Write your name here

Surname	Other names

Centre Number | Candidate Number

Edexcel GCSE

Physics/Science

Unit P1: Universal Physics

Foundation Tier

Thursday 7 March 2013 – Morning
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 ▶

P41958A

1/1/1/1/1/

P 4 1 9 5 8 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

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

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

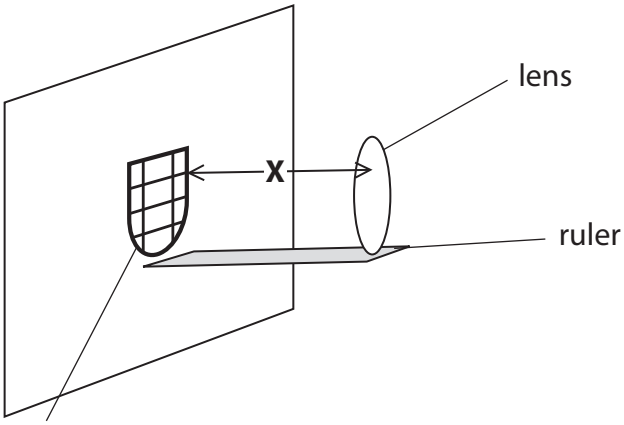
Answer ALL questions.

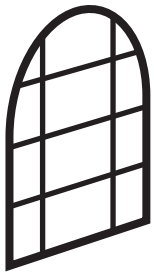
Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Lenses and waves

1 (a) Some students investigate a converging lens.
The students set up the apparatus as shown.

Not to scale





distant object

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

(i) The distance **X** is

(1)

☒ **A** the focal length

☒ **B** the object distance

☒ **C** the eyepiece distance

☒ **D** the magnification

(ii) Use words from the box to complete the sentences.

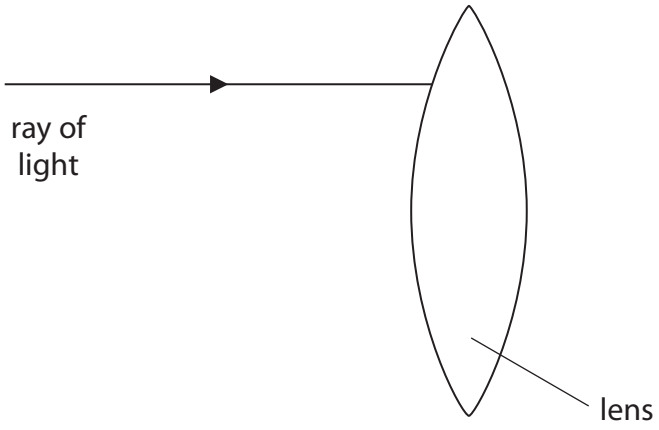
(2)

bigger than	diverging	real
smaller than	the same as	virtual

The size of the image is ..... the distant object.

The type of image formed on the screen is a ..... image.

(b) The diagram shows a ray of light as it arrives at a lens.



Draw the path of the ray inside the lens.

(1)

(c) The students use a telescope to view the Moon.

Light from the Moon takes 1.3 s to reach the students.

The speed of light is 300 000 km/s.

Calculate the distance to the Moon.

(2)

distance = speed × time

distance to the Moon = ... km

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

A satellite orbits the Moon.

Radio waves from this satellite transfer

(1)

☒ **A** matter only

☒ **B** energy and matter

☒ **C** information and matter

☒ **D** energy and information

(Total for Question 1 = 7 marks)

Energy transfers

2 (a) Here are some forms of energy:

chemical	elastic potential	electrical
heat (thermal)	kinetic	light
nuclear	sound	

(i) Use words from the box to complete the table.
Each word may be used once, more than once, or not at all.

The first one has been done for you.

(3)

device	energy transferred from...	energy is mostly transferred into...
electric motor	electrical	kinetic
bow and arrow	elastic potential	
electric kettle	electrical	
microphone		electrical

(ii) In the electric motor only some of the electrical energy is transferred into kinetic energy.

State what happens to the remaining electrical energy.

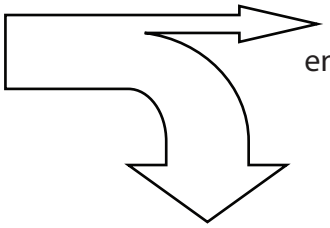
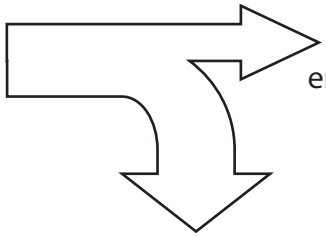
(1)

.....

(b) Many appliances are sold with an energy efficiency rating.

A-rated appliances are the most energy efficient.

Here is some information about two types of electric lamp.

	halogen lamp	compact fluorescent lamp (CFL)
energy efficiency rating	B	A
energy transfer diagrams (not drawn to scale)	energy transfer in one second electrical energy = 20 J  light energy = 2 J	energy transfer in one second electrical energy = 20 J  light energy = 8 J

(i) Calculate how much energy is wasted in one second by the compact fluorescent lamp (CFL).

(1)

energy wasted = ... J

(ii) Use the energy transfer diagrams to explain why the CFL lamp has a better efficiency rating than the halogen lamp.

(2)

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.....

(c) The photograph shows an electric heater used to warm garages.

When the heater is switched on, it quickly warms up and then stays at a constant temperature.

Explain why the heater stays at a constant temperature.

(2)

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.....

(Total for Question 2 = 9 marks)

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Electromagnetic radiation

3 Some students repeat Herschel's experiment.

(a) They place four identical thermometers, **P**, **Q**, **R** and **S**, in the shade.

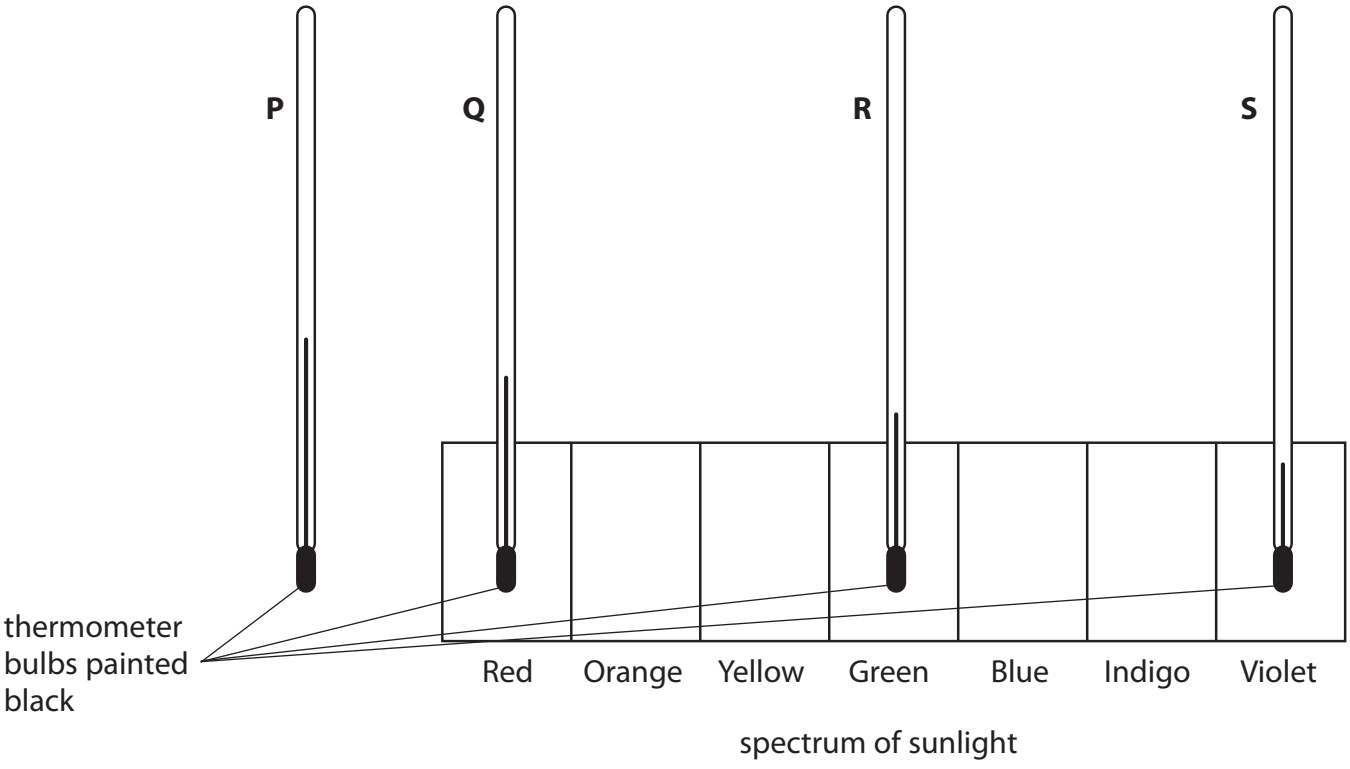
The table shows some of the readings on the thermometers in the shade.

Complete the table to show the reading on thermometer **Q**.

(1)

	thermometers in the shade			
	P	**Q**	**R**	**S**
temperature / °C	18		18	18

(b) Then the four thermometers are placed in the spectrum of sunlight as shown.



(i) The bulbs of the thermometers are painted black.

State why the bulbs of the thermometers are painted black.

(1)

.....

.....

(ii) The table shows the readings on the thermometers in the spectrum of sunlight.

	thermometers in the spectrum of sunlight			
	P	**Q**	**R**	**S**
temperature / °C	25	23	21	20

Describe conclusions that can be made from the students' results.

(2)

.....

.....

.....

.....

(iii) State why the students put the four thermometers together in the shade before placing them in the spectrum of sunlight.

(1)

.....

.....

(c) Another scientist, Ritter, discovered ultraviolet radiation.

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

Too much exposure to ultraviolet radiation may cause

(1)

☒ **A** deafness

☒ **B** heating of internal body cells

☒ **C** damage to the eyes

☒ **D** damage to the bone cells

(ii) Three signals, ultraviolet, visible light and infrared, are sent from the surface of the Moon to an orbiting spacecraft.

The three signals are sent at the same time.

Which of these is correct for the signals arriving at the spacecraft?

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

(1)

☒ **A** the visible light signal arrives first

☒ **B** the ultraviolet signal arrives first

☒ **C** the infrared signal arrives first

☒ **D** all three signals arrive at the same time

(iii) Describe **one** use of ultraviolet radiation.

(2)

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(Total for Question 3 = 9 marks)

Using sound waves

4 (a) Dolphins emit sounds at many different frequencies.

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

A dolphin can produce sounds with a frequency of more than 20 kHz.

These sounds are called

(1)

☒ **A** infrasound waves

☒ **B** microwaves

☒ **C** supersonic waves

☒ **D** ultrasound waves

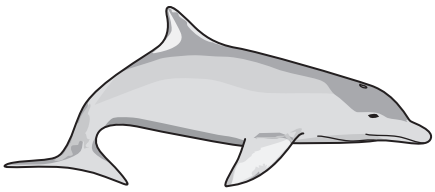
(ii) A dolphin is near to a group of fish.

Describe how a dolphin uses high frequency sound to locate the position of the fish.

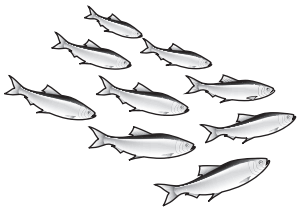
You may add to the diagram to help with your answer.

(3)

DOLPHIN

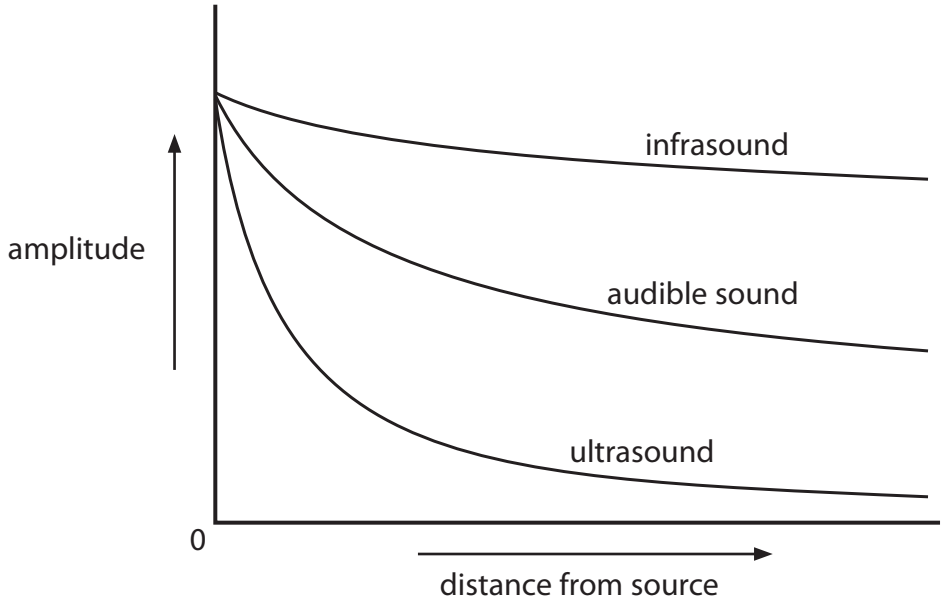


FISH



(b) As a sound wave travels through water its amplitude gets smaller.

This graph shows how the amplitude of different types of sound waves decreases as they travel through water.



Whales use sound to communicate over long distances.

Explain which is the best type of sound wave for whales to use when communicating over long distances.

(2)

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(c) Geologists use sound waves from a small explosion to search for oil underground.

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

(i) These sound waves are called

(1)

☒ **A** cosmic waves

☒ **B** seismic waves

☒ **C** volcanic waves

☒ **D** tectonic waves

(ii) A small explosion is triggered at the Earth's surface.
The waves reflect back from the top of the oil field.

Suggest why the waves are reflected from the oil field.

(1)

.....

(d) A wave has a frequency of 15 Hz.
Its wavelength is 125 m.

Calculate the speed of the wave.

State the unit.

(3)

speed of wave = ...

unit =.....

(Total for Question 4 = 11 marks)

Investigating the Universe

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

Which of these is the biggest?

(1)

☒ **A** the Solar System

☒ **B** a galaxy

☒ **C** a nebula

☒ **D** the Universe

(b) These are four stages in the evolution of a star similar to the Sun.

They are **not** in the correct order.

1. main sequence star
2. white dwarf
3. red giant
4. nebula

Write down the stages in the correct order.

(2)

The first stage has been done for you.

nebula

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(c) (i) The chart shows the electromagnetic (EM) spectrum.
Some parts of the spectrum have been labelled.

radio	**P**	**Q**	visible light	**R**	**S**	gamma rays

State the name of part **Q**.

(1)

.....

(ii) Three telescopes using different parts of the spectrum have been added to the chart.

radio	**P**	**Q**	visible light	**R**	**S**	gamma rays
Jodrell Bank			Hubble			Compton

Jodrell Bank is located near Manchester, whereas Hubble and Compton are in space.

Explain why some telescopes are located outside the Earth's atmosphere.

(2)

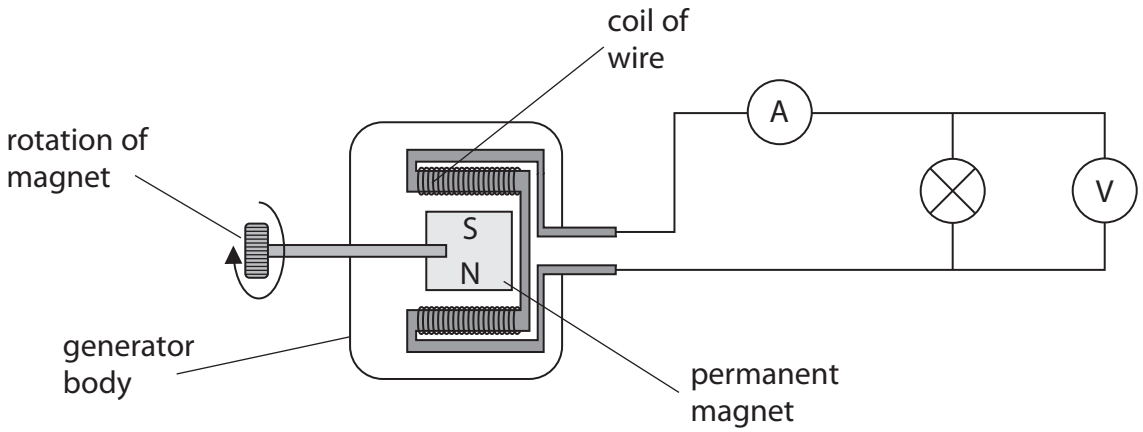
*(d) Describe how modern telescopes have contributed to our understanding of the Universe.

(6)

(Total for Question 5 = 12 marks)

The generation of electricity

6 (a) The diagram shows a simple generator connected to a lamp.



The magnet is made to spin at a steady speed.
The ammeter gives a reading of 1.5 A.
The voltmeter gives a reading of 6 V.

(i) Calculate the output power of the generator.

(2)

output power = ... W

(ii) State two changes to the design of the generator that would give a larger output power for the same speed of rotation.

(2)

1 .....

2 .....

(iii) This generator supplies an alternating current (AC) to the lamp.
Other types of generators supply a direct current (DC).
Describe the difference between charge movement in a direct current and in an alternating current.

(2)

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*(b) The first public power station was built in the centre of New York.

It used generators to supply direct current at 110 V. The cables had to go underground and they could only supply nearby shops and offices.

The electricity was mainly used for electric light.

The development of alternating current generators led to major changes in the way electricity is transmitted and used.

Compare the modern National Grid system with the early system in New York.

(6)

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(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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