Write your name here

Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

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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P 4 0 2 0 0 A 0 1 2 0

PEARSON

FORMULAE

You may find the following formulae useful

wave speed = frequency × wavelength $v = f \times \lambda$

$$\text{wave speed} = \frac{\text{distance}}{\text{time}} \qquad v = \frac{x}{t}$$

electrical power = current × potential difference $P = I \times V$

cost of electricity = power × time × cost of 1 kilowatt-hour

$$\text{power} = \frac{\text{energy used}}{\text{time taken}} \qquad P = \frac{E}{t}$$

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

$$\frac{\text{primary voltage}}{\text{secondary voltage}} = \frac{\text{number of turns on primary coil}}{\text{number of turns on secondary coil}} \qquad \frac{V_p}{V_s} = \frac{N_p}{N_s}$$

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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

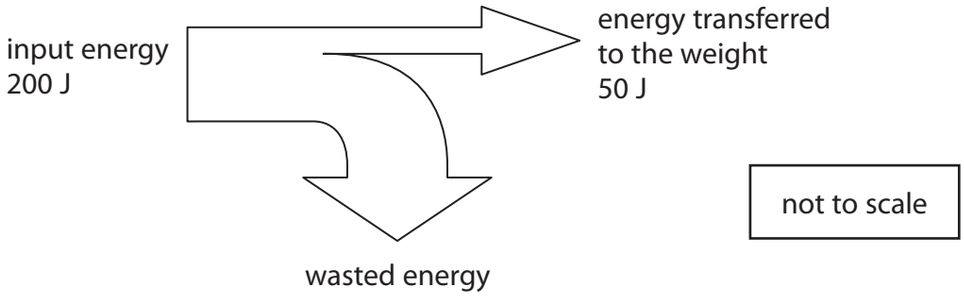
(b) The students use the electric motor to lift a weight.
The current in the motor is 0.5 A.
The potential difference (voltage) across the motor is 6 V.

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.

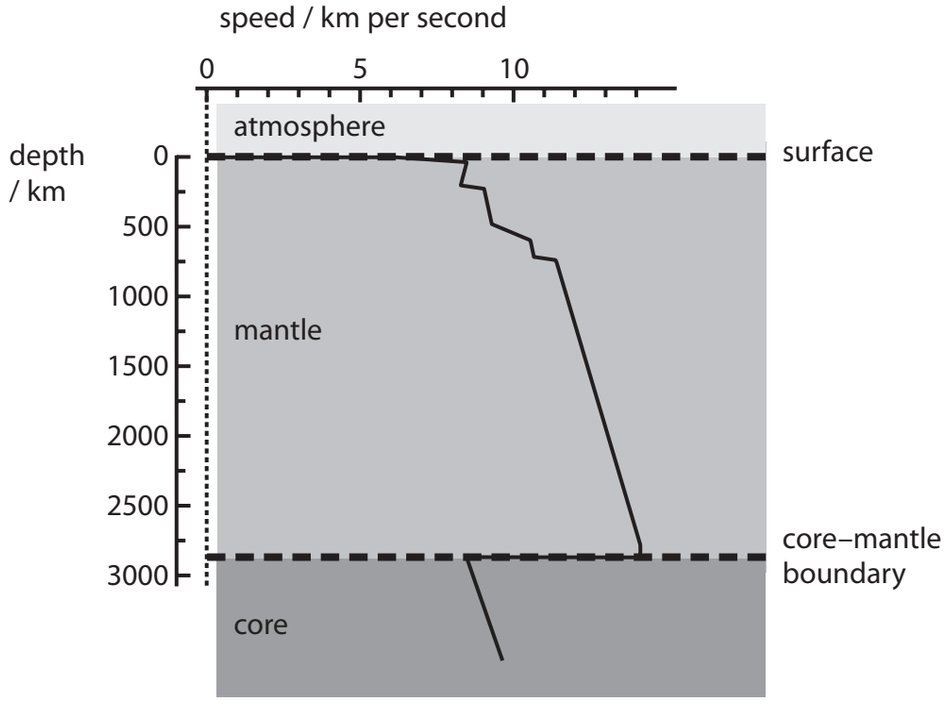
Which row of the table is correct for these waves?

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

(1)

	seismic waves are	infrasound waves are
☒ **A**	longitudinal only	longitudinal and transverse
☒ **B**	longitudinal only	longitudinal only
☒ **C**	longitudinal and transverse	longitudinal and transverse
☒ **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.

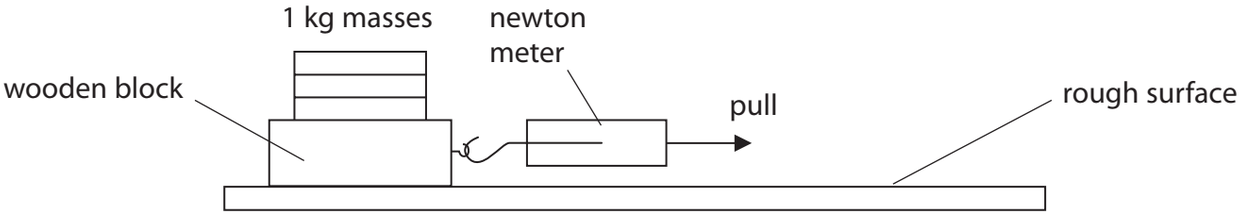
Calculate the total time of travel for the wave.

(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)

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

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

(1)

(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)

(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.

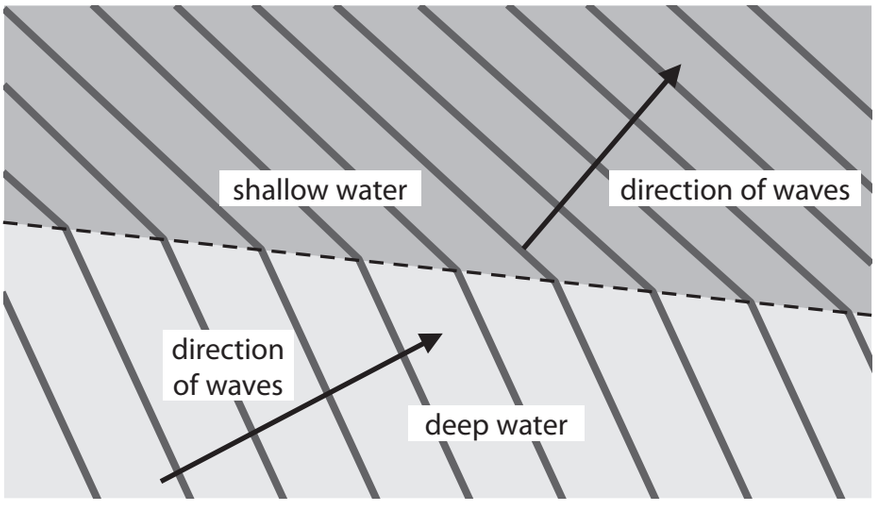
(3)

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)

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(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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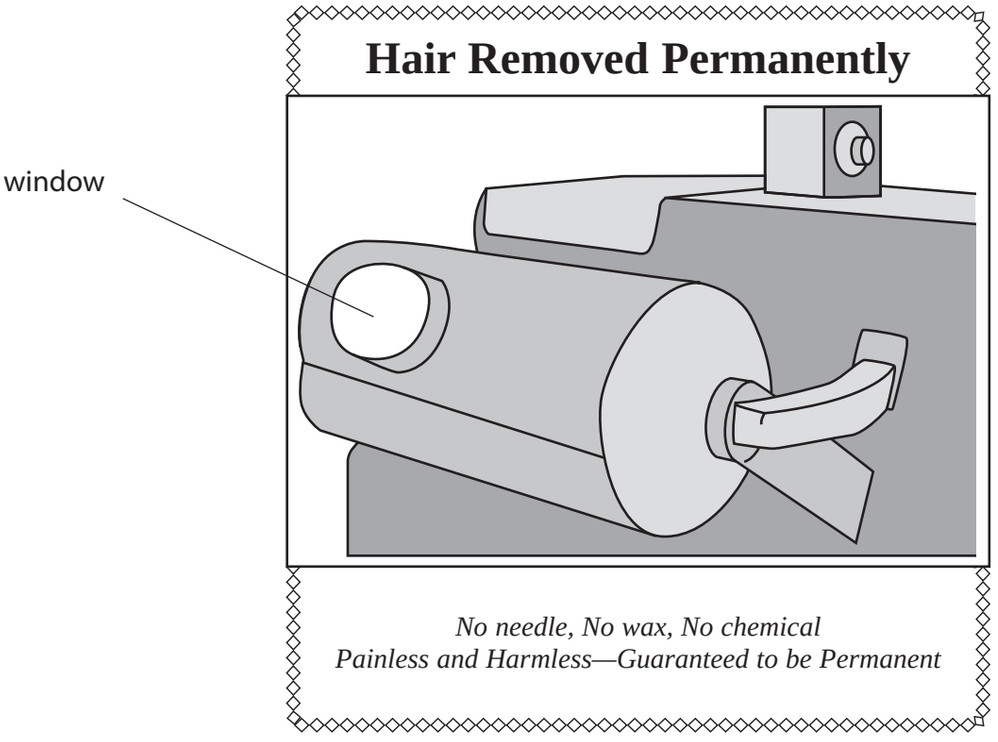
(Total for Question 4 = 10 marks)

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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*(b) There is a hair removal device which is currently available in some specialist clinics. It uses a low energy infrared laser beam. The makers say that this is much less dangerous than the X-ray device.

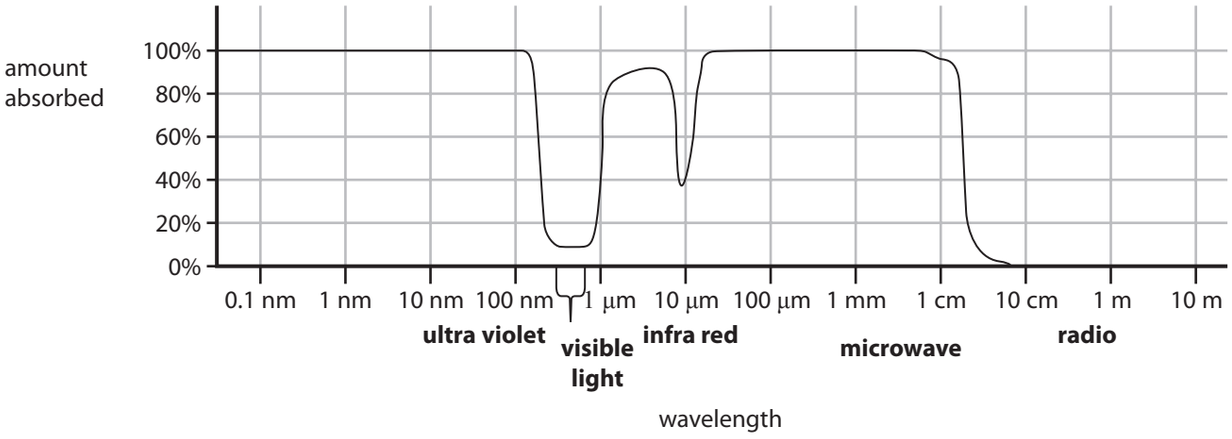
By considering the dangers associated with both devices, discuss whether the infrared laser device should be put on general sale to the public.

(6)

(Total for Question 5 = 12 marks)

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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.....

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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)

(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)

*(b) Scientists believe that the Universe is expanding.

Describe how careful observation of electromagnetic radiation from distant galaxies as well as from the whole of space gave evidence supporting the Big Bang Theory.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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