

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

Physics/Science

Unit P1: Universal Physics

Higher Tier

Thursday 24 May 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 = $\frac{\text{(useful energy transferred by the device)}}{\text{(total energy supplied to the device)}} \times 100\%$

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

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

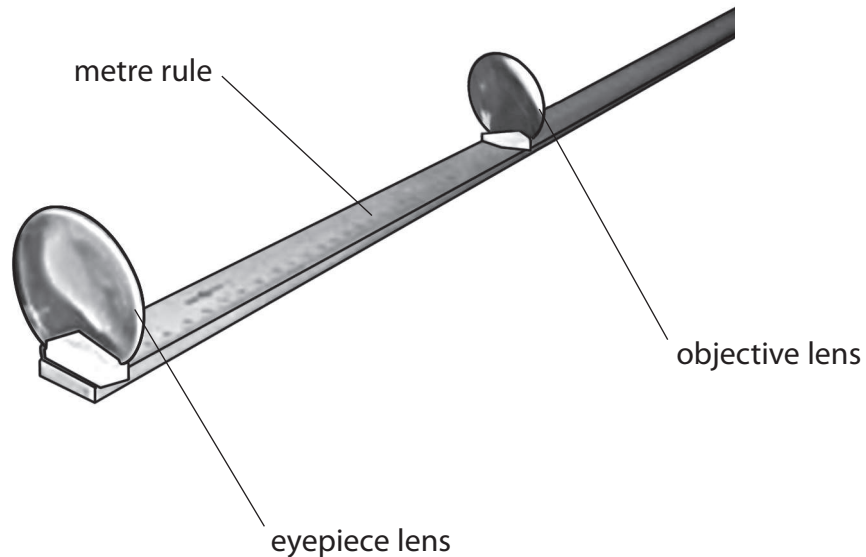


Answer ALL questions.

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 ☒.

Refracting telescope

1 The diagram shows a simple telescope which can be made in the laboratory.



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

The type of lens used as the objective lens is

(1)

- A concave
- B converging
- C diverging
- D reflecting

(b) The objective lens produces an image of a distant object.

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

The image produced by the objective lens is

(1)

- A the right way up and smaller
- B the right way up and bigger
- C upside down and smaller
- D upside down and bigger



(ii) Describe how the position of this image can be shown.

(2)

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(c) State the purpose of the eyepiece.

(1)

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(d) The telescope is used to look at the planet Venus.

Assume that the distance from Venus to the Earth is 39 000 000 km.

The speed of light is 300 000 000 m/s.

Calculate the time it takes for light to travel from Venus to the Earth.

(3)

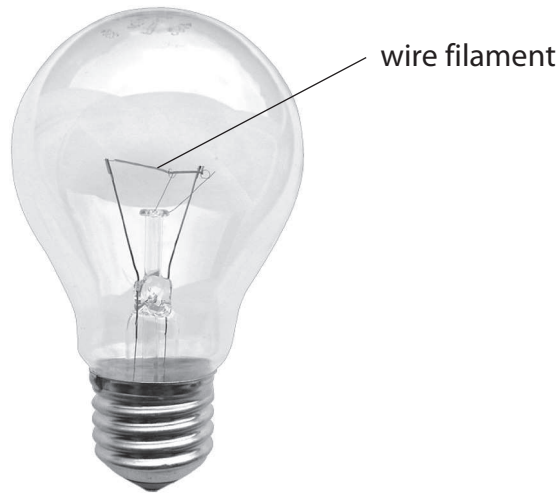
time = s

(Total for Question 1 = 8 marks)



Lamps

2 This lamp has a wire filament that glows white hot when it is in use.



(a) A 100 W filament lamp is 15% efficient.

(i) Explain the meaning of the term **15% efficient**.

(2)

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(ii) Draw a labelled energy flow diagram to show what happens to 100 J of electrical energy supplied to the lamp.

(2)



(b) Many people choose to buy expensive low-energy lamps instead of cheaper filament lamps.

Give **two** reasons for this.

(2)

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(c) When a filament lamp is in use, the temperature of the wire filament remains at 2500 °C.

Explain why this temperature remains constant.

(3)

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(Total for Question 2 = 9 marks)



Elephants and infrasound

- 3 (a) Sound travels through the air as longitudinal waves.

Describe how the air particles move when a sound wave passes.

(2)

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- (b) Elephants call to each other using infrasound.
People cannot hear these infrasound calls.

Which of the following statements is the reason that people cannot hear infrasound?

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

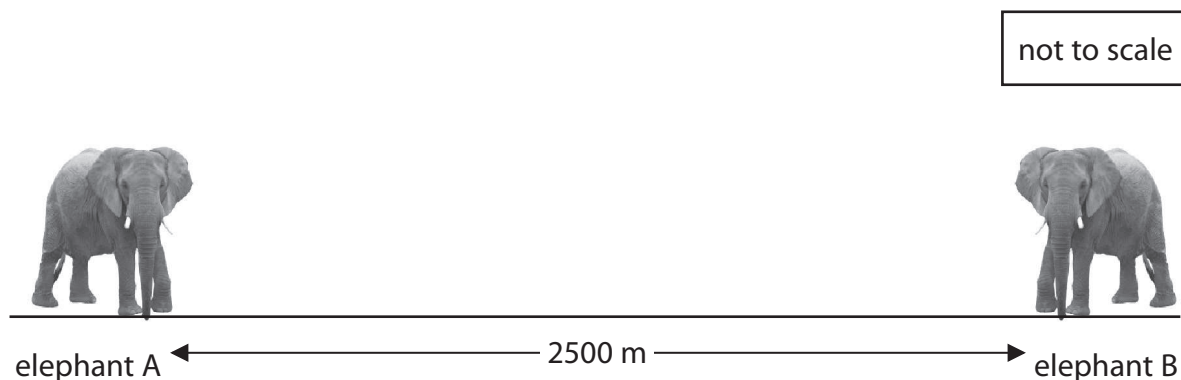
(1)

- A the amplitude of infrasound is too big
- B the frequency of infrasound is too low
- C the speed of infrasound is too fast
- D the wavelength of infrasound is too short



- (c) Both infrasound waves and ultrasound waves are types of sound waves. They are used by animals to communicate.

Two elephants use infrasound waves for long distance communication. The distance between these two elephants is 2500 m.



Elephant A emits an infrasound call. When elephant B hears the infrasound, it calls back. Elephant A hears the answering call from elephant B. The speed of infrasound is 340 m/s.

- (i) Show that the minimum time for elephant A to call and hear an answer from elephant B is about 15 s.

(3)

- (ii) An elephant's infrasound call has a range of 4000 m. Each infrasound call lasts between 2 s and 10 s. Each elephant usually waits about 30 s before it calls again.

Suggest a reason why elephants wait 30 s before calling again.

(1)

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(d) Describe a use of infrasound that does not involve animals.

(2)

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(Total for Question 3 = 9 marks)

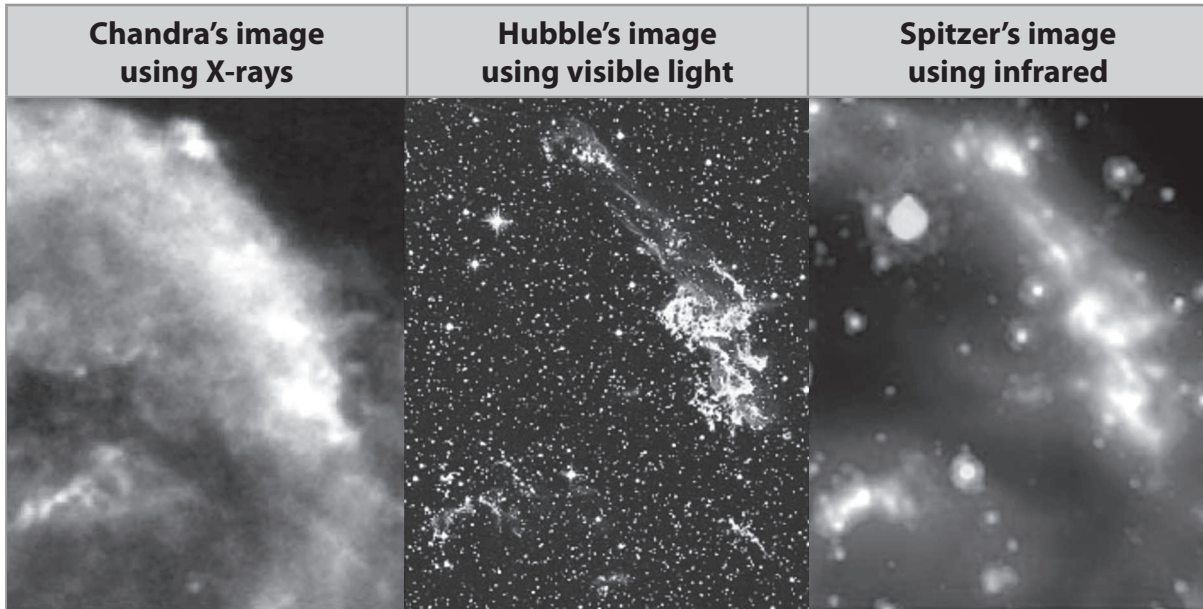


Looking at our Universe

- 4 (a) Chandra, Hubble and Spitzer are space telescopes.

The photographs show exactly the same part of the Universe observed using the different telescopes.

The main object shown in each photograph is the same supernova.



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

A supernova is

(1)

- A a star in its main sequence
- B the appearance of a new star
- C the explosion of a massive star
- D the explosion of a white dwarf




(ii) The waves that the three telescopes use are

- X-rays
- visible light
- infrared

Complete the table by arranging these three waves in order of decreasing wavelength.

(1)

longest wavelength  shortest wavelength		
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(iii) Astronomers use different types of telescope, like Chandra, Hubble and Spitzer.

Explain how using these different telescopes gives a better understanding of the Universe.

(3)

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(b) Most space telescopes orbit the Earth but the Spitzer telescope stays behind the Earth to hide from the Sun.

Suggest why this is necessary.

(2)

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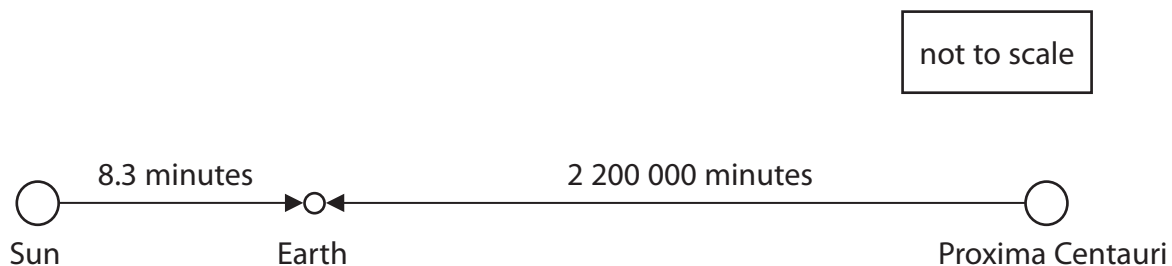
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- (c) Outside our Solar System, the star closest to Earth is called Proxima Centauri.
 Light from this star takes 2 200 000 minutes to reach the Earth.
 Light from the Sun takes 8.3 minutes to reach the Earth.
 The speed of light is 18 000 000 km/minute.



- (i) By calculation, compare the distance of Proxima Centauri from the Earth with the distance of the Sun from the Earth.

(2)

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- (ii) A light year is the distance that light travels in one year.

Astronomers usually give the distance from stars as a number of light years instead of a number of kilometres.

Suggest a reason for this.

(1)

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(Total for Question 4 = 10 marks)



Power from the wind

5 A windfarm generates electrical power from the wind.

(a) State **one** disadvantage of using the wind to generate electrical power.

(1)

(b) A windfarm generates 322 MW of electrical power.

The windfarm is connected to a transmission line at a potential difference of 132 kV.

(i) Calculate the current from the windfarm.

(3)

current = A

(ii) The windfarm produces 322 MW of power.
The windfarm is to be extended by adding 75 improved turbines.
The extended windfarm will then produce a total of 539 MW.

Calculate the power produced by each improved turbine.

(2)

power = MW



* (c) There is a plan to replace the existing transmission line from the windfarm with one at the higher potential difference of 400 kV.

The new transmission line will cross more than 200 km of mountains. The cables will hang 50 m above the ground from 600 new, taller pylons. Eventually, about 1000 of the old, shorter pylons will be removed.

Discuss the advantages and disadvantages of this plan.

(6)

(Total for Question 5 = 12 marks)



Electromagnetic waves

6 (a) The diagram shows the parts of the electromagnetic spectrum.

radio waves	microwaves	infrared	visible light	ultraviolet	X-rays	gamma rays
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(i) Which parts of the electromagnetic spectrum are used for both communication and cooking?

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

(1)

- A infrared and microwaves
- B infrared and radio waves
- C microwaves and radio waves
- D radio waves and X-rays

(ii) Fluorescent substances absorb ultraviolet and emit visible light.

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

Visible light has a

(1)

- A faster speed than ultraviolet
- B higher frequency than ultraviolet
- C lower frequency than ultraviolet
- D smaller wavelength than ultraviolet



(b) Ultraviolet radiation and infrared radiation are emitted by the Sun and reach the surface of the Earth.

(i) Describe a harmful effect of ultraviolet radiation.

(2)

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(ii) Explain why ultraviolet radiation is likely to be more dangerous to humans than infrared radiation.

(2)

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*(c) Herschel discovered invisible rays beyond one end of the visible spectrum.
Ritter discovered invisible rays beyond the other end of the visible spectrum.

Compare and contrast the two experiments leading 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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