Write your name here

Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Physics/Science

Unit P1: Universal Physics

Higher Tier

Thursday 8 November 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 1 7 6 4 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

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

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

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

Answer ALL questions.

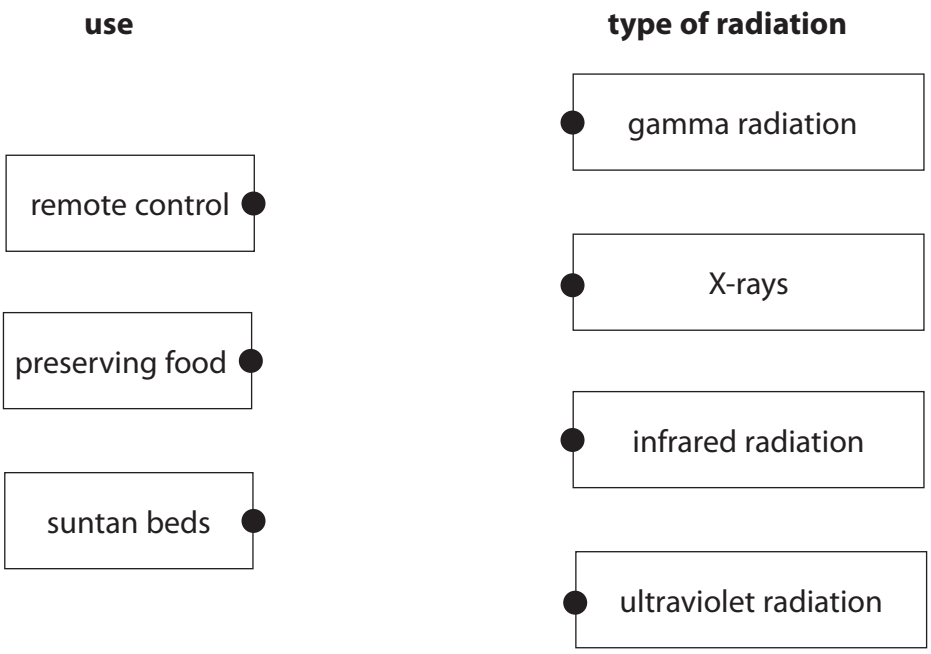
Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Electromagnetic spectrum

1 (a) Different types of electromagnetic radiation have different uses.

Draw one straight line from each use to the correct type of radiation.

(3)



(b) X-rays from a star travel to a space telescope in orbit around the Earth.

Explain why visible light from the same star takes the same time to reach the telescope.

(2)

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(c) Which of these ionising radiations is from a radioactive source and is also part of the electromagnetic spectrum?

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

(1)

☒ **A** alpha particles

☒ **B** beta particles

☒ **C** gamma rays

☒ **D** X-rays

(d) An X-ray of wavelength 2.0 nm has a frequency of 1.5×10^{17} Hz.

1.0 nm = 1.0×10^{-9} m

Calculate the speed of the wave.

(2)

speed = ... m/s

(Total for Question 1 = 8 marks)

Solar energy

2 There are two types of solar panels.

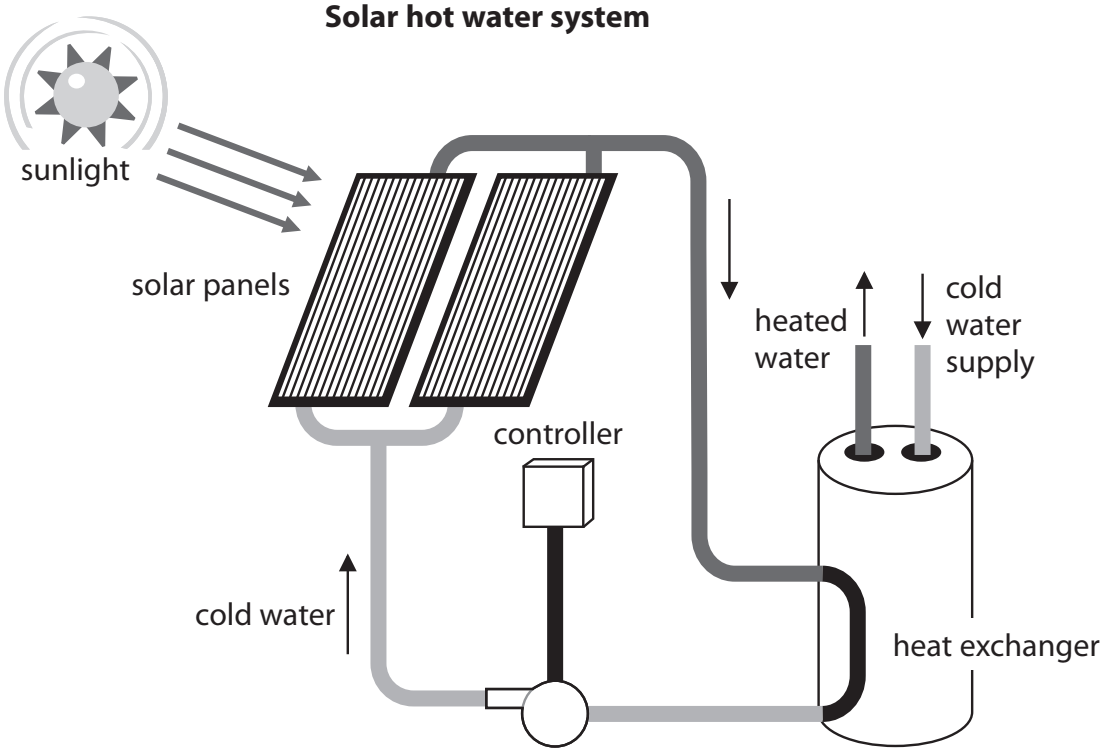
One type of solar panel uses the Sun's energy to heat water.

The other type uses solar cells to produce electricity.

(a) The diagram shows solar panels in a system used to heat water for a house.

Cold water goes into the panels and is heated by energy from the Sun.

Solar hot water system



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

The solar heating panels are painted black because

(1)

☒ **A** black is a good absorber of heat

☒ **B** black is a good conductor of heat

☒ **C** black is a good radiator of heat

☒ **D** black is a good reflector of heat

(ii) On one sunny day no hot water is used in the house.

The water in the panels reaches a constant temperature even though the water is still absorbing energy from the Sun.

Explain why the temperature of the water in the panels becomes constant.

(3)

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(b) The photograph shows a solar farm which uses many thousands of solar cells to generate electricity.

(i) Which energy transfer takes place in a solar cell?

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

(1)

☒ **A** chemical to electrical

☒ **B** electrical to light

☒ **C** electrical to chemical

☒ **D** light to electrical

(ii) A large solar farm has 21 700 solar panels and generates 5.0 MW of power.

1.0 MW = 1.0×10^6 W

Calculate the average power each panel produces.

(2)

average power produced by each panel = ... W

(iii) The solar farm receives 25 MW of power from the Sun to generate 5 MW of electrical power.

Calculate the efficiency of the solar farm.

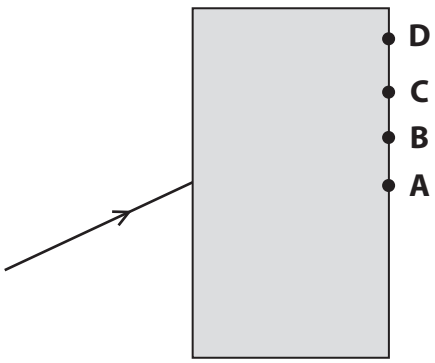
(2)

efficiency = ...

(Total for Question 2 = 9 marks)

Refraction and telescopes

3 The diagram shows a ray of light incident on a glass block.



(a) (i) At which point is the ray of light shown likely to leave the glass block?

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

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

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

The ray of light changes direction when it enters the glass block because there is a change of

(1)

☒ **A** amplitude

☒ **B** frequency

☒ **C** speed

☒ **D** energy

(b) A student uses a lens to form a clear image of a house.
The image is formed on a piece of paper.
The house is a long way away.

Describe how the student should find the focal length of the lens.

(2)

(c) Galileo used a telescope to observe Jupiter.

His observations provided evidence to support the idea that the Earth is not the centre of the Universe.

Explain how Galileo's observations supported this idea.

(2)

(d) A student looked for information about telescopes on the Internet.
He found this equation for the magnification of a simple telescope.

$$\text{magnification} = \frac{\text{focal length of lens furthest from the eye (the objective)}}{\text{focal length of lens nearest the eye (the eyepiece)}}$$

The information sheet given with a simple telescope states:

- the magnification is 40 times ($\times 40$)
- the focal length of the objective is 110 cm.

Calculate the focal length of the eyepiece.

(3)

focal length of eyepiece = ... cm

(Total for Question 3 = 9 marks)

Transformers

4 A small notebook computer has a power rating of 40 W.
The computer is connected to the mains supply through a step-down transformer.
The mains supply is a.c.

(a) (i) How much energy is supplied to the computer each second?

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

(1)

- ☒ **A** 0.025 J
- ☒ **B** 4.0 J
- ☒ **C** 40 J
- ☒ **D** 240 J

(ii) Sketch an alternating current on the axes shown.

(1)

(b) The step-down transformer has:

- 2400 turns on the primary coil
- 200 turns on the secondary coil
- a primary voltage of 230 V.

Calculate the voltage output of the secondary coil.

(3)

secondary voltage = ... V

(c) (i) Explain how transformers are used to improve the efficiency of power transmission in the National Grid.

(3)

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(ii) Explain why flying a kite near power lines could be a danger to the person flying the kite.

(2)

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(Total for Question 4 = 10 marks)

Ultrasound

5 Ultrasound has many different applications.

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

Ultrasound is used for

(1)

- ☒ **A** cooking
- ☒ **B** communication between animals
- ☒ **C** communication with satellites
- ☒ **D** detecting forged bank notes

(ii) Explain why ultrasound rather than X-rays are used for foetal scanning.

(2)

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(b) An ultrasound wave vibrates 30 000 times a second.

(i) State the frequency of the wave.

(1)

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(ii) Describe the motion of particles in a material when this ultrasound wave passes through.

(2)

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*(c) Explain how sonar is used by deep sea fishermen to detect the depth of a shoal of fish below the surface of the sea.

(6)

(Total for Question 5 = 12 marks)

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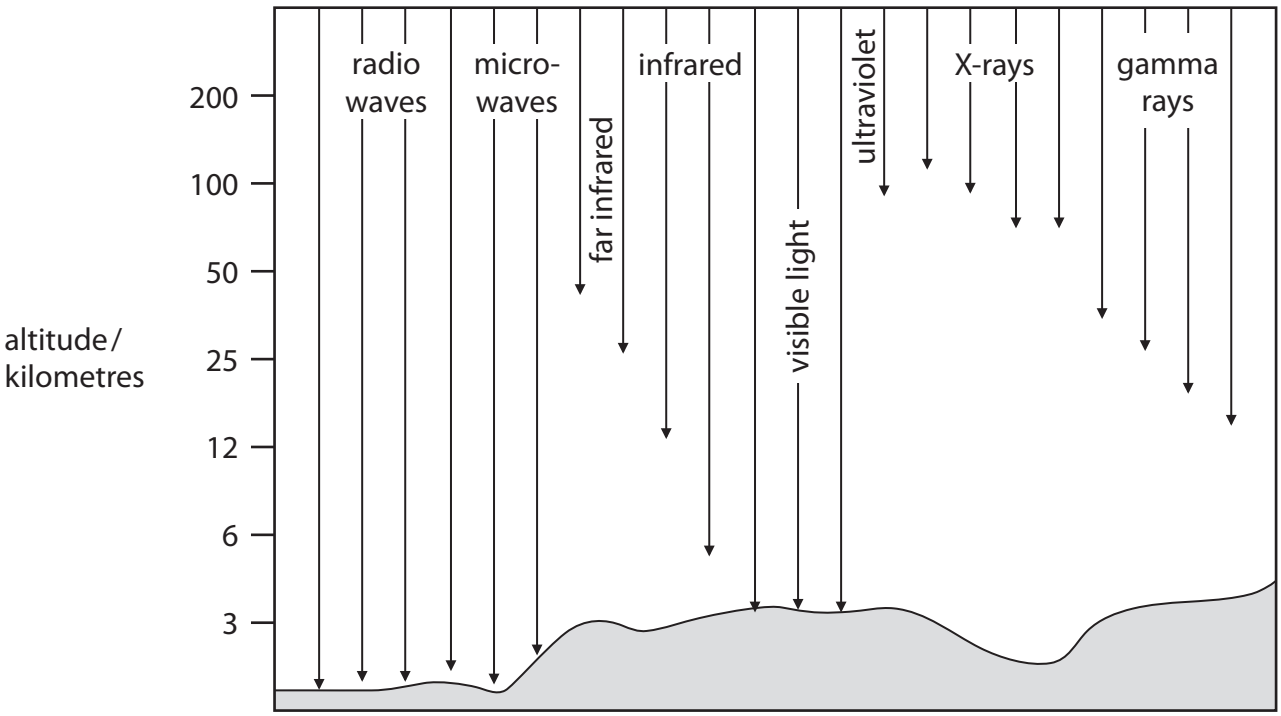
The Solar System

6 Not all electromagnetic radiation coming from space reaches the Earth's surface.

The diagram shows how far radiation from each part of the electromagnetic spectrum travels down through the atmosphere.



(a) (i) Name **one** type of radiation that can reach the surface of the Earth from stars.

(1)

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(ii) Name **one** type of radiation from stars that cannot be detected at the Earth's surface but can be detected using satellites.

(1)

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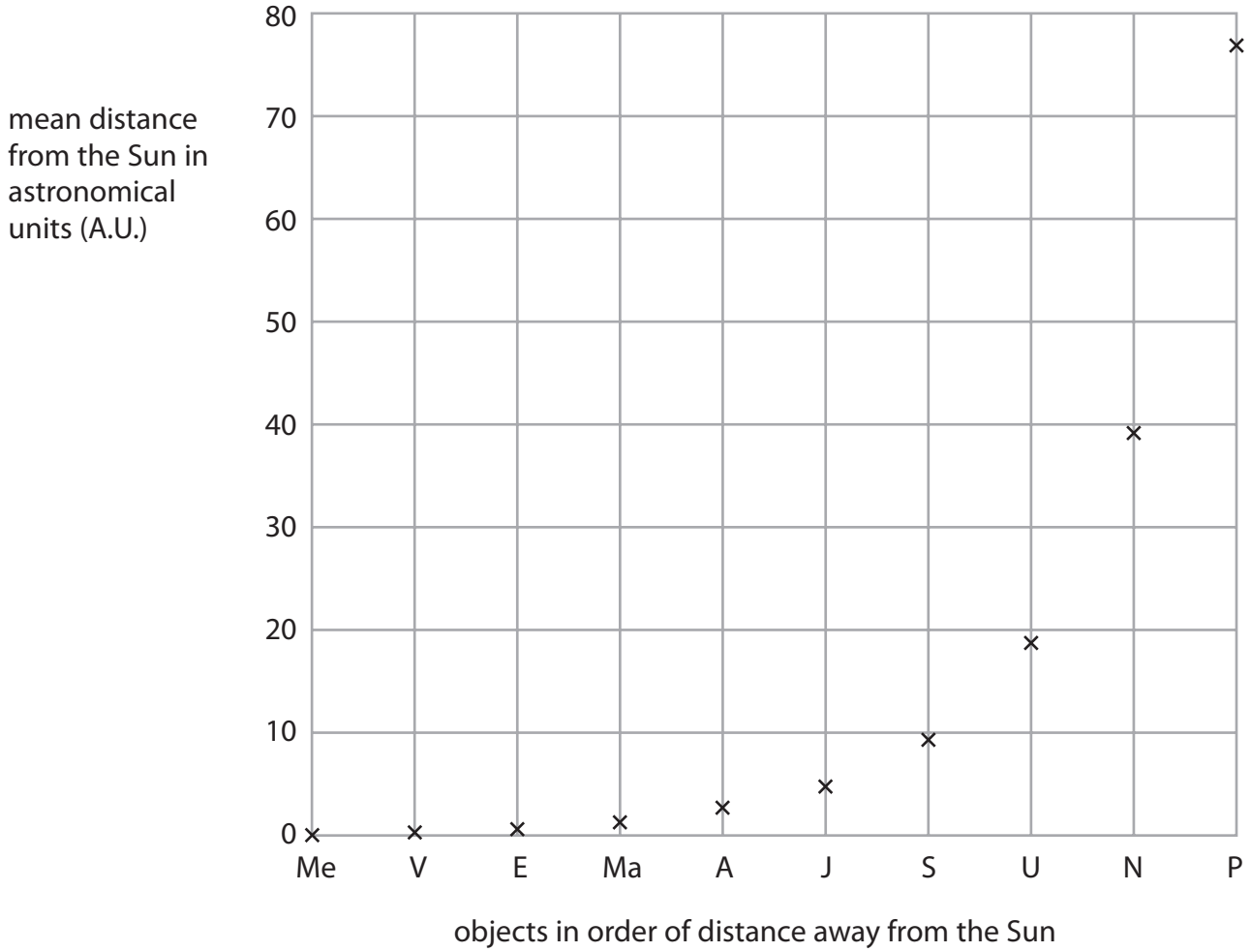
(b) Bode, a scientist, found a rule predicting the distance of objects from the Sun.

The chart shows the mean distances from the Sun predicted by Bode's rule.



[Me – Mercury; V – Venus; E – Earth; Ma – Mars; A – Asteroid Belt; J – Jupiter; S – Saturn; U – Uranus; N – Neptune; P – Pluto]

(i) Read, from the chart, the predicted values for the distance from the Sun to Neptune and from the Sun to Pluto.

(2)

Sun to Neptune.....

Sun to Pluto.....

(ii) Bode's rule works well for all objects between Mercury and Uranus.
From scientific measurements, however, the actual mean distance from the Sun to Neptune is 30 A.U.
Some scientists think that Neptune was not part of the original Solar System.

Explain how the predicted value for Neptune supports the view of these scientists.

(2)

*(c) Scientists are using a variety of methods to search for life beyond Earth.

Discuss the problems involved in using these methods.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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