to show your answer.

(1)

	seismic waves are	infrasound waves are
<input type="checkbox"/> A	longitudinal only	longitudinal and transverse
<input type="checkbox"/> B	longitudinal only	longitudinal only
<input type="checkbox"/> C	longitudinal and transverse	longitudinal and transverse
<input type="checkbox"/> D	longitudinal and transverse	longitudinal only

(b) The chart shows how the speed of P-waves varies with the depth in the Earth's mantle.



(i) State what happens to a P-wave when it crosses from the mantle into the core. (1)

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(ii) Describe how the speed of a P-wave changes between a depth of 1000 km and 2500 km. (2)

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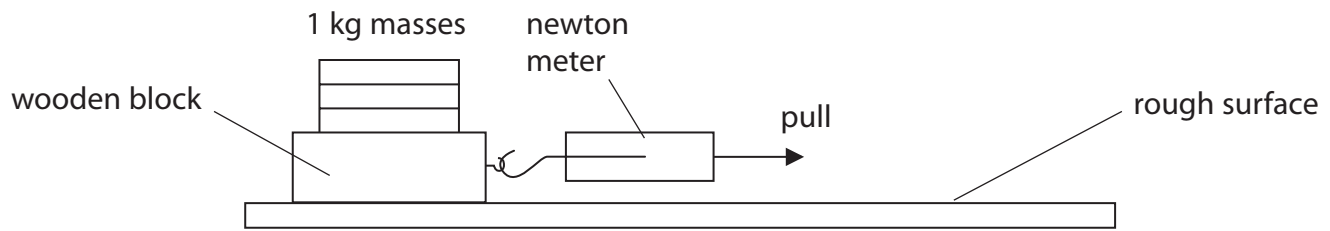
(iii) The average speed of a P-wave in the mantle is 12 km/s.
A P-wave travels vertically down from the surface and reflects from the core–mantle boundary back to the surface.
It travels a total distance of 5800 km.
Calculate the total time of travel for the wave. (3)

time = s



(c) A class investigates the force needed to start a wooden block moving on a rough surface.

They use the apparatus shown.



Each student repeats the experiment five times.

A set of results for one student is shown in the table.

attempt	force needed to start block moving / N
1	30
2	57
3	26
4	48
5	39

All the students in the class get a similar wide range of results.

Explain what the results show about predicting earthquakes.

(2)

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(Total for Question 2 = 9 marks)



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Turn over for Question 3



Solar power

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

The output power of a solar panel is the rate of transfer of

(1)

- A current
- B electrons
- C energy
- D voltage

(b) A solar panel generates direct current.

(i) Describe the difference between direct current and alternating current.

(2)

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(ii) The output from the solar panel is 60 V.

State why a transformer cannot be used to increase this voltage.

(1)

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(c) Homeowners are being encouraged to fit solar panels to the roofs of their homes.

Explain why using solar panels to generate electricity for the National Grid benefits the environment.

(2)

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(d) A homeowner fits a solar panel to her roof.

The cost of the solar panel is £4800.

The solar panel supplies an average of 800 kW h of electrical energy to the National Grid each year.

The homeowner is paid 40p for each kW h of energy supplied to the National Grid.

Calculate the payback time for the solar panels by selling energy to the National Grid.

(3)

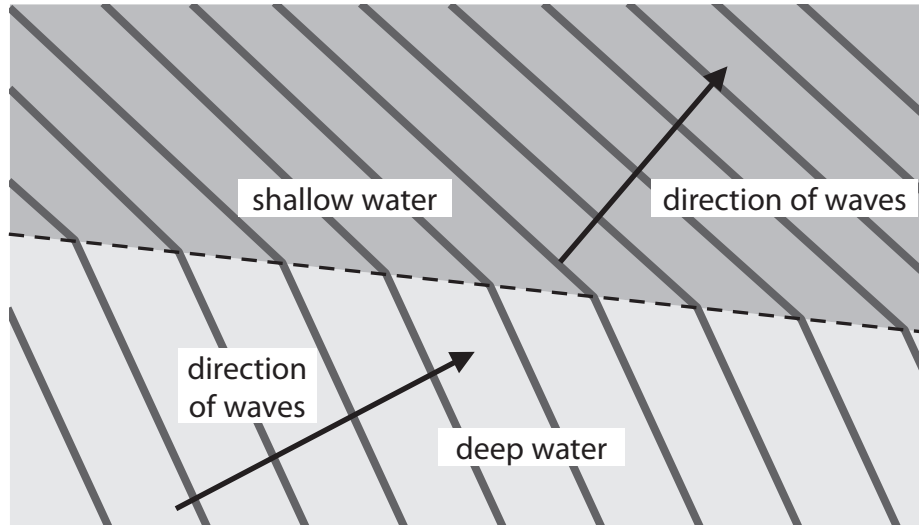
payback time = years

(Total for Question 3 = 9 marks)



Waves

- 4 (a) The diagram represents water waves travelling from deep water into an area of much shallower water.



- (i) State the name of the effect shown in this diagram.

(1)

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

When the waves go from deep water to shallow water, the

(1)

- A frequency decreases
- B wavelength decreases
- C frequency increases
- D wavelength increases

- (iii) Explain another change which can be seen from the diagram when the waves go from deep water to shallow water.

(2)



- (b) The velocity of the waves in deep water is 25 m/s.
The wavelength is 120 m.

Calculate the frequency of the waves.

(3)

frequency = Hz

- (c) The photograph shows a floating buoy used to warn boats about shallow water.



The buoy has a lamp and a bell.

Explain the difference between transverse and longitudinal waves by referring to sound from the bell and the light from the lamp.

(3)

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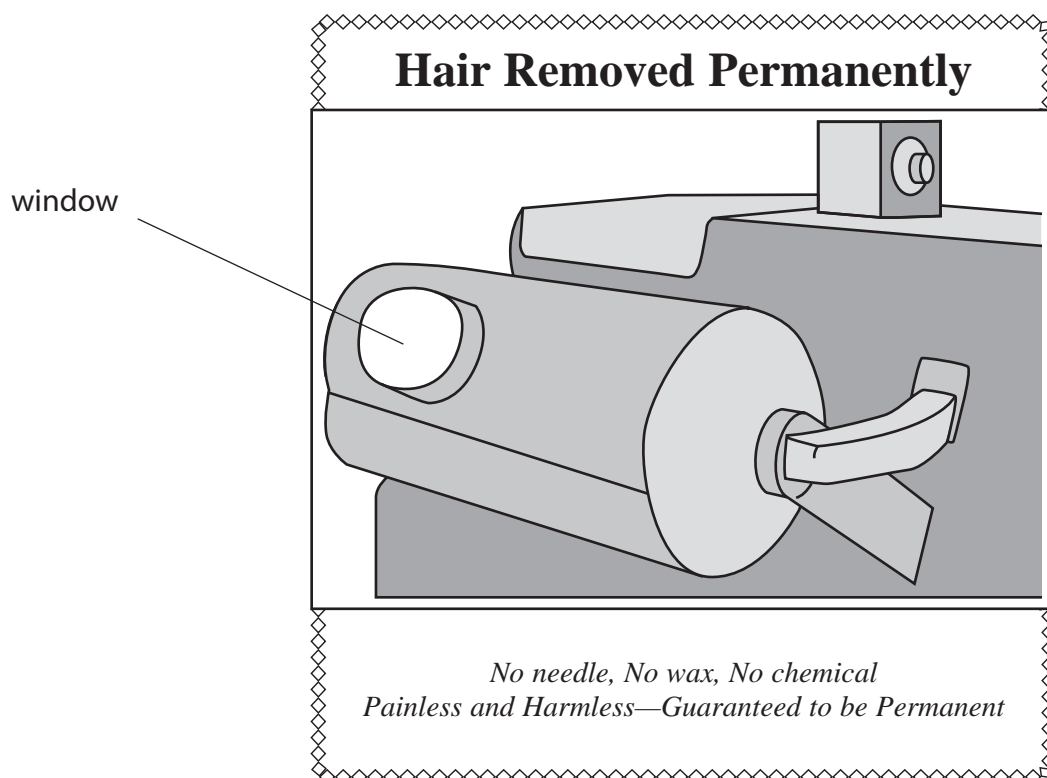
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(Total for Question 4 = 10 marks)



Using X-rays

- 5 (a) The device shown in the picture was invented not long after the discovery of X-rays.
It emitted X-rays through the window.



In the 1920s, it was used to remove unwanted hair from the arm.
The patient placed her arm in front of the window.
The X-rays destroyed the hair roots.

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

X-rays are

(1)

- A electromagnetic waves with very high frequency
- B electromagnetic waves with very long wavelength
- C electromagnetic waves which always have low energy
- D ionising radiations emitted by radioactive sources



(ii) Some users believed that sunglasses would protect their eyes from the X-rays.
Explain how effective this would be as a precaution.

(2)

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(iii) This hair removal device was banned in 1940.
Many people who had used it for a long time had become seriously ill.
State **one** of the effects this machine may have had on them.

(1)

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(iv) The device was advertised as 'harmless'.
Suggest why people used this device for many years.

(2)

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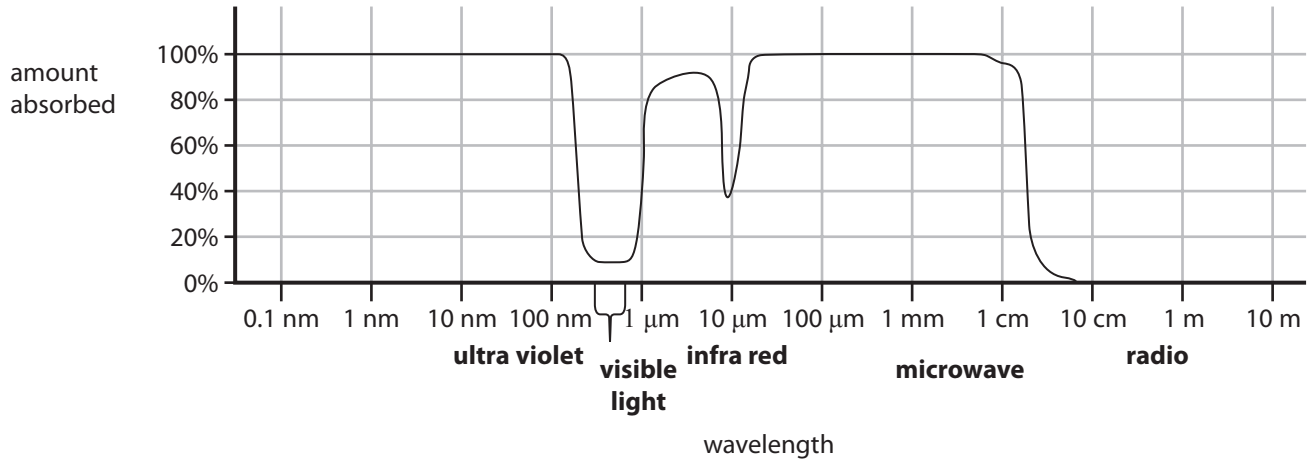
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Observing the Universe

- 6 (a) The Earth's atmosphere absorbs electromagnetic radiation. The diagram shows how the amount absorbed changes with wavelength.



- (i) How much of the visible light from space is **absorbed** as it passes through our atmosphere?

Put a cross (☒) in a box to show your answer.

(1)

- A 0%
- B 10%
- C 90%
- D 100%

- (ii) Large telescopes which collect visible light to explore the Universe are usually placed near the tops of mountains. Suggest why radio telescopes do not have to be placed high up a mountain.

(1)

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(iii) One theory of the origin of the Universe predicted that there should be cosmic background radiation with a wavelength of about 1 mm.

Explain why scientists had to wait until the development of space flight before they could study this radiation in detail.

(2)

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(iv) The electromagnetic radiation from most galaxies has a red-shift.

Suggest why, when a galaxy has a very large red-shift, some of its visible light is not detected through the Earth's atmosphere.

(2)

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