Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Physics/Science

Unit P1: Universal Physics

Higher Tier

Wednesday 24 January 2018 – 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.
- 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 × wavelength $v = f \times \lambda$

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

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

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

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

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

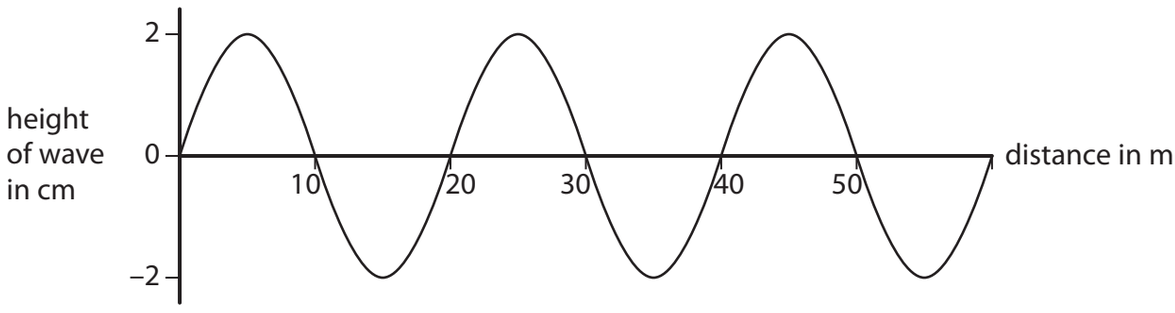
$\frac{\text{primary voltage}}{\text{secondary voltage}} = \frac{\text{number of turns on primary coil}}{\text{number of turns on secondary coil}}$ $\frac{V_p}{V_s} = \frac{N_p}{N_s}$

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 ☒.

Waves

1 (a) The graph shows details about a wave.



(i) What is the amplitude of the wave?

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

(1)

☒ **A** 2 cm

☒ **B** 4 cm

☒ **C** 10 m

☒ **D** 20 m

(ii) The speed of the wave is 30 m/s.

Calculate the frequency of the wave.

(3)

frequency = ... Hz

(b) (i) The focal point of a lens is the point where rays from a distant object meet after passing through the lens.

Describe what is meant by the term **focal length** of a lens.

(2)

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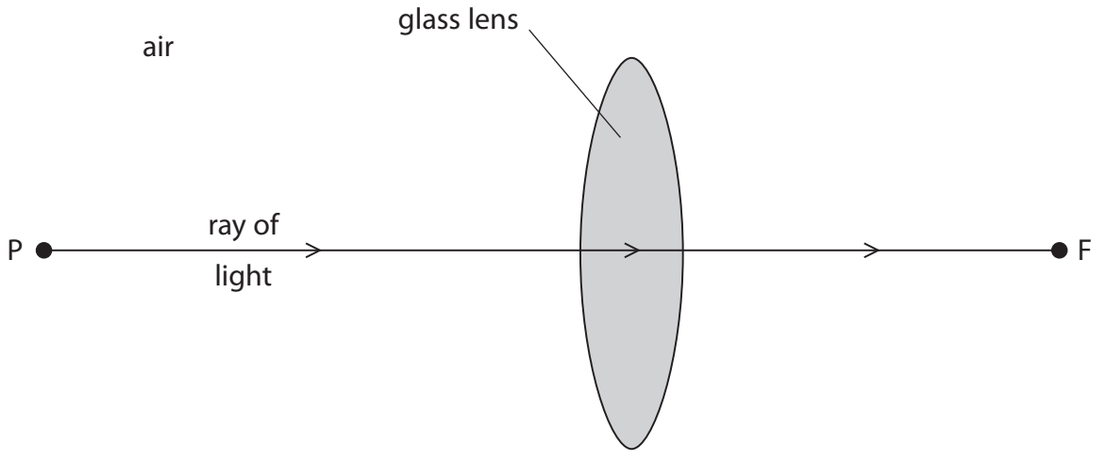
(ii) The diagram shows a ray of light from an object at P.

The ray travels through a glass lens to the focal point, F, of the lens.



Sketch a graph to show how the speed of the ray varies as it travels from P to F.
Speed of the ray in air is 3×10^8 m/s.
No calculation is required.

(2)

(Total for Question 1 = 8 marks)

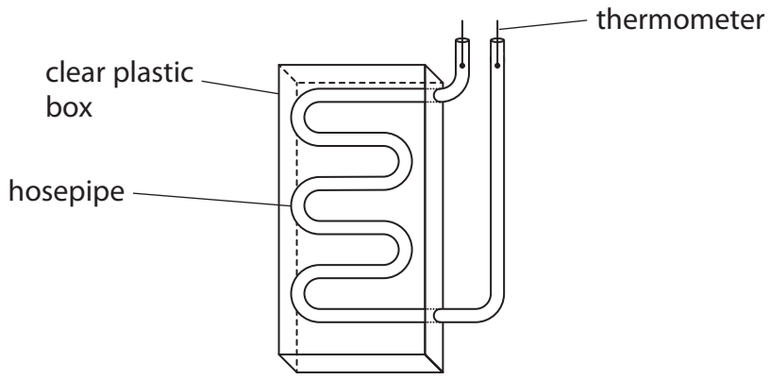
Heating water

2 A student uses a red hosepipe to make a solar water heater.

The hosepipe is full of water.

The student coils the hosepipe and fixes it into a clear plastic box as shown.

There is a thermometer in each end of the hosepipe.



The Sun shines on the hosepipe and heats the water.

(a) The student now paints the hosepipe to make it more efficient at absorbing heat.

Which of these coloured paints would be the best to use?
Put a cross (☒) in the box next to your answer.

(1)

☒ **A** black

☒ **B** grey

☒ **C** silver

☒ **D** white

(b) The solar heater is kept in a cool place overnight.

In the morning, the student brings the solar heater out into the bright sunshine.

The student records the temperature on the thermometers from sunrise to sunset on a sunny day.

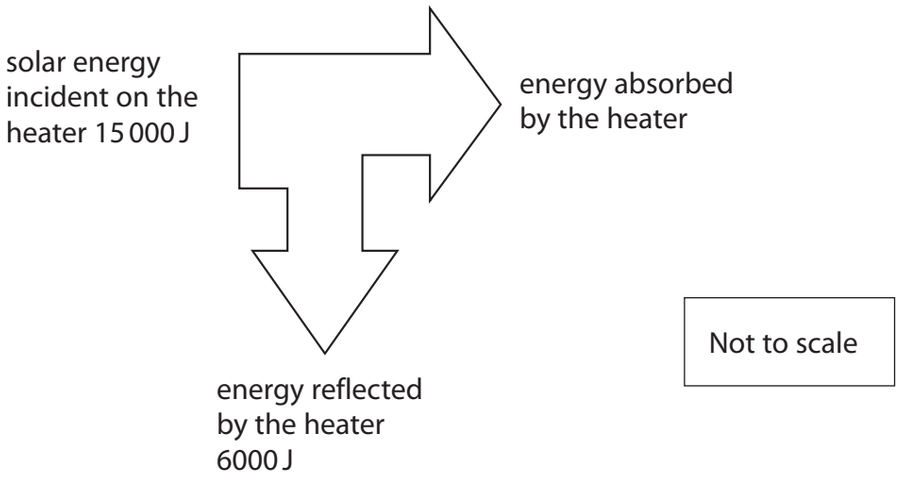
Explain what happens to the temperature of the water in the hosepipe during the day, from sunrise to sunset.

(4)

(c) Some of the solar energy incident on the solar heater is reflected.

The rest of the solar energy is absorbed.

The diagram gives some information about energy transfers during the first 300 s.



Calculate the efficiency of the heater.

(3)

efficiency = ...

(Total for Question 2 = 8 marks)

The Solar System

3 (a) State the name of the force that keeps the Moon in orbit around the Earth.

(1)

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(b) Explain why the distance between the Earth and Jupiter changes a lot but the distance between the Earth and the Moon stays almost the same.

(2)

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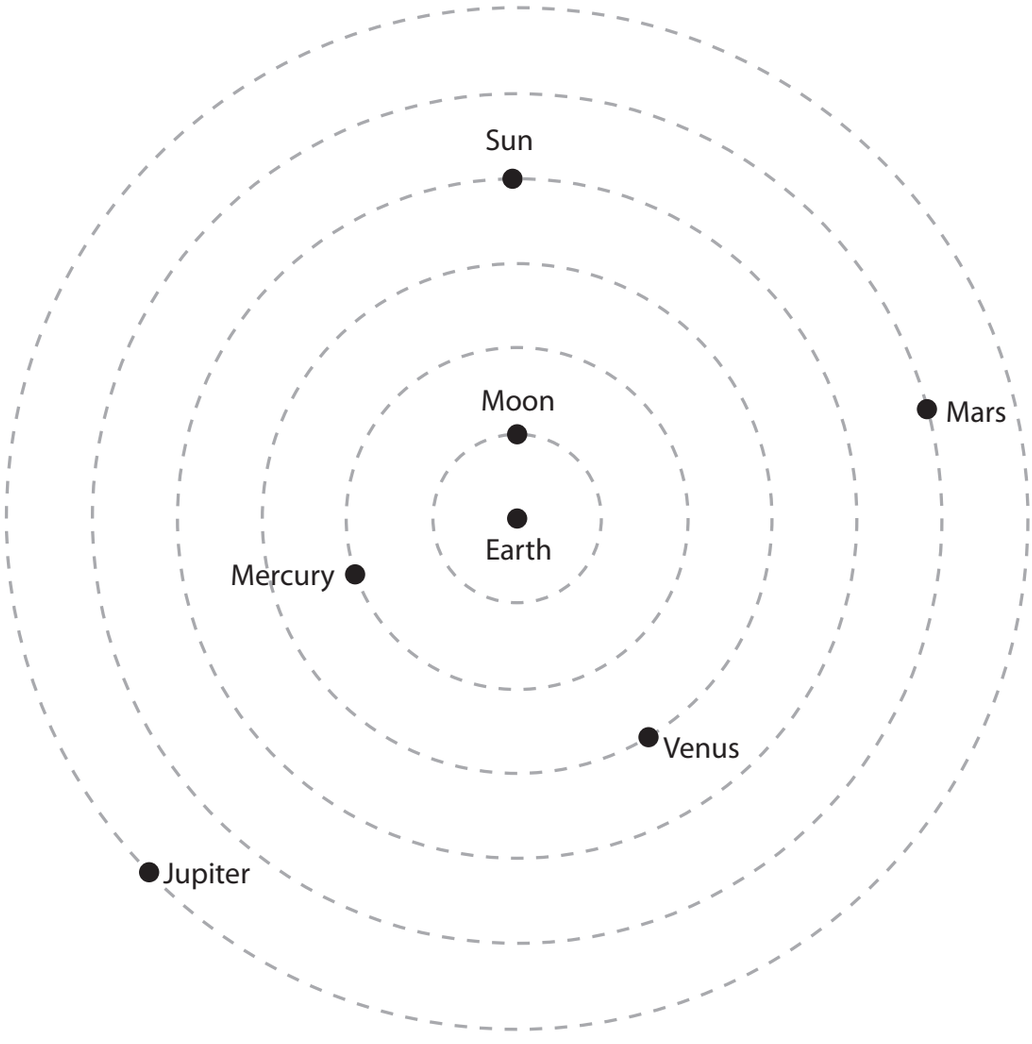
(c) The diagram shows how people used to think the Solar System was arranged.

The dashed circles represent orbits.



(i) State **one** way that this model agrees with the currently accepted model of the Solar System.

(1)

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(ii) State **two** ways this diagram could be changed to make it more like the currently accepted model of the Solar System.

(2)

1 .....

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2 .....

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(iii) Galileo used a telescope to observe Jupiter.

Explain how his observations provided evidence for the currently accepted model of the Solar System rather than evidence for the previous model.

(3)

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(Total for Question 3 = 9 marks)

An electric motor

4 Students investigate the efficiency of an electric motor.

(a) The students measure the input power and the output power of the motor.

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

The power of the motor is the rate of transfer of

(1)

☒ **A** charge

☒ **B** current

☒ **C** energy

☒ **D** voltage

(b) The motor uses an alternating current (a.c.).

Sketch a graph for an alternating current of frequency 0.5 Hz.

(2)

(c) The electric motor has an efficiency of 40%.

Explain what is meant by an **efficiency of 40%**.

(2)

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(d) The motor has a power rating of 15 W.

The motor runs at this power for 3 minutes.

The cost of electricity is 20 p per kilowatt-hour.

(i) Calculate the energy supplied to the motor in 3 minutes.

State the unit.

(3)

energy supplied = ... unit .....

(ii) Calculate the cost of running the motor for 3 minutes.

(3)

cost = ... p

(Total for Question 4 = 11 marks)

Waves in action

5 (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**	transverse only	transverse only
☒ **B**	transverse only	longitudinal only
☒ **C**	longitudinal and transverse	transverse only
☒ **D**	longitudinal and transverse	longitudinal only

(b) A P-wave travels in the mantle of the Earth at an average speed of 12 000 m/s.

This P-wave travels a distance of 5800 km.

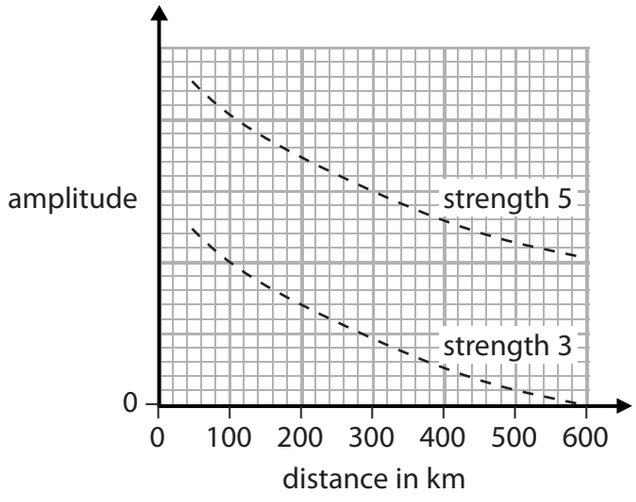
Calculate the time this takes.

(3)

time of travel = ... s

(c) The amplitude of a seismic wave in the Earth's surface varies with the distance from where the earthquake occurs.

The graph shows this variation in amplitude for two earthquakes of different strengths.



Compare how the amplitude values vary with distance for the two earthquakes.

(2)

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*(d) Waves are also used in sonar.

Explain how a sonar pulse from one submarine can be used to determine the distance to a second submarine.

(6)

(Total for Question 5 = 12 marks)

Radiation

6 Radiation is used in many different ways.

(a) Which of these can be used both for communication and for cooking?

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

☒ **A** infrared radiation

☒ **B** gamma radiation

☒ **C** ultraviolet radiation

☒ **D** X-radiation

(1)

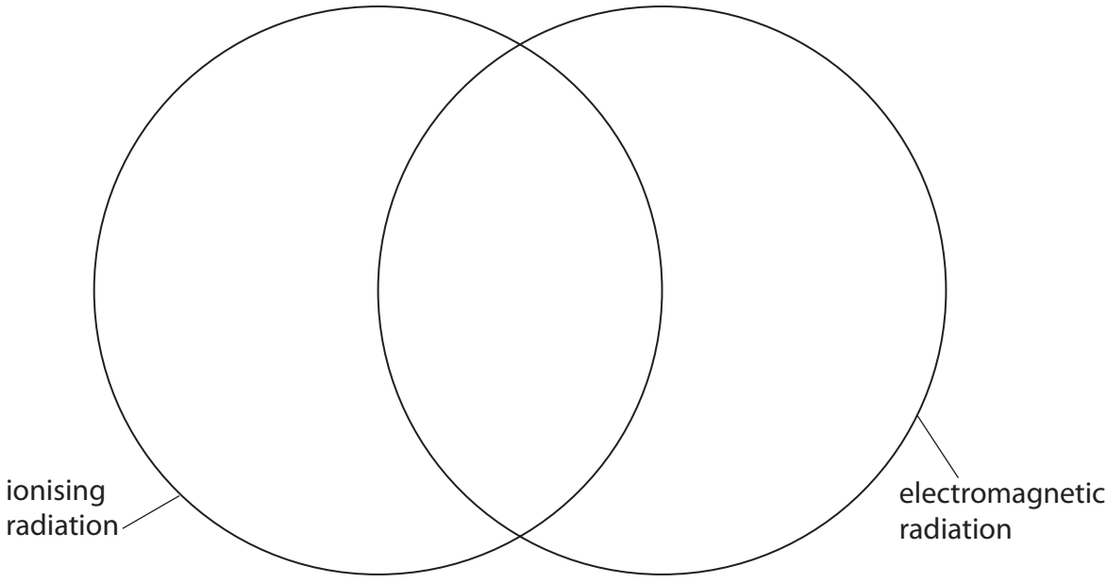
(b) The word box contains the names of three types of radiation.

beta radiation	microwaves	X-rays

Use this diagram to classify the three types of radiation given in the word box.

Write the name of each type of radiation in the correct section of the diagram.

(2)



(c) Some telescopes are located on high mountains.
This is to reduce the effects of light pollution.

These ground-based telescopes are still limited in the information they can gather.

Explain the limitations of ground-based telescopes in observing stars.

(3)

*(d) Herschel discovered invisible rays just beyond one end of the visible spectrum.

Another scientist discovered invisible rays just beyond the other end of the visible spectrum.

Explain how their two experiments led to these discoveries.

You may draw labelled diagrams to help with your answer.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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