**Pearson
Edexcel GCSE**

Centre Number

Candidate Number

Physics/Science
Unit P1: Universal Physics

Foundation Tier

Wednesday 20 May 2015 – Afternoon
Time: 1 hour

Paper Reference
5PH1F/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 ▶

P44801RA

P44801RA0120

PEARSON

FORMULAE

You may find the following formulae useful.

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

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

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

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

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

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

P44801RA0220

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

1 (a) The photographs show two ways of supplying thermal energy.

Use words from the box to complete the sentence under each photograph.

chemical	electrical	kinetic	light	sound

(i) The photograph shows a kettle.

The kettle transfers .... energy to thermal energy.

(1)

(ii) The photograph shows a barbecue.

The barbecue transfers .... energy to thermal energy.

(1)

(b) This photograph shows a fan.

fan blade

The blades of the fan are turned by an electric motor.

In one second, the motor gets 200 J of electrical energy from the mains supply. Only 180 J of this energy is used to turn the blades of the fan.

The rest of the energy is wasted.

(i) Calculate how much of the 200 J of energy is wasted.

(1)

wasted energy = ... J

(ii) State what happens to the wasted energy.

(1)

....

....

(iii) Calculate the efficiency of the motor.

(2)

efficiency = ...

(c) A student wants to use sunlight to heat water in a container.

(i) The student can choose from four containers.

The containers:

* are all the same size
* have different colours
* have different surfaces.

Which container is the best absorber of thermal energy?
Put a cross (☒) in the box next to your answer.

(1)

	container colour	container surface
☒ **A**	light	shiny
☒ **B**	light	rough
☒ **C**	dark	shiny
☒ **D**	dark	rough

(ii) The student places the container in bright sunlight.
After half an hour, the temperature of the water is 50 °C.
The water then stays at 50 °C, even though the container is still in bright sunlight.

Which of these explains why the temperature stays at 50 °C?
Put a cross (☒) in the box next to your answer.

(1)

☒ **A** The water in the container is no longer absorbing thermal energy.

☒ **B** The container is losing thermal energy faster than it is absorbing it.

☒ **C** The container is losing thermal energy at the same rate it is absorbing it.

☒ **D** The water in the container has started to boil.

(Total for Question 1 = 8 marks)

Scientists and telescopes

2 Herschel and Hubble were astronomers who have had telescopes named after them.

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

The telescope named after Herschel detects infrared radiation.
Herschel is a suitable name for this infrared telescope because

(1)

☒ **A** Herschel discovered Uranus using a telescope

☒ **B** Herschel constructed over 400 telescopes

☒ **C** Herschel discovered infrared radiation

☒ **D** Herschel constructed this telescope

(b) Both the Hubble telescope and the Moon orbit the Earth.
The table gives data about these

	average radius of orbit / km	time of orbit
Moon	385 000	27 days
Hubble	560	96 minutes

(i) What is the closest distance between the Moon and the Hubble telescope?

(1)

.... km

(ii) Explain why the distance between the Moon and the Hubble telescope changes.

You may add to this diagram to help your answer.

(2)

....

....

....

....
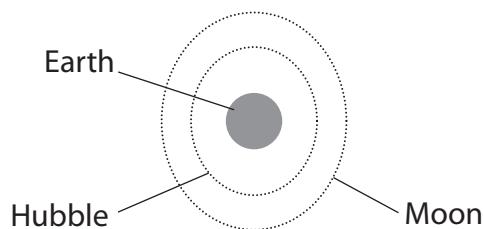
(c) Hubble measured the distance of many galaxies from Earth.
He also measured the speed at which each galaxy moved away from Earth.

Hubble plotted his data on a graph like this.

how fast the galaxy is moving away from Earth / units of speed

distance from Earth to galaxy / units of distance
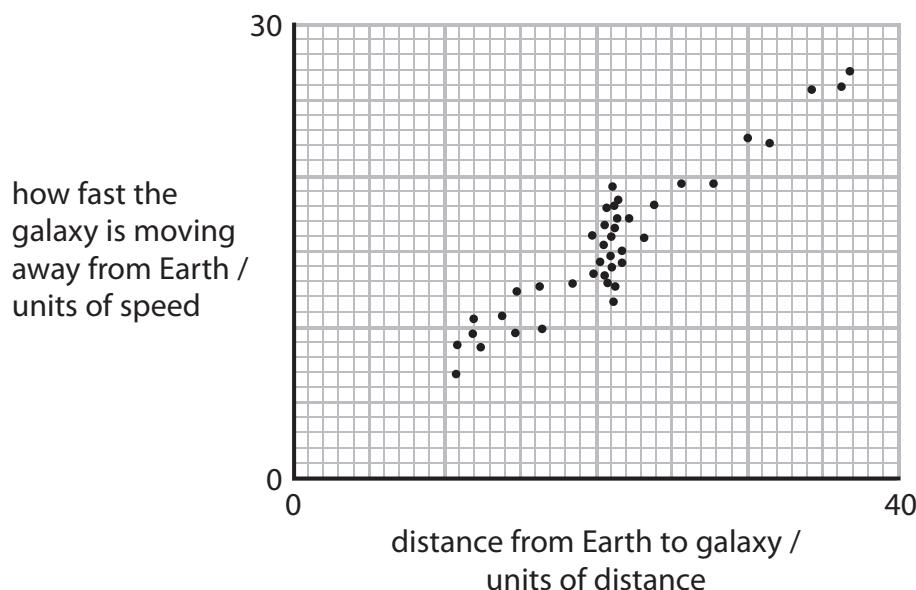
(i) Plot the point: distance = 5 units, speed = 4 units

(1)

(ii) Draw the straight line of best fit.

(1)

(d) Hubble's work led to the theory of the Big Bang.

Describe what is meant by the Big Bang theory.

(2)

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....

....

(Total for Question 2 = 8 marks)

A domestic wind-powered generator

3 (a) The picture shows a wind-powered generator used to produce electricity for a house.

© The Wall Street Journal

(i) The table shows some electrical components.

Put ticks in the table next to the **two** components the generator must contain.

(2)

component	✓
ammeter	
coil of wire	
battery	
magnet	
voltmeter	

(ii) Explain why the voltage produced by this wind-powered generator is not always the same.

(2)

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....

(iii) It would cost the homeowner 15 p to buy 1.0 kW h of electrical energy from the National Grid.

His generator has a maximum power of 2.0 kW.
The generator produces energy at this maximum power for 3 hours.

Calculate how much it would cost to buy the same amount of energy from the National Grid.

(2)

cost = ... p

(b) An electric kettle is plugged into a 230 V mains supply.
It has a power of 2.5 kW.

Use this equation to calculate the current in the kettle.

$$\text{current (in amps)} = \frac{\text{power (in watts)}}{\text{voltage (in volts)}}$$

(3)

current = ... A

(c) Suggest why a 2 kW wind-powered generator may not supply all the electrical energy needed in a house.

(1)

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(Total for Question 3 = 10 marks)

Bees

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

A student correctly estimated the length of a bee.

The length of a bee is about 2.0

(1)

☒ **A** mm

☒ **B** cm

☒ **C** m

☒ **D** km

(b) Bees have several colours.

Which of these colours appears in a pure spectrum of visible light?

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

(1)

☒ **A** black

☒ **B** brown

☒ **C** white

☒ **D** yellow

(c) The diagrams show the radiations to which the human eye and the bee eye are sensitive.

human eye

sensitivity to radiation

0

frequency

visible

bee eye

sensitivity to radiation

0

frequency

visible

infrared

ultraviolet
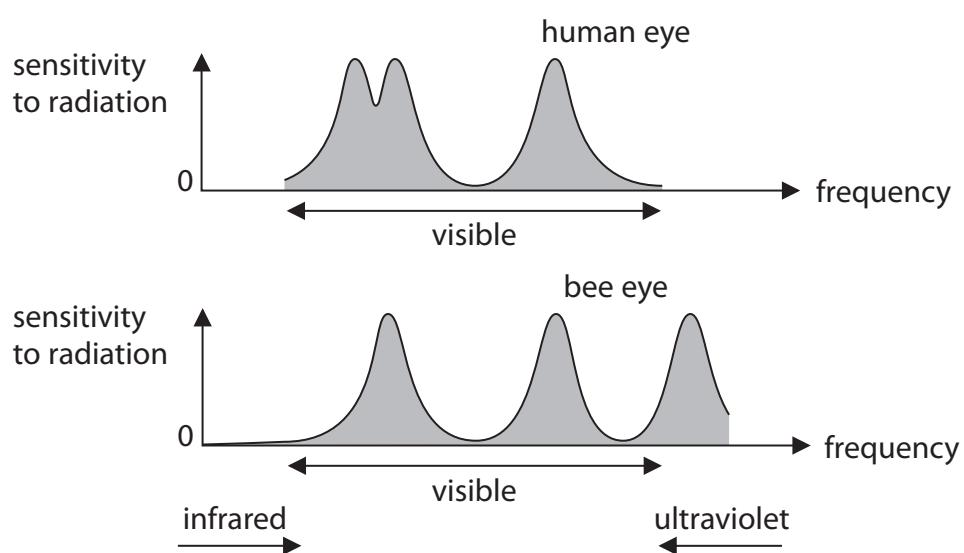
Describe differences in the sensitivity to radiation of a human eye and a bee eye.

(2)

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....

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

A bee's wings flap up and down with a frequency of 230 Hz.

This is a frequency of

(1)

⊠ **A** infrasound

⊠ **B** sonar

⊠ **C** sound

⊠ **D** ultrasound

(e) There is a piece of music called "The Flight of the Bumble Bee."
This takes 4 minutes to play.
During this time, a bee flies 1608 m.

Calculate the average speed of the bee.

(3)

speed .... m/s

(f) A scientist wrote this sentence:

"*Ultraviolet radiation is harmful to humans but useful to honey bees.*"

Suggest what the scientist means by this sentence. You may wish to look back at
the graphs in part (c).

(2)

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(Total for Question 4 = 10 marks)

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Waves in action

5 (a) The diagram shows a transverse wave.

X .... Y ....
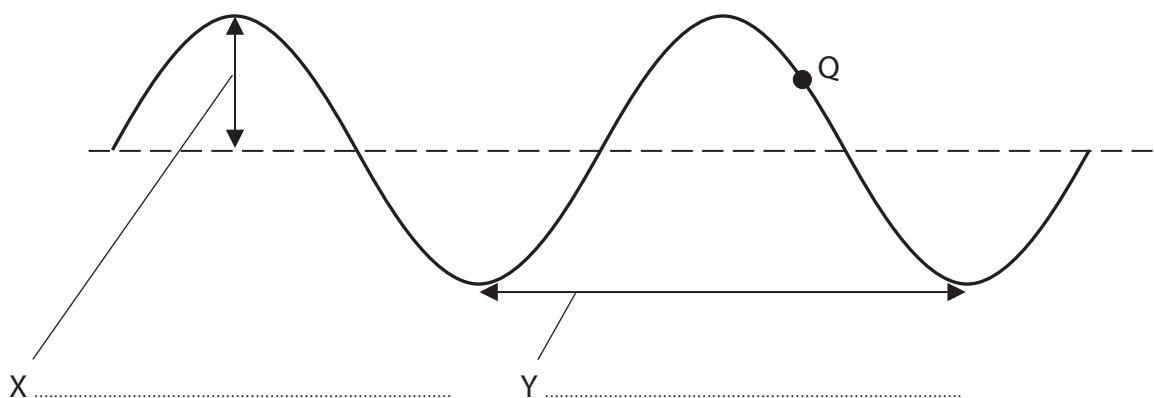
(i) Use words from the box to label the distances X and Y.

| amplitude | frequency | magnification | speed | wavelength |

(2)

(ii) Q is a particle in the wave.

Which of these shows the way in which particle Q moves?

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

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(b) The photographs show a refracting telescope and a reflecting telescope.
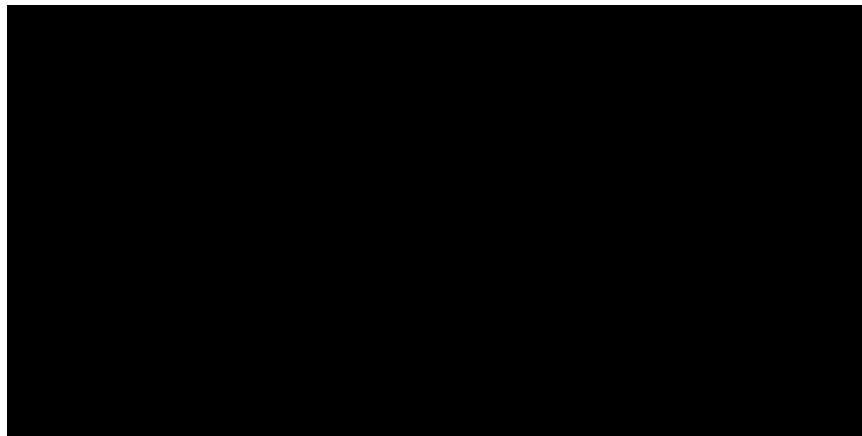
refracting telescope   reflecting telescope

Both telescopes are used to form an image of a distant object.

(i) The two types of telescope form their images of a distant object in different ways.
A refracting telescope uses a converging lens to form an image of a distant object.

Describe how a reflecting telescope forms an image of a distant object.

(2)

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(ii) Both telescopes use a converging lens as an eyepiece.

State what the eyepiece of a telescope is intended to do to the image.

(1)

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*(c) A long time ago, astronomers thought that the Earth was the centre of the Universe.

This was called the geocentric model.
The evidence for this model came from observations of the sky using the naked eye.

After the telescope was invented, astronomers quickly gathered evidence which showed that the geocentric model is not correct.

Describe the evidence both for the geocentric model and against the geocentric model.

(6)

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(Total for Question 5 = 12 marks)

Earthquakes

6 (a) Seismic (earthquake) waves can be either P-waves or S-waves.

Which row of the table is correct for P-waves?

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

(1)

	type of wave	can they be refracted?
☒ **A**	longitudinal	yes
☒ **B**	transverse	no
☒ **C**	longitudinal	no
☒ **D**	transverse	yes

(b) Explain why it is difficult to predict when an earthquake will happen.

(2)

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(c) The graph shows how long it takes the P-waves and the S-waves from an earthquake to travel different distances.

time of travel / minutes

distance from earthquake / thousands of km
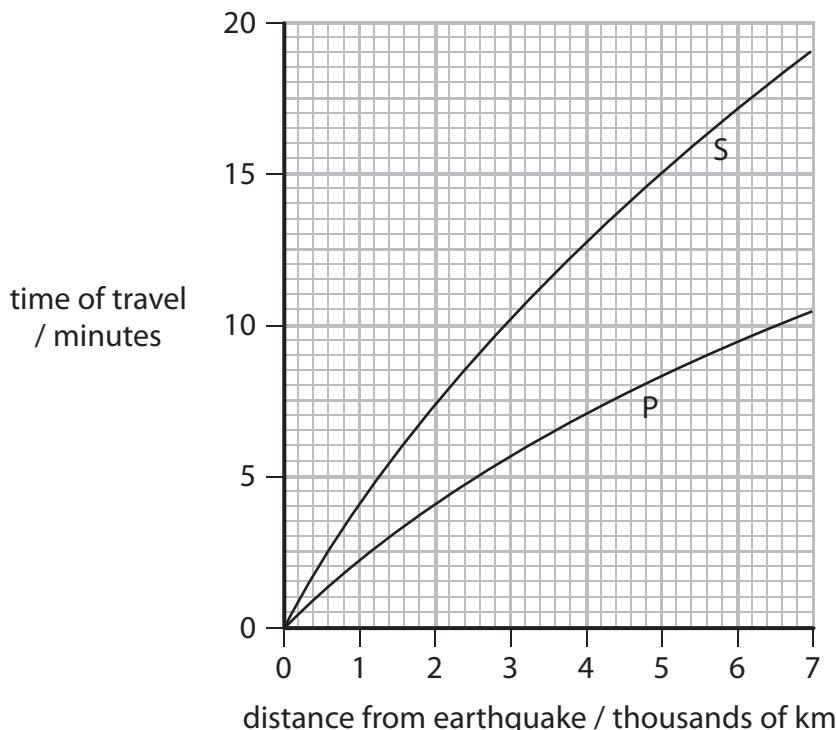
The time difference between these waves arriving at a place allows scientists to find out how far away the earthquake was.

Use the graph to find the time difference between the P- and S-waves when the distance is 4800 km.

(3)

time for P-wave = ... minutes

time for S-wave = ... minutes

time difference = ... minutes

*(d) The map below shows the positions of some seismic earthquake stations in the UK.

At the seismic stations, scientists record the arrival of earthquake waves.
They use this data to locate where an earthquake happened.

Describe how they use the data to find out where an earthquake happened.
You may add to the diagram above or draw your own diagram to help with your answer.

(6)

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(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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