EDEXCEL GCSE PHYSICS

PHYSICS



EXAM QUESTION PACK

UNIT P1 FOUNDATION TIER 5PH1F PAPERS

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Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Physics/Science

Unit P1: Universal Physics

Foundation Tier

Wednesday 24 January 2018 – 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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 5 7 5 8 4 A 0 1 2 0

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

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Questions begin on next page.

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) The chart shows the electromagnetic spectrum.

Most of the parts have been labelled.

gamma rays		ultraviolet	visible light		microwaves	radio waves

(i) Use words from the box to complete the chart.

(2)

infrared	infrasound	seismic waves	ultrasound	X-rays

(ii) State which of the seven parts of the electromagnetic spectrum has the highest frequency.

(1)

.....

(b) A special ink cannot be seen when visible light shines on it.

The ink glows when ultraviolet radiation shines on it.

Describe how this ink could be used.

(2)

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

One harmful effect of microwave radiation is

(1)

☒ **A** burning of the skin

☒ **B** internal heating of body cells

☒ **C** mutation of cells in the body

☒ **D** skin cancer

(d) Describe **one** use of gamma radiation.

(2)

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(Total for Question 1 = 8 marks)

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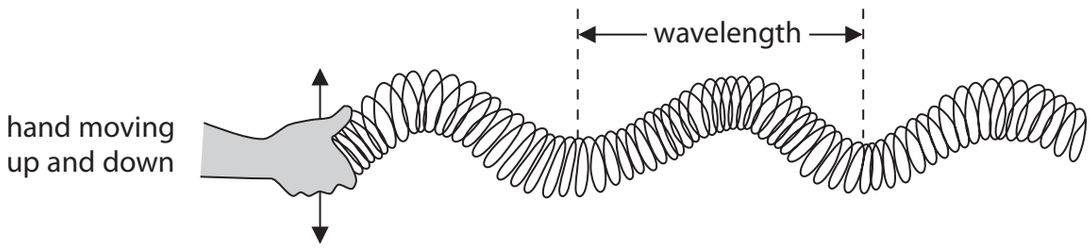
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Waves and rays

2 (a) Light travels through space as a wave.

A model of this type of wave can be made using a Slinky spring.

A Slinky spring is a long coil of wire like the one shown in the diagram.



(i) State the name of this type of wave.

(1)

.....

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

The amplitude of this wave can be made bigger by moving the hand up and down

(1)

☒ **A** by a bigger distance

☒ **B** by a smaller distance

☒ **C** at a faster rate

☒ **D** at a slower rate

(iii) The wave shown in the diagram has a wavelength of 0.71 m and the frequency is 3.2 Hz.

Calculate the speed of the wave.

(2)

speed of the wave = ... m/s

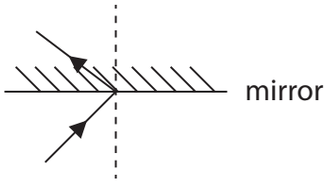
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(b) Mirrors and lenses can be used in telescopes.

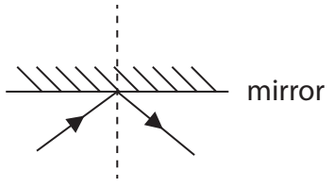
(i) Which diagram best shows what happens to a ray of light when it hits a plane mirror?

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

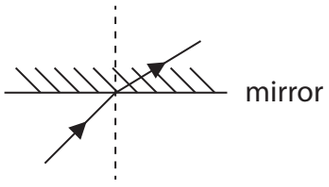
(1)



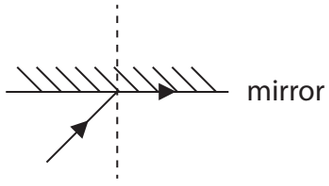
☒ **A**



☒ **B**



☒ **C**

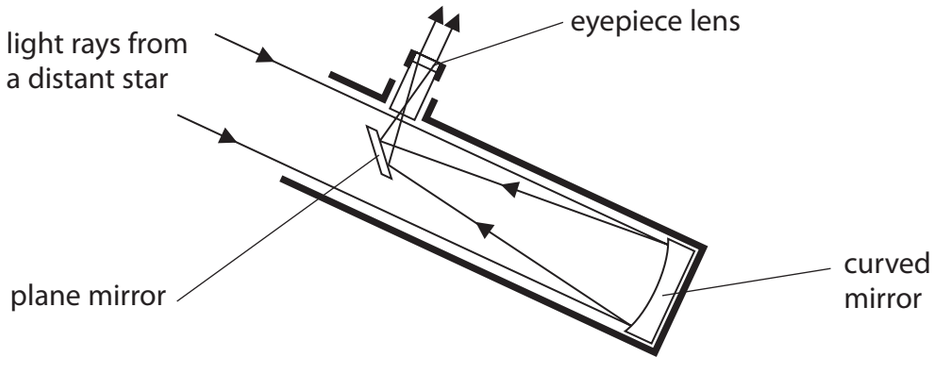


☒ **D**

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(ii) The diagram shows light rays in a reflecting telescope.



The telescope is forming an image of a distant star.

Describe what the mirrors and the eyepiece lens do to the light rays from the distant star.

(3)

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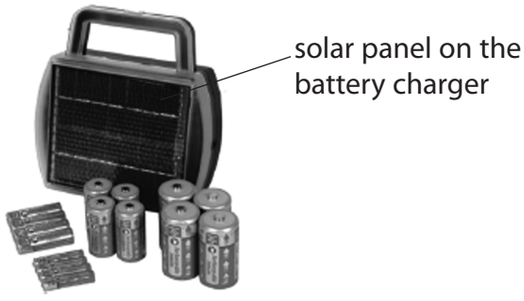
(Total for Question 2 = 8 marks)

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Energy

3 A student uses a solar-powered battery charger to charge some batteries.



(a) Use words from the box to complete the following sentences.

(2)

chemical	kinetic	sound	the mains	the Sun

(i) The source of energy for the battery charger is ..... .

(ii) Energy is stored in the batteries as ..... energy.

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(b) The diagram shows the energy transferred by the battery charger in one second.

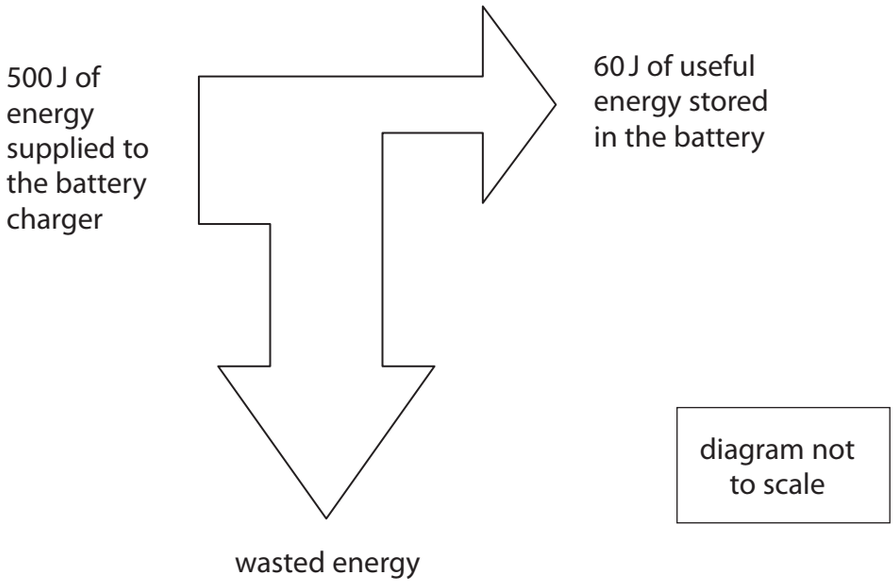


diagram not to scale

(i) Calculate the amount of wasted energy.

(1)

wasted energy = ... J

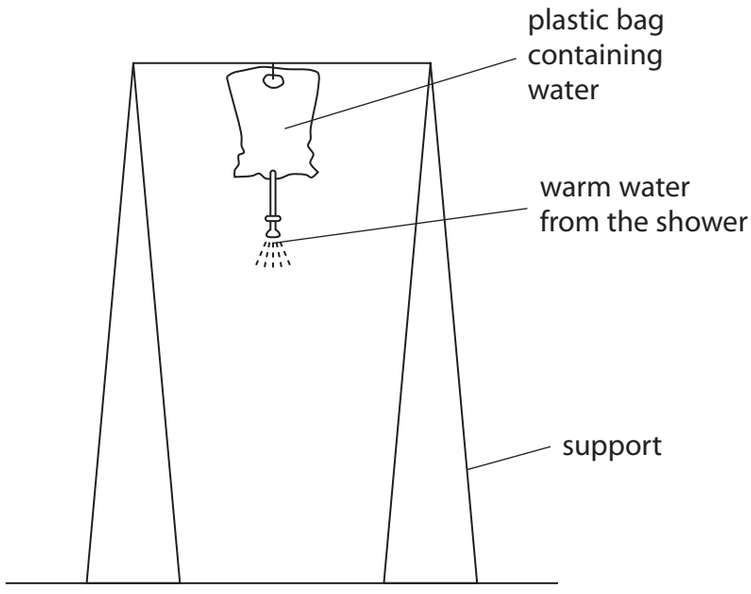
(ii) Calculate the efficiency of the battery charger.

(2)

efficiency of the battery charger .....

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(c) The diagram shows a solar-powered shower.



The bag is in bright sunlight during the day.

(i) Explain what colour the bag should be to heat the water to the highest temperature.

(2)

(ii) Early on a sunny day, the water in the bag is cold.

Explain why the temperature of the water increases during the morning and then stays constant.

(3)

(Total for Question 3 = 10 marks)

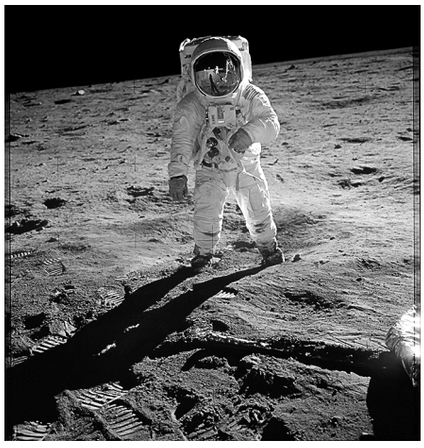
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Space

4 (a) The photograph is taken from a manned mission to the Moon.



(Source © NASA)

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

People have walked on the Moon but have not yet walked on Mars.
One of the reasons is because

(1)

☒ **A** Mars is nearer to the Earth than the Moon is

☒ **B** Mars is nearer to the Sun than the Moon is

☒ **C** Mars is further from the Earth than the Moon is

☒ **D** Mars is further from the Sun than the Moon is

(b) Which of these is the smallest?

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

(1)

☒ **A** the Milky Way galaxy

☒ **B** the Moon

☒ **C** the Sun

☒ **D** the Universe

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(c) Scientists have looked for evidence of water on the Moon.

Suggest why the scientists have done this.

(1)

.....

.....

(d) Light takes 1.3 s to get from the Moon to the Earth.
The speed of light is 300 000 km/s.

Calculate the distance between the Moon and the Earth.
State the unit.
Use the equation

distance = speed × time

(3)

distance = ... unit .....

(e) Some telescopes are now located in space.

Explain why some telescopes are deliberately located in space.

(2)

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(f) A nebula is a cloud of gas and dust.

A star forms when gas and dust in a nebula come together to form a hot object.

Explain why the gas and dust come together and why the object formed is hot.

(2)

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(Total for Question 4 = 10 marks)

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Electricity

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

An electric current is the rate of flow of

(1)

☒ **A** atoms

☒ **B** charge

☒ **C** molecules

☒ **D** voltage

(b) An electric heater is connected to a mains voltage of 230 V.

The current in the heater is 9.2 A.

Calculate the power.

(2)

power = ... W

(c) The power supplied to a desktop computer is 350 W.

The cost of 1 kW h of electricity is 20 p.

Calculate the cost of using the computer for 4 hours.

(3)

cost of using the computer for 4 hours = ... p

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*(d) The diagrams give some information about an LED lamp and a filament lamp.

The two different lamps give out the same amount of light.





LED lamp
cost = £3.00
power = 9W
lifetime = 15000 hours
useful output energy is 25J for every 100J of input energy

filament lamp
cost = £0.60
power = 60W
lifetime = 1000 hours
useful output energy is 5J for every 100J of input energy

Using the information above, compare the advantages and disadvantages of each type of lamp.

(6)

(Total for Question 5 = 12 marks)

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Waves in action

6 (a) P-waves and S-waves are seismic (earthquake) waves.

The table has six statements about P-waves and S-waves.

Put a tick (✓) in the box next to the three correct statements.

(2)

statement	(✓)
P-waves are transverse waves	
S-waves are transverse waves	
P-waves travel faster than S-waves in the Earth's crust	
S-waves travel faster than P-waves in the Earth's crust	
P-waves can travel through the liquid core of the Earth	
S-waves can travel through the liquid core of the Earth	

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

The frequency of ultrasound is

(1)

☒ **A** more than 20 000 Hz

☒ **B** between 2000 Hz and 20 000 Hz

☒ **C** between 20 Hz and 2000 Hz

☒ **D** less than 20 Hz

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(c) Describe how bats use ultrasound to locate their prey.

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

(3)



bat



moth (prey)

Question 6 continues on page 20

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*(d) Ultrasound and X-rays are used for medical scans.

Compare and contrast the use of ultrasound and X-rays for medical scans.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

January 2018

Pearson Edexcel GCSE
In Physics (5PH1F)
Paper 01

edexcel

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Acceptable answers	Marks
1 (a) (i)	X-rays (1) infrared (1) in this order	2 marks if both correct in this order 1 mark if one correct in the right place 1 mark if order is 'infrared' 'X-rays'	(2)

Question number	Answer	Acceptable answers	Marks
1 (a) (ii)	gamma (rays)	symbol for gamma (Y)	(1)

Question number	Answer	Acceptable answers	Marks
1 (b)	A description including **one** of the following **pairs** • on items (1) • assist in identification (if stolen) (1) • on document/currency (1) • help to identify forgery (1) • write (on paper) (1) • secret message (1) • stamp / on (back of) hand (1) • as pass-out at an event (1)	 • named item • to identify (owner) • banknotes eq • (to identify) genuine notes/forgeries • (print on) t-shirt • shows up in club allow other correct examples allow to detect UV (radiation) for 1 mark	(2)

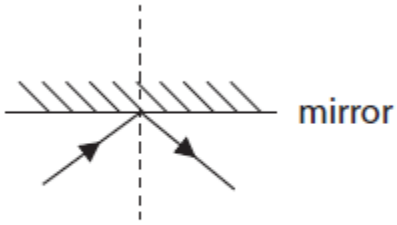
Question number	Answer	Acceptable answers	Marks
1 (c)	**B** internal heating of body cells		(1)

Question number	Answer	Acceptable answers	Marks
1 (d)	A description including **one** of the following pairs • treating/killing (1) • cancer (1) • detecting (1) • cancer (1) • tracing leaks (1) • in pipes (1)	radiotherapy scores 2 marks any other suitable examples e.g. exploring space (using a)gamma telescope	(2)

Question number	Answer	Acceptable answers	Marks
2 (a) (i)	transverse (wave)	accept reasonable spellings of transverse	(1)

Question number	Answer	Acceptable answers	Marks
2 (a) (ii)	**A** a bigger distance		(1)

Question number	Answer	Acceptable answers	Marks
2 (a) (iii)	substitution (1) 3.2 x 0.71 evaluation (1) 2.3 (m/s)	 allow answers that round to 2.3 e.g. 2.272 award full marks for the correct answer without working.	(2)

Question number	Answer	Acceptable answers	Marks
2 (b) (i)	 ☒ **B**		(1)

Question number	Answer	Acceptable answers	Marks
2 (b) (ii)	A description including **three** of the following points • reflection (of light) at (either) mirror (1) • the curved mirror focuses (the light) (1) • (mirror) inverts (1) • {lens / eyepiece} magnifies (image) (1) • image is formed where the light rays cross (1)	 bounces for reflects the curved mirror gives the image flips it over/turns it over/changes the direction (of light) {lens/eyepiece} refracts light virtual image formed by <u>lens</u> real image inside telescope Accept for 1 mark if no other mark awarded: (Telescope) reflects **AND** refracts light (1)	(3)

Question number	Answer	Acceptable answers	Marks
3 (a) (i)	the Sun		(1)

Question number	Answer	Acceptable answers	Marks
3 (a) (ii)	chemical		(1)

Question number	Answer	Acceptable answers	Marks
3 (b) (i)	440 (J)	500 - 60	(1)

Question number	Answer	Acceptable answers	Marks
3 (b) (ii)	Substitution (1) 60 ÷ 500 or 60 x 100 (%) 500 Evaluation (1) 0.12 or 12 (%)	 allow 0.88 or 88% for 1 mark only award full marks for the correct answer without working.	(2)

Question number	Answer	Acceptable answers	Marks
3 (c) (i)	An explanation linking the following points: black (1) (because) (good) absorber (of thermal radiation) (1)	 {absorbs / takes in} heat radiation **ignore** references to: attract good emitter of light dark / darker	(2)

Question number	Answer	Acceptable answers	Marks
3 (c) (ii)	an explanation linking any **three** of the following points: • (bag / water) absorbs {thermal energy / heat /radiation} (1) • (bag / water) {radiates /emits/loses} {thermal energy /heat / radiation} (1) • more heat radiated at higher temperature (1) • input and output are balanced (at steady temperature) (1)	idea of more heat lost (to surroundings) at higher temperature (at constant temp) "absorbing heat at same (rate) as radiating heat" (2 marks)) **ignore** (sun) light / rays	(3)

Question number	Answer	Acceptable answers	Marks
4 (a)	**C** Mars is further from the Earth than the Moon is		(1)

Question number	Answer	Acceptable answers	Marks
4 (b)	**B** the Moon		(1)

Question number	Answer	Acceptable answers	Marks
4 (c)	reference to the connection between water and life	water is needed for life see if we could live there could sustain life water gives possibility of life	(1)

Question number	Answer	Acceptable answers	Marks
4 (d)	substitution (1) 300 000 × 1.3 evaluation (1) 39(0 000) unit (1) km	Ignore powers of ten until the final mark e.g. 3.9 with wrong unit scores 2 marks unit consistent with answer award 2 marks for the correct numerical answer without working.	(3)

Question number	Answer	Acceptable answers	Marks
4 (e)	An explanation linking any two from • (telescope {above / out of}) {atmosphere/air} (1) • dust/clouds/obstructions etc (in atmosphere) (1) • no light pollution in space (1) • can detect a wider range of EM radiation (1)		(2)

Question number	Answer	Acceptable answers	Marks
4 (f)	An explanation linking the following • (pulled together by) gravity (1) • (transferring) {potential /kinetic} energy to {thermal/heat/kinetic} (1)	collisions create friction (not 'friction' by itself) friction produces {thermal/heat} (very) high pressure produced	(2)

Question number	Answer	Acceptable answers	Marks
5 (a)	**B** charge		(1)

Question number	Answer	Acceptable answers	Marks
5 (b)	substitution (1) 230 × 9.2 evaluation (1) 2100 (W)	 numbers that round to 2100 e.g. 2116, 2120 award full marks for the correct answer without working.	(2)

Question number	Answer	Acceptable answers	Marks
5 (c)	 Conversion (1) 0.35 (kW) Substitution (1) 0.35 x 4 x 20 (p) Evaluation (1) 28 (p)	 28(p) or £0.28 (3 marks) 28,000(p) or £280 (2 marks) 2.8 to any other power of 10 (1 mark) award 1 mark for any power x any time x a cost e.g. 3500 x 4 x 20 evaluated incorrectly scores 1 award full marks for the correct answer without working.	(3)

<table>
<tr><th colspan="2">Question Number</th><th>Indicative Content</th><th>Mark</th></tr>
<tr><td>QWC</td><td>*5(d)</td><td>A comparison including some of the following points

LED lamp
Advantages
• saves energy / more efficient
• cost efficient
• lasts longer
• lower power (needed)
• less fossil fuels burnt
• cool to touch
• efficiency 25 %
• lasts 14000 hours longer
• lasts 15 times longer

Disadvantages
• higher initial cost
• costs 5 times as much
• costs £2.40 more

filament lamp
Disadvantages
• wastes more energy
• less efficient
• shorter lifetime
• higher power (needed)
• more fossil fuels burnt
• gets hot
• wastes 95% of energy supplied
• uses (about) 7 times as much power

Advantages
• costs less to buy

LED lamp
cost = £3.00
power = 9 W
lifetime = 15 000 hours
useful output energy is 25 J for every 100 J of input energy

filament lamp
cost = £0.60
power = 60 W
lifetime = 1 000 hours
useful output energy is 5 J for every 100 J of input energy</td><td>(6)</td></tr>
<tr><td>Level</td><td>0</td><td colspan="2">No rewardable content</td></tr>
<tr><td>1</td><td>1 - 2</td><td colspan="2">• A limited comparison of one advantage or one disadvantage
e.g. LED lamps last a long time/ filament lamps get very hot
OR
A correct value quoted from information with no comparison
• the answer communicates ideas using simple language and uses limited scientific terminology
• spelling, punctuation and grammar are used with limited accuracy</td></tr>
</table>

2	**3 - 4**	• A simple comparison of two different advantages / disadvantages e.g. LED lamps cost more but last longer / filament lamps have a short life time and use more power **OR** Correct values quoted from table and used to provide two comparisons without calculations… • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	**5 - 6**	• A detailed comparison of two different advantages / disadvantages using **at least one quantitative** comparison. e.g. energy saving lamps cost 5 times more but last 10 times longer. / Energy saving lamps produce 4 times as much light energy for every 100J of electrical energy supplied and are much more efficient. / Energy saving lamps last 9,000 hours longer than and they use less power. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

<table>
<tr><th>Question number</th><th>Answer</th><th>Acceptable answers</th><th>Marks</th></tr>
<tr><td>6 (a)</td><td>
<table>
<tr><th>statement</th><th>(✓)</th></tr>
<tr><td>P-waves are transverse waves</td><td></td></tr>
<tr><td>S-waves are transverse waves</td><td>✓</td></tr>
<tr><td>P-waves travel faster than S-waves in the Earth's crust</td><td>✓</td></tr>
<tr><td>S-waves travel faster than P-waves in the Earth's crust</td><td></td></tr>
<tr><td>P-waves can travel through the liquid core of the Earth</td><td>✓</td></tr>
<tr><td>S-waves can travel through the liquid core of the Earth</td><td></td></tr>
</table>
</td><td>all three correct
(2 marks)

two correct
(1 mark)

one correct
(zero marks)

four boxes ticked
(maximum 1 mark)

more than four boxes ticked
(zero marks)</td><td>(2)</td></tr>
</table>

Question number	Answer	Acceptable answers	Marks
6 (b)	**A** more than 20 000 Hz		(1)

Question number	Answer	Acceptable answers	Marks
6 (c)	A description including **three** of the following: • (bats) emits /sends /makes (ultra)sound /it / signal/wave(1) •signal/wave/(ultra)sound reflects /bounces(back)/ rebounds (off moth/prey) (1) • bat's (ears) detect **reflected** (ultra)sound (1) • reflection is used to estimate distance (to moth) (1)	On diagram idea of something emitted e.g. line (with arrow) from anywhere on /near bat or outgoing waves On diagram idea of something reflected e.g. line with arrow from anywhere on/near moth or reflected waves (from moth) idea of reflection detected e.g. bat hears the reflected (ultra)sound/wave/signal idea of bat analyses data e.g. bat times how long (it takes) for reflected wave to get back **Ignore** idea that it listens for noises from prey	(3)

Question Number		Indicative Content	Mark
QWC	***6(d)**	A description linking some of the following: • ultrasound does not cause damage to (healthy) cells / ORA • idea of real-time image with ultrasound • ultrasound uses non-ionising radiation • idea that (consultant) can change image position during ultrasound scan • 3D image possible with ultrasound • ultrasound safer for consultant • ultrasound machines more portable ultrasound can be used to measure blood flow rates • ultrasound gives detail of soft tissue • X-rays are more suitable for bony structures • X-rays produce higher resolution images X- rays are more suitable for parts of body containing gas • (lungs, intestines) This list is not exhaustive. Give credit for other plausible suggestions	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited description with no comparison or contrast ie describes a use/fact about ultrasound OR X-rays eg Ultrasound can be used to look at a fetus (unborn child) • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple description giving some attempt at comparison or contrast ie describes a use of ultrasound AND X-rays eg Ultrasound can be used to look at a fetus (but) X-rays are used to detect broken bones OR Ultrasound can be used to look at a fetus because it's safer (than X-rays) • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed description with clear comparison and/or contrast ie describes a use of ultrasound AND X-rays, one of which is detailed, AND a clear comparison Ultrasound can be used to monitor a fetus. In ultrasound the waves reflect off soft tissue. X-rays (are used to look at bones because they) are absorbed by bones OR Ultrasound can be used to monitor a fetus. In ultrasound the waves reflect off soft tissue. X-rays are used to look at bones but not used for fetus because they can damage DNA/cause mutations of cells • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

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Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Physics/Science

Unit P1: Universal Physics

Foundation Tier

Wednesday 24 May 2017 – 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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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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

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

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

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Questions begin on next page.

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) (i) Waves on the surface of water are transverse waves.

State one other example of a transverse wave.

(1)

.....

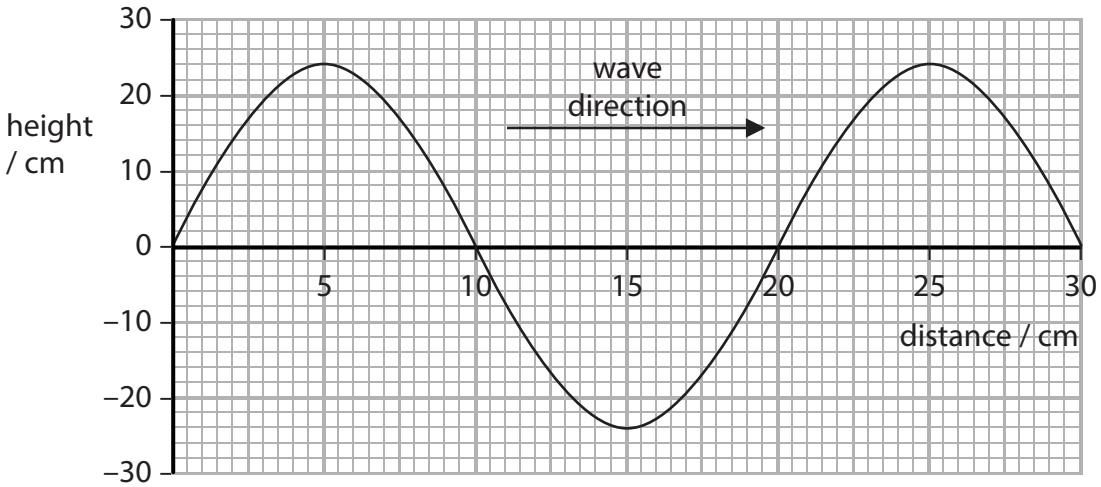
(ii) Sound waves are longitudinal waves.

State one other example of a longitudinal wave.

(1)

.....

(b) The graph shows a water wave.



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

(1)

The amplitude of the wave is

☒ **A** 10 cm

☒ **B** 20 cm

☒ **C** 24 cm

☒ **D** 48 cm

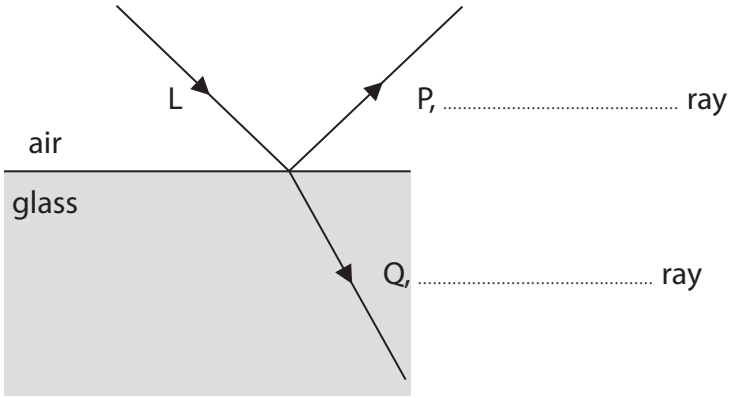
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(c) The diagram shows a ray of light, L, incident on a boundary between air and glass.

This becomes two rays P and Q.



Use words from the box to complete the labels on the diagram.

incident	magnified	normal	reflected	refracted

(2)

(d) A sound wave in a solid has a frequency of 1100 Hz.

The wavelength of this sound wave is 3.0 m.

Calculate the speed of this sound wave.

State the unit.

(3)

speed = ... unit .....

(Total for Question 1 = 8 marks)

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Earthquakes

2 (a) Which row of the table is correct for a seismic S-wave?

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

(1)

	electromagnetic	transverse
☒ **A**	no	no
☒ **B**	yes	yes
☒ **C**	yes	no
☒ **D**	no	yes

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

(1)

Earthquakes occur between a plate in the crust and a second plate

☒ **A** in the crust

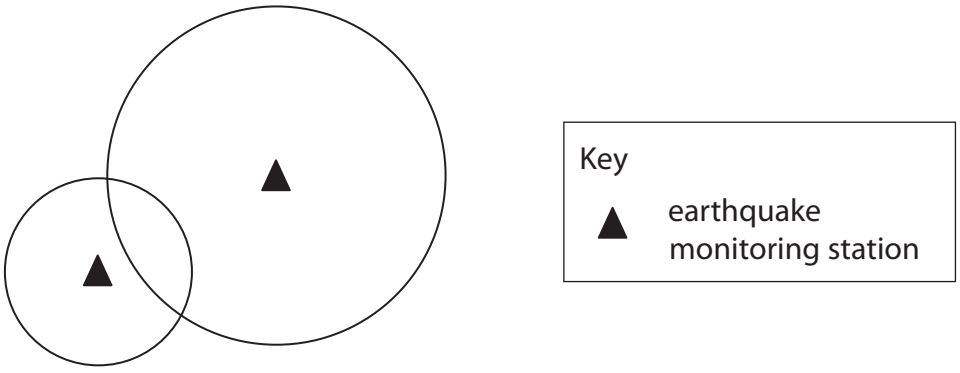
☒ **B** in the inner core

☒ **C** in the mantle

☒ **D** in the outer core

(c) The diagram shows circles drawn around two earthquake monitoring stations.

The circles indicate the distances of an earthquake from each station.



Explain why this is not enough to locate exactly the position of an earthquake.

(2)

.....

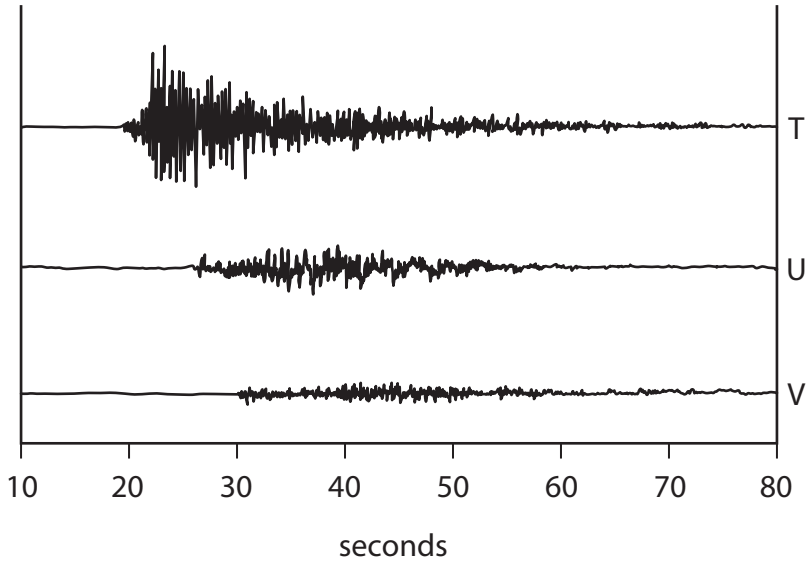
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(d) The diagram shows the different traces that the same earthquake produces on seismometers at three different towns T, U and V.



Suggest **two** pieces of evidence that show the towns are at different distances from where the earthquake happened.

(2)

1 .....

.....

2 .....

.....

(e) Explain why scientists find it difficult to predict when a tsunami wave will occur.

(2)

.....

.....

.....

.....

(Total for Question 2 = 8 marks)

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Electricity

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

(1)

The unit of potential difference is the

☒ **A** amp

☒ **B** joule

☒ **C** volt

☒ **D** watt

(b) Choose words from the box to complete the sentence.

(3)

current	efficiency	gain	high	loss	low	resistance

Electrical energy is transmitted at ..... voltages,

because it improves the ..... by reducing

heat ..... in the transmission lines.

(c) When a voltage of 12 V is applied to the input coil of a transformer, there is a current of 0.5 A in the input coil.

Calculate the input power of the transformer.

State the unit.

(3)

input power of the transformer = ... unit .....

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(d) A student investigates induced voltage.

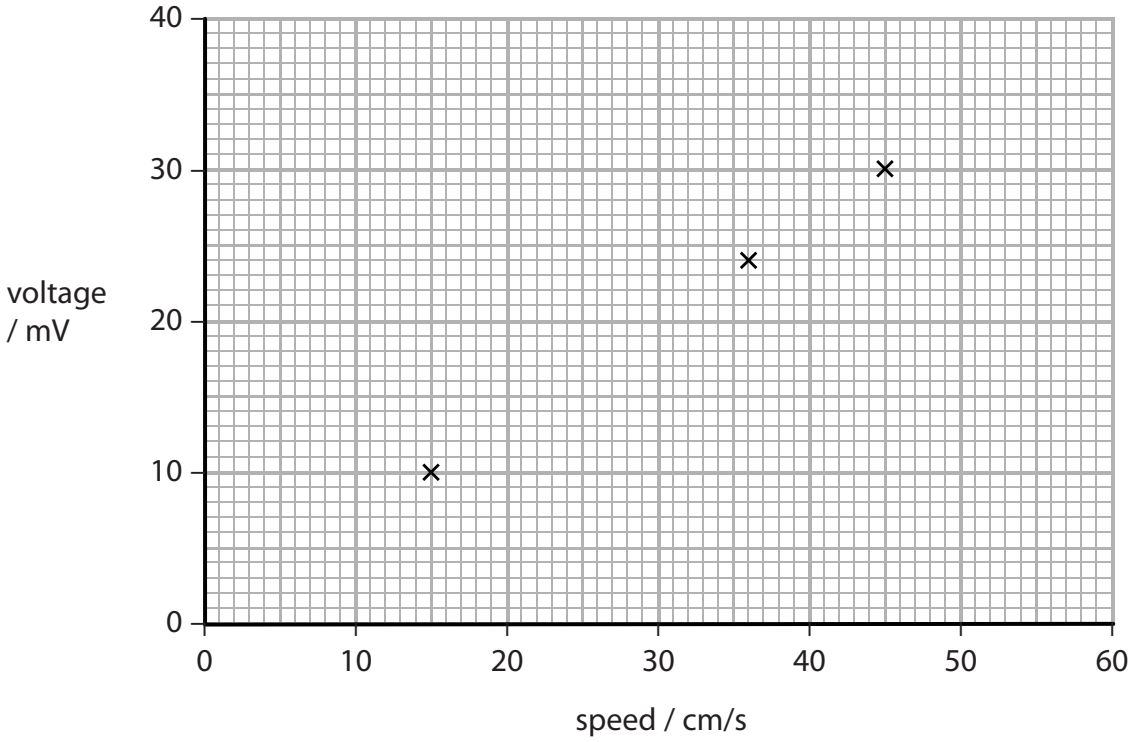
She pushes a magnet into a coil at different speeds.

She puts some of her results on a graph.

(i) When the speed of the magnet is 6 cm/s, the induced voltage is 4 mV.

Plot this value on the graph, marking it with a cross, ×.

(1)



(ii) Draw the line of best fit.

(1)

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

(1)

When the speed of the magnet is 20 cm/s, the induced voltage is about

☒ **A** 6.5 mV

☒ **B** 13 mV

☒ **C** 26 mV

☒ **D** 30 mV

(Total for Question 3 = 10 marks)

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Earth, Pluto and the Sun

4 The table gives some information about the Earth and about Pluto.

	distance from the Sun measured in units of distance
Earth	15.0
Pluto	591

(a) Calculate the shortest distance between Earth and Pluto.

(2)

distance = ... units of distance

(b) In fact the distance between Earth and Pluto is always changing.

Explain why the distance between Earth and Pluto is always changing.

You may draw a diagram to help your answer.

(2)

.....

.....

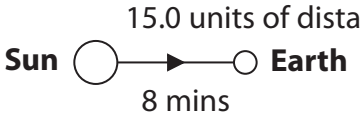
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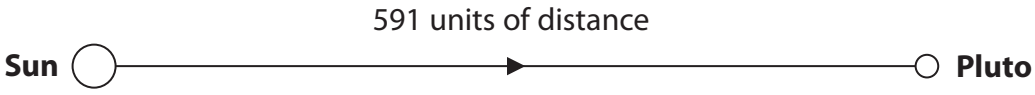
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(c) Light takes 8 minutes to get from the Sun to Earth.

not drawn to scale





Calculate the time it takes for light to get from the Sun to Pluto.

(3)

time taken = ... minutes

(d) The Sun is our nearest star.

Use words from the box to complete the following sentences.

black hole	main sequence star	nebula	red giant
	supernova	white dwarf	

(3)

Our Sun was formed from a collapsing .....

The next stage in the evolution of our Sun is .....

Our Sun will end up as a .....

(Total for Question 4 = 10 marks)

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Electromagnetic waves

5 Visible light and microwaves are both electromagnetic waves.

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

(1)

Electromagnetic waves

☒ **A** all have the same wavelength in a vacuum

☒ **B** all have the same wavelength in glass

☒ **C** all travel at the same speed in a vacuum

☒ **D** all travel at the same speed in glass

(ii) Visible light can be split into colours.

The diagram shows the colours arranged in order of frequency.

Complete the diagram by writing in the four missing colours.

(3)

.....	.....	yellow	.....	blue	indigo	.....

low frequency — high frequency

(iii) Microwaves have many uses.

State **two** uses for microwaves.

(2)

1 .....

.....

2 .....

.....

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*(b) The potential danger of electromagnetic waves increases as the frequency of the waves increases.

Compare the harmful effects of two types of electromagnetic waves on people.

Choose one wave with a lower frequency than visible light and one wave with a higher frequency than visible light.

(6)

(Total for Question 5 = 12 marks)

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Energy transfers

6 (a) (i) A student has a battery-powered torch.

When the lamp in the torch is lit for 10 s, 9 J of energy is transferred in a useful way and 61 J is wasted.

Complete the table to show the amount of each form of energy linked with this torch in 10 s.

(2)

form of energy	amount of energy in 10 s / J
thermal (heat)	
light	
electrical	

(ii) Soon after the torch is switched on, the temperature of the filament in the lamp reaches a steady high temperature.

The filament stays at this high temperature even though electricity is still being supplied to it.

Explain why the temperature of the filament in the lamp remains the same.

(2)

.....

.....

.....

(b) The energy supplied to a machine is 2500 J.

The machine has an efficiency of 20%.

The equation for finding the useful energy transferred by a machine is

$$\frac{\textit{useful energy transferred}}{\textit{by the machine}} = \frac{\textit{total energy supplied}}{\textit{to the machine}} \times \frac{\textit{efficiency of machine}}{100}$$

Calculate the useful energy transferred by this machine.

(2)

useful energy = ... J

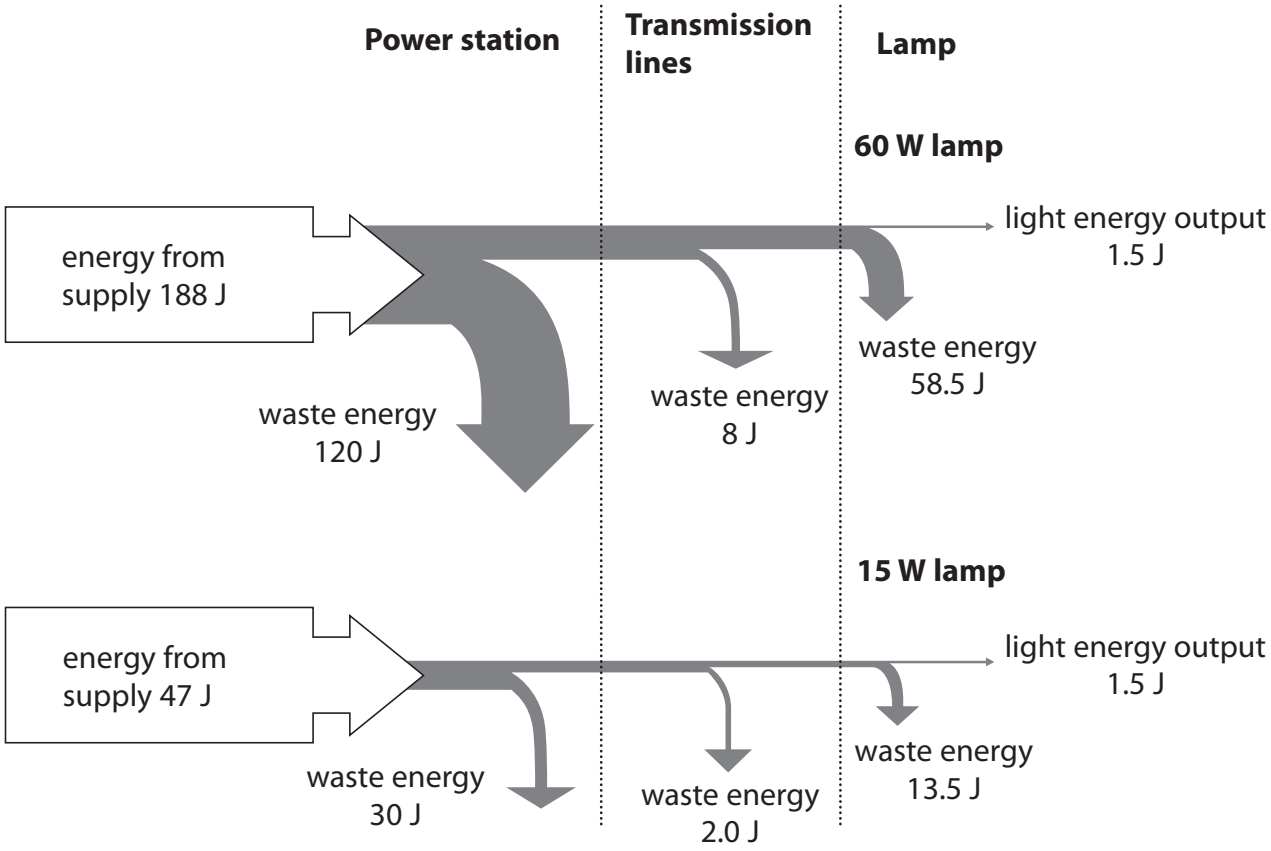
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*(c) A student investigates the energy chains for a 60 W lamp and a 15 W lamp.

The diagram shows the energy chains for each lamp.

Each energy chain starts with the amount of energy supplied to the power station in one second and ends with the light given out by the lamps in one second.

Some of the energy supplied is wasted in the chains.



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One of the lamps is described as an energy-saving lamp.

Explain why using the energy-saving lamp saves energy.

Quote values from the diagram to help your answer.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2017

Pearson Edexcel GCSE

In Physics (5PH1F) Paper 1F

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Summer 2017
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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Acceptable answers	Marks
1 (a)(i)	One from electromagnetic (waves) (1) (seismic) secondary / S (wave) (1)	any named electro-magnetic wave e.g. UV EM mexican wave correct diagram or description (e.g. how to use "slinky") **ignore** unqualified seismic/earthquake **ignore** references to a.c. electricity/CRO traces	**(1)**

Question number	Answer	Acceptable answers	Marks
1 (a)(ii)	One from (seismic) primary / P (wave) (1) ultrasound (1) infrasound (1)	{shock/pressure} waves correct diagram or description (e.g. how to use "slinky") **ignore** unqualified seismic/earthquake (waves)	**(1)**

Question number	Answer	Acceptable answers	Marks
1 (b)	☒ **C** 24 (cm) **The only correct answer is C** **A** is not correct because 10 cm is half the wavelength **B** is not correct because 20 cm is the wavelength **D** is not correct because 48 cm is twice the amplitude		**(1)**

Question number	Answer	Acceptable answers	Marks
1 (c)	Must be in this order P: reflected (1) Q: refracted (1)	 accept reflection, reflecting etc accept refraction, refracting etc **ignore** spelling errors as long as they do not confuse reflected and refracted eg reflacted or refrected score 0 **do not award** for a line if more than one word given on the line	**(2)**

Question number	Answer	Acceptable answers	Marks
1 (d)	substitution (1) 1100 × 3.00 evaluation (1) 3300 unit (1) m/s	award full marks (2) for correct numerical answer without working accept power of 10 error (even without working) for 1 mark **ecf** from MP1 to MP2 as long as working shows multiplication with at least one number correct. m s^{-1}, metres/sec, metres per second **ignore** mps	**(3)**

(Total for Question 1 = 8 marks)

Question number	Answer	Acceptable answers	Marks
2 (a)	☒ D no yes **The only correct answer is D** **A** is not correct because an S wave is transverse **B** is not correct because an S wave is not electromagnetic Outer core **C** is not correct because an S wave is not electromagnetic		**(1)**

Question number	Answer	Acceptable answers	Marks
2 (b)	☒ **A** in the crust **The only correct answer is A** **B** is not correct because there are no plates in the inner core **C** is not correct because there are no plates in the mantle **D** is not correct because there are no plates in the outer core		**(1)**

Question number	Answer	Acceptable answers	Marks
2 (c)	An explanation linking any two of: (circles intersect) in two places (1) (earthquake could be) at either of these (1) three circles/stations are needed (1)	 anywhere in overlap or where circles cross “triangulation” **If no other mark scored,** idea of inaccuracy of *distance measurement* = 1 mark marks can be scored from appropriate annotations on diagram	**(2)**

Question number	Answer	Acceptable answers	Marks
2 (d)	(initial) detection time (is different) (1) (maximum) {amplitude/height/strength} (of the signal is different) (1)	either order starting time / numerical values quoted (i.e. 20, 25, 30) '{hit / strikes} much later' is just sufficient ***ignore*** responses which are ambiguous with respect to the length of time for the signal louder / taller / magnitude / intensity / power / bigger ***ignore*** references to frequency / wavelength	**(2)**

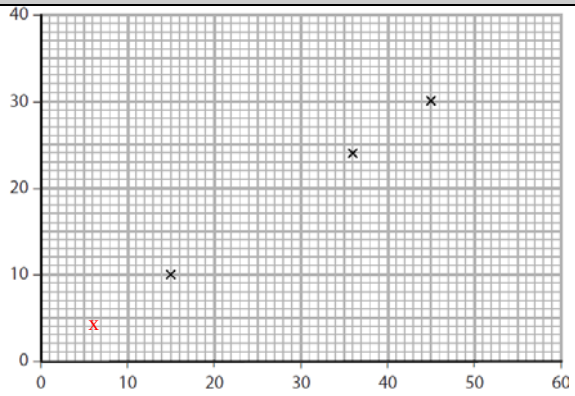
Question number	Answer	Acceptable answers	Marks
2 (e)	An explanation linking any **TWO** of: earthquakes (1) (earthquakes) are difficult to predict (1) {(earthquake) under the water / tsunami {on/in} the water} (1)	 P and S waves / meteorite / rock falls / volcanoes / plate movement difficult to monitor / difficult to get accurate readings random / sudden / unpredictable / can occur at any time ocean / sea for water	**(2)**

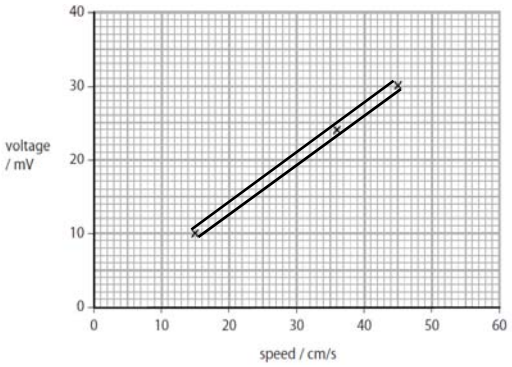
(Total for Question 2 = 8 marks)

Question number	Answer	Acceptable answers	Marks
3 (a)	☒ **C** volt **The only correct answer is C** **A** is not correct because the amp is a unit of current **B** is not correct because the joule is a unit of energy **D** is not correct because the watt is a unit of power		**(1)**

Question number	Answer	Acceptable answers	Marks
3 (b)	**Must** be in this order high (1) efficiency (1) loss (1)	**accept** recognisable misspellings **do not award** for a line if more than one word given on the line	**(3)**

Question number	Answer	Acceptable answers	Marks
3 (c)	substitution (1) 0.5 x 12 evaluation (1) 6 unit (1) W	award full marks (2) for correct numerical answer without working watt joule per second J/s J s^{-1} Joule per second VA AV **ignore** j/s **ignore** jps unit must be compatible with numerical answer IF no numerical answer or working, accept kW etc.	**(3)**

Question number	Answer	Acceptable answers	Marks
3 (d)(i)		**must** be shown with a cross (bod noticeable dot) if a second or more crosses are given, this mark should not be awarded +/- ½ a small square but clearly associated with correct intersection	**(1)**

Question number	Answer	Acceptable answers	Marks
3 (d)(ii)	 line within region shown	straight line – judge by eye passing through top x and bottom marked x somewhere ignore extension to their own marked x	**(1)**

Question number	Answer	Acceptable answers	Marks
3 (d)(iii)	☒ **B** 13 mV **The only correct answer is B** **A** is not correct because 6.5 is not 13 **C** is not correct because 26 is not 13 **D** is not correct because 30 is not 13		**(1)**

(Total for Question 3 = 10 marks)

Question number	Answer	Acceptable answers	Marks
4 (a)	591 – 15.0 (1) 576 (units of distance) (1)	clear indication of subtraction award full marks for correct answer without working	**(2)**

Question number	Answer	Acceptable answers	Marks
4 (b)	Explanation linking any two of: (both) orbiting/moving (around the Sun) (1) at different (orbital) speeds / rates / radii (1) positions relative to Sun changes (1)	 different eccentricities in different (orbital) times different radii and orbits can be shown on a (labelled) diagram to score 2 marks **ignore** expanding universe **ignore** red shift **ignore** rotation / spinning / tilt	**(2)**

Question number	Answer	Acceptable answers	Marks
4 (c)	EITHER 591/15 (1) 8 x 591/15 (1) 315 (mins) (1) OR 15÷8 (1) 591 ÷ 1.875 (1) 315 (mins) (1)	 39.4 accept in range 311 -320 due to possible rounding 1.875 591 x 8 ÷15 accept in range 311 -320 due to possible rounding award full marks for correct answer without working 5.25 hours with unit – 3 marks 5.25 without unit – 2 marks Look out for alternative scaling factors 0.025 and 0.53, which can lead to full marks.	**(3)**

Question number	Answer	Acceptable answers	Marks
4 (d)	Must be in this order nebula (1) red giant (1) white dwarf (1)	accept recognisable misspellings. the names do not score if they are in the incorrect place in the table if more than one word per line, no mark for that line	**(3)**

(Total for Question 4 = 10 marks)

Question number	Answer	Acceptable answers	Marks
5 (a)(i)	☒ **C** all travel at the same speed in a vacuum **The only correct answer is C** **A** is not correct because wavelength in a vacuum can change **B** is not correct because wavelength in glass can change **D** is not correct because speed in glass can be different		**(1)**

Question number	Answer	Acceptable answers	Marks
5 (a)(ii)	red and orange (in this order) (1) green (1) violet (1)	**do not accept** 'purple' for violet **do not award** for a box if more than one word given in the box **accept** recognisable misspellings as long as the meaning is clear (eg violent)	(3)

(RED	**ORANGE) (1)**	yellow	**GREEN (1)**	blue	indigo	**VIOLET (1)**

Question number	Answer	Acceptable answers	Marks
5 (a)(iii)	any two from: cooking (1) (mobile) phones (1) satellite (transmissions) (1)	 heating water / food sterilization 'mobiles' allow communications for either mp2 or mp3 but not both allow any other sensible use e.g. skin treatments/ ablation / radar **ignore** unqualified medical use	**(2)**

Question Number		Indicative Content	Mark
QWC	***5(b) Exp**	A comparison including some of the following points: e.m. waves (from low to high frequency) • radio (waves) • microwaves • infrared • *(light)* • ultraviolet • X-rays • gamma (rays) effects of e.m. waves • radio (waves) no harm to humans / may cause headaches / inconclusive evidence • microwaves internal heating of body cells (**ignore** cancer) • infrared (skin) burns (**ignore** cancer) • ultraviolet eye damage / cause (skin) cancer / sunburn / damage to {cells/tissues} • X-rays mutation or damage to {cells/tissues} / cause cancer • gamma (rays) mutation or damage to {cells/tissues} / cause cancer NOTE: If two effects are given for one wave, one right and one wrong, ignore the incorrect one.	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited comparison giving **two** em waves on opposite sides of light **OR** one wave and {its harmful effect / frequency higher or lower} e.g. infrared and gamma are em waves • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple comparison giving **two** em waves, comparing frequencies **OR** harmful effects **OR** one wave comparing frequencies **AND** harmful effects e.g. infrared and gamma are em waves, infrared has the lower frequency OR Gamma rays are harmful as they mutate cells but radio waves are harmless • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	

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3	**5 - 6**	• a detailed comparison giving **two** appropriate em waves, comparing their frequencies AND their harmful effects e.g. infrared and gamma are em waves, infrared has the lower frequency, infrared causes skin burns, gamma causes cancer • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

(Total for Question 5 = 12 marks)

<table>
<tr><th>Question number</th><th>Answer</th><th>Acceptable answers</th><th>Marks</th></tr>
<tr><td>6 (a)(i)</td><td>61 AND 9 (1)

70 (1)

The numbers must be in the correct box

<table>
<tr><th>type of energy</th><th>amount of energy / J</th></tr>
<tr><td>thermal (heat)</td><td>61</td></tr>
<tr><td>light</td><td>9</td></tr>
<tr><td>electrical</td><td>70</td></tr>
</table>
</td><td>Note: THERE IS ONLY ONE MARK FOR TOP BOX AND MIDDLE BOX TOGETHER</td><td>(2)</td></tr>
</table>

<table>
<tr><th>Question number</th><th>Answer</th><th>Acceptable answers</th><th>Marks</th></tr>
<tr><td>6 (a)(ii)</td><td>An explanation linking

(electrical) energy supplied {equals / is constant} (1)

(to) energy given out (1)</td><td>idea of equilibrium can score 2

stays the same

simple idea of using and losing scores 1

heat given out and taken in are equal is minimum for 2 marks</td><td>(2)</td></tr>
</table>

Question number	Answer	Acceptable answers	Marks
6 (b)	substitution (1) 2500 x 20/100 evaluation (1) 500 (J)	 2500 x 0.2 20% of 2500 accept 2500 x 0.2/100 5 (J) for 2 marks award full marks for the correct answer without working. award 1 mark for a power of 10 error (with or without working)	**(2)**

Question Number		Indicative Content	Mark
QWC	***6(c) Exp**	An explanation including some of the following points: • 15 W lamp is the energy-saving lamp • light energy output for both lamps is 1.5 J • energy is lost/wasted for both lamps in power station, transmission lines and lamp • less energy is lost at each stage for 15 W lamp than 60 W lamp • 15 W lamp wastes 13.5J energy • 60 W lamp wastes 58.5 J • 186.5 J is wasted in producing 1.5 J for 60 W lamp • 45.5 J is wasted in producing 1.5 J for 15 W lamp • energy input of 60 W lamp is 188 J • energy input for 15 W lamp is 47 J	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation quoting any value from chart in the correct context e.g. 8 J is wasted in transmission lines for 60 W lamp **OR** a qualitative statement about an input or an output e.g. one lamp takes in more energy at the power station. • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	a simple explanation linking qualitatively the same output energy from lamp with the input energy at supply or lamps e.g. (so) for the same {useful / light} output less energy is drawn from the supply with the energy-saving lamp **OR** a quantitative link between useful / waste energies, only for lamps e.g. the 15 W lamp wasted only 13.5 W whereas the 60 W lamp wastes 58.5 W e.g. energy outputs of both lamps are 1.5 J **OR** a quantitative link showing the wasted energies from supply to lamp for one lamp. e.g. 186.5J is wasted by the 60W lamp • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation linking stated values of energy output compared to stated values of input, illustrating energy savings. e.g. (so) for the same 1.5 J (or {useful / light} output), less energy, 47 J, is drawn from the supply with 15 W lamp than with 60 W lamp, 188 J.	

		• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

(Total for Question 6 = 12 marks)

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Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Physics/Science

Unit P1: Universal Physics

Foundation Tier

Wednesday 25 May 2016 – 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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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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

$$\text{power} = \frac{\text{work done}}{\text{time taken}} \qquad P = \frac{E}{t}$$

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

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Questions begin on next page.

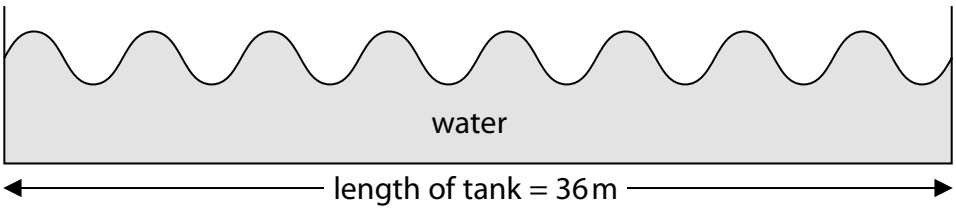
Answer ALL questions.

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 ☒.

Water waves and light

1 (a) Scientists use wave tanks to show the behaviour of waves.

The diagram shows a wave tank from the side.



(i) Calculate the wavelength of the waves.

(1)

wavelength = ... m

(ii) A crest of the wave takes 20 s to travel the whole length of the tank.

Calculate the speed of the wave.

State the unit.

(3)

speed of wave = ... unit = ...

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(b) When light passes through a lens it can change direction.

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

(1)

The change in direction that occurs when light passes through a lens is called

- ☐ **A** inversion
- ☐ **B** magnification
- ☐ **C** reflection
- ☐ **D** refraction

(c) (i) A converging lens is used to form a real image of the Moon on a screen.

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

The image produced by this lens is real because it is

(1)

- ☐ **A** bigger than the object
- ☐ **B** in colour
- ☐ **C** on a screen
- ☐ **D** the right way up

(ii) Describe how to estimate the focal length of a converging lens by using a distant object like the Moon.

(2)

.....

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(Total for Question 1 = 8 marks)

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Radiation

2 This question is about the following radiations

- microwave
- infrared
- ultraviolet
- ultrasound.

(a) One of these radiations is used to scan a fetus.



State which one of these radiations is used to scan a fetus.

(1)

.....

(b) Describe one use of ultraviolet radiation.

(2)

.....

.....

.....

.....

(c) State which one of these radiations is both electromagnetic and has the shortest wavelength.

(1)

.....

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(d) State **two** of these radiations that travel at the same speed as light in a vacuum.

(2)

.....

.....

(e) High frequency electromagnetic radiation is potentially more dangerous to humans than low frequency electromagnetic radiation.

Infrared radiation has a higher frequency than microwave radiation.

However, microwave radiation can be more dangerous to humans than infrared radiation.

Explain why microwave radiation can be more dangerous to humans.

(2)

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(Total for Question 2 = 8 marks)

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Energy

3 The photograph shows a pirate boat in a theme park.



© James Salter 2006

At the bottom of its swing the pirate boat passes over a roller that transfers some energy to the pirate boat.

(a) The photograph shows the pirate boat at the top of its swing.

State the main form of energy that the pirate boat has gained by the time it reaches the top of the swing.

(1)

.....

(b) The roller is powered by an electric motor.
The roller pushes the pirate boat for 2.3 s.
During this time 190 000 J of energy is supplied to the motor.

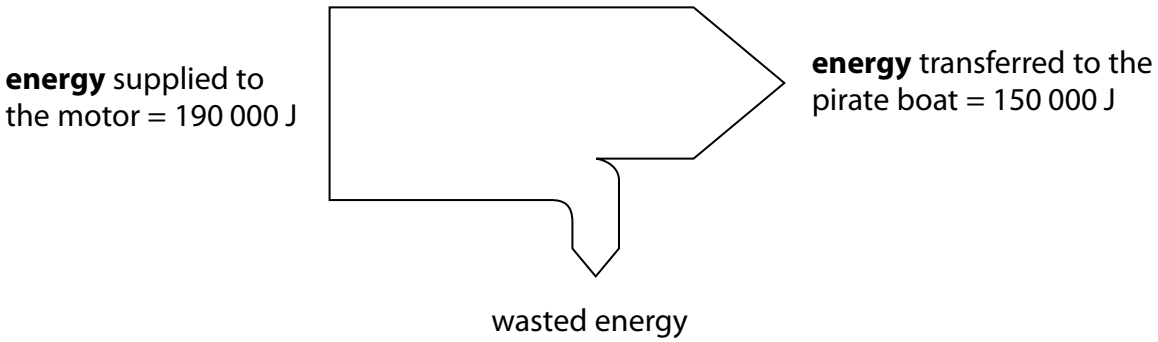
Calculate the power supplied to the electric motor.

(2)

power = ... W

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(c) The diagram shows the energy transferred by the motor in 2.3 s.



(i) Calculate the energy wasted in the 2.3 s.

(1)

wasted energy = ... J

(ii) Calculate the efficiency of the electric motor.

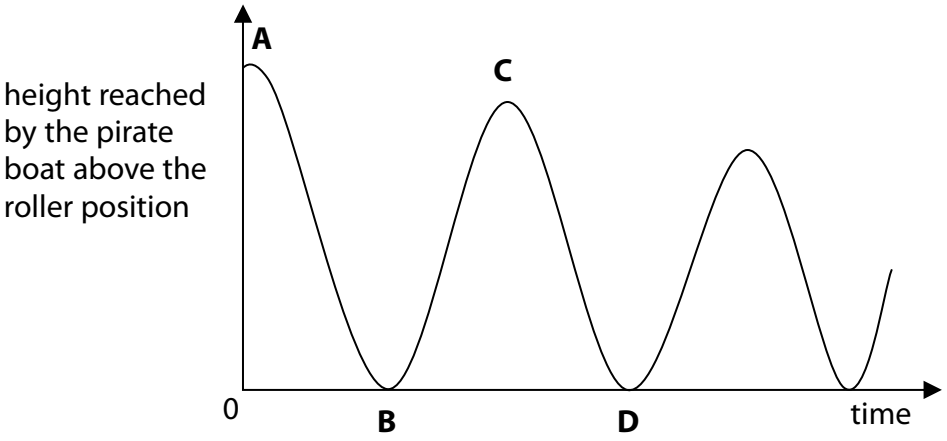
(3)

efficiency = ...

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(d) The roller is lowered and the pirate boat swings freely.

The graph shows how the height reached by the pirate boat changes with time.



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

The pirate boat will have maximum kinetic energy at point

(1)

☐ **A**

☐ **B**

☐ **C**

☐ **D**

(ii) Explain why the maximum height reached by the pirate boat is less at point **C** than at point **A**.

(2)

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.....

(Total for Question 3 = 10 marks)

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The Sun and the Moon

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

The Sun is part of

(1)

- ☐ **A** the Milky Way only
- ☐ **B** the Solar System only
- ☐ **C** the Solar System and the Milky Way only
- ☐ **D** the Milky Way, the Solar System and the Universe

(ii) Which of these has been used for exploration of the Moon but not Mars?

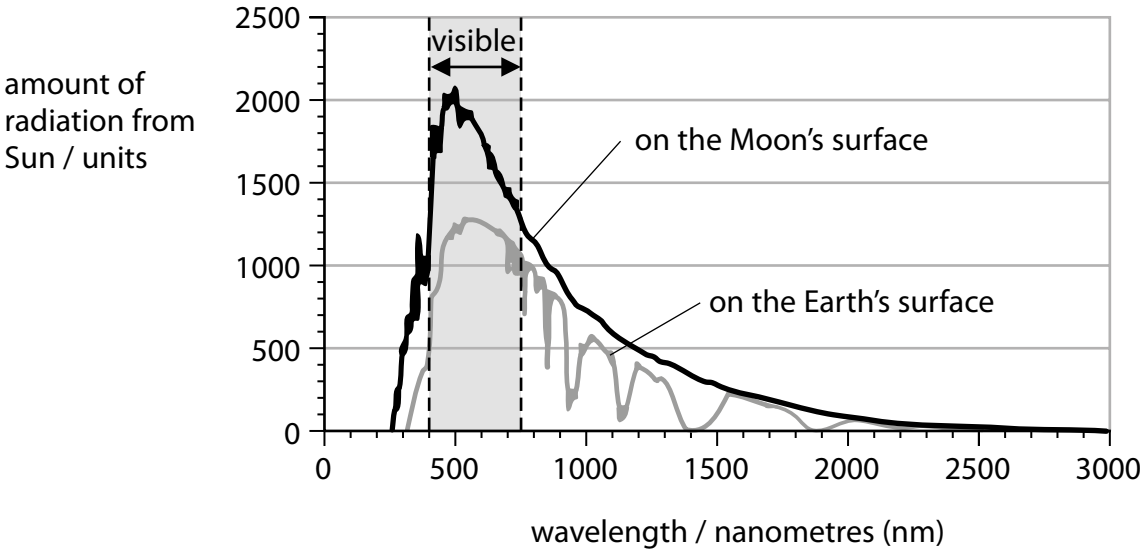
Put a cross (☒) in the box next to your answer.

(1)

- ☐ **A** a rover
- ☐ **B** a telescope
- ☐ **C** a manned mission
- ☐ **D** an orbiting satellite

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(b) The graph shows the amounts of radiation from the Sun, at different wavelengths, falling on the Moon and the Earth.



(i) State the value of the shortest wavelength of radiation falling on the Moon's surface.

(1)

shortest wavelength of radiation = ... nm

(ii) Name the type of radiation which has a wavelength of 800 nm.

(1)

.....

(iii) The amount of radiation of wavelength 500 nm falling on the Earth on an area of 1 m^2 in 1 second is about 1250 J.

Estimate the amount of radiation of wavelength 500 nm falling on the Earth on an area of 10 m^2 in 60 s.

(2)

total amount of radiation = ... J

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(iv) Explain why the radiation from the Sun reaching the Earth's surface is different from the radiation reaching the Moon's surface.

(2)

.....

.....

.....

.....

(c) Explain why some telescopes are sent into space instead of being used on the surface of the Earth.

(2)

.....

.....

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.....

(Total for Question 4 = 10 marks)

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Electricity in the home

5 (a) An electric kettle is plugged into the 230 V mains.
The current in the heating element of the kettle is 11 A.

Calculate the power supplied to the kettle.

(2)

power = ... W

(b) An electric toothbrush is powered by a rechargeable battery.

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

Energy is stored in the battery as

(1)

☐ **A** kinetic energy

☐ **B** thermal energy

☐ **C** chemical energy

☐ **D** gravitational potential energy

(ii) One part of the battery charger changes the 230 V mains voltage to 9.0 V.

State the name of this part of the battery charger.

(1)

.....

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(c) The current in the kettle is alternating current (a.c.).

The current in the toothbrush is direct current (d.c.).

Explain the difference between alternating current and direct current.

You may draw a diagram to help your answer.

(2)

.....

.....

.....

.....

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*(d) An electric fridge is kept cool by a compressor.

The compressor clicks on and off during the day to keep the inside of the fridge at a constant low temperature.

The table shows some information about two different fridges.

	Fridge A	Fridge B
cost	£ 500	£ 800
lifetime	3 years	6 years
power of compressor	0.15 kW	0.25 kW
time the compressor is on in one day	9 hours	7 hours
cost of 1 kWh of electrical energy	13.6 p	13.6 p

Describe the advantages and disadvantages of each fridge.

(6)

(Total for Question 5 = 12 marks)

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Making models of earthquakes

6 (a) (i) Describe how readings from two seismic stations, M and N, can be used to help find the position of an earthquake.

You may add to the diagram to help your answer.

(2)



(ii) Scientists recommend that results from three seismic stations are used.

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

Scientists recommend this because

(1)

- ☐ **A** three results will give a good average for the distance
- ☐ **B** three results will eliminate anomalies in measurements
- ☐ **C** all experiments need at least three results to be accurate
- ☐ **D** three results will pinpoint the exact position of the earthquake

(b) The frequency of a wave is given by the equation:

frequency = wave speed / wavelength

A seismic wave has a speed of 6 km/s.

Its wavelength is 10 m.

Calculate the frequency of this wave.

(3)

frequency = ... Hz

*(c) Syrup and biscuit pieces can model parts of the Earth.

The photograph shows pieces of broken biscuit floating on some syrup.

The syrup is in a large deep container.



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There are two heaters at different places underneath the container.

These heaters affect the positions of the biscuit pieces.

The syrup, biscuit pieces and heaters can be used to model what happens inside the Earth and at the crust.

Explain how this model relates to the different parts of the Earth.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2016

Pearson Edexcel GCSE in Physics (5PH1F) Paper 01
Unit P1: Universal Physics

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- For questions worth more than one mark, the answer column shows how partial credit can be allocated. This has been done by the inclusion of part marks eg (1).
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Answer	Acceptable answers	Mark
1(a)(i)	4.5	$\frac{36}{8}$	**(1)**

Question Number	Answer	Acceptable answers	Mark
1 (a)(ii)	substitution (1) $\frac{36}{20}$ evaluation (1) 1.8 m/s (1)	award full marks for correct answer with no working independent unit mark metres per second ms^{-1} **IGNORE** mps	**(3)**

Question Number	Answer	Acceptable answers	Mark
1 (b)	**D** refraction		**(1)**

Question Number	Answer	Acceptable answers	Mark
1 (c)(i)	**C** on a screen		**(1)**

Question Number	Answer	Acceptable answers	Mark
1 (c)(ii)	Description to include two from: • move the lens/screen until there is an image on a screen (1) • (measure the distance) from lens (1) • to screen / image / focal point (1)	 obtain a clear/sharp/in focus image owtte	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)	ultrasound	accept any recognisable spellings	**(1)**

Question Number	Answer	Acceptable answers	Mark
2 (b)	Any one suitable description linking a use and the appropriate method, e.g. detecting genuine banknotes (1) using a uv light (1) or tanning / sunbeds (1) using a uv light (1) or at discos (1) using uv lamps (1) or disinfecting water (1) using fluorescent lamps (1) or curing glues / fillings / nail polish (1) using uv lamps (1)	 detecting forged banknotes using a fluorescent light / fluorescence fluorescent light / the sun using a fluorescent light / uv light / chemicals glow killing bacteria	**(2)**

Question Number	Answer	Acceptable answers	Mark
2 (c)	ultraviolet	No marks if two waves given	**(1)**

Question Number	Answer	Acceptable answers	Mark
2 (d)	Any **TWO** from microwave (1) infrared (1) ultraviolet (1)	**IGNORE** radiation not on list Responses including ultrasound score maximum 1 mark. All four radiations score no marks.	**(2)**

Question Number	Answer	Acceptable answers	Mark
2 (e)	Explanation linking any two from:	Take 'it' unqualified as referring to microwaves	**(2)**
	microwaves heat water (1)	boils blood / body fluids	
	(idea of) inside the body / internal heating of body (cells) (1)	humans are (mainly) water infrared (only) heats skin (cells) / burns skin	
	the microwave radiation may be more {intense / powerful} (1)	there may be more microwave radiation **IGNORE** references to frequency, wavelength, cooking food, mutation, cancer, UV	

Question Number	Answer	Acceptable answers	Mark
3(a)	(gravitational) potential (energy) (1)	GPE PE gravitational gravitation energy gravity	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)	substitution (1) $\frac{190\ 000}{2.3}$ evaluation (1) 83 000 (W)	award full marks for correct answer with no working 82 608 numbers that round up to 83 000 POT errors 1 mark max	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(c)(i)	40 000 (J)	190 000 – 150 000 Accept this for one mark even if the final answer is incorrect	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)(ii)	substitution $\frac{150\ 000}{190\ 000}$ (× 100 %) (1) (1) evaluation 79 (%) (1)	award full marks for correct answer with no working 0.79 numbers that round up to 79 or 0.79 15/19 with no working scores 2	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(d)(i)	**B**		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(d)(ii)	Explanation linking 2 of: • energy is transferred / lost / dissipated / wasted (1) • (lost) as heat/thermal (energy) / sound (1) • (to) surroundings (1)	 the boat loses energy (KE) the pirate boat has less energy each swing / max PE decreases each swing (through) friction / air resistance / wind air / environment	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a) (i)	D the Milky Way, the Solar system and the Universe		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	C a manned mission (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	a value between 210 (nm) and 290 (nm) inclusive (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	infrared	Microwave(s), radio (waves)	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(iii)	substitution (1) 1250 x 10 x 60 evaluation (1) 750 000 (J)	correct answer no working scores 2 marks 1250 x 10 or 12500 gains one mark OR 1250 x 60 or 75 000 gains one mark	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)(iv)	Explanation linking any two from: • There is an atmosphere on Earth / no atmosphere on the Moon (1) • (The Earth's atmosphere) absorbs (some solar) radiation (1) • at all wavelengths (1) • some wavelengths more than others (1)	allow reflects / blocks / deflects / reduces for absorbs If no other marks scored, award 1 mark for: Moon and Earth are different distances from the Sun	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)	An explanation linking any two from : • (on Earth) image is distorted/not as bright/less clear (1) • (objects being studied) very small/far away (1) • atmosphere (in way)/light pollution (1) • can detect different parts of the em spectrum (that are not detectable on Earth) (1) • can keep it pointed at the same spot more easily (1) • less radiation collected (on Earth	(above atmosphere) image is more defined /clearer/better/more detail see {further/further away} /fainter/more objects obscured by clouds waves can be detected (that are not detectable on Earth) not affected by Earth's rotation	**(2)**

Question Number	Answer	Acceptable answers	Mark
5 (a)	substitution (1) 230 × 11 evaluation (1) 2500 (W)	award full marks for correct answer with no working 2530 numbers that round down to 2500	**(2)**

Question Number	Answer	Acceptable answers	Mark
5 (b)(i)	**C** chemical energy		**(1)**

Question Number	Answer	Acceptable answers	Mark
5 (b)(ii)	transformer	switch mode SM SMPS	**(1)**

Question Number	Answer	Acceptable answers	Mark
5 (c)	Explanation linking: • d.c. goes one way only (1) • a.c. (continually) <u>changes</u> direction (1)	 goes backwards and forwards/ is positive and negative both marks can be scored by correctly labelled diagrams note that on diagrams a.c. must show positive and negative	**(2)**

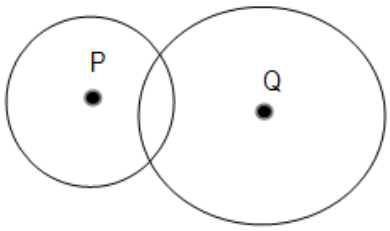
<table>
<tr><th colspan="2">Question Number</th><th>Indicative Content</th><th>Mark</th></tr>
<tr><td>QWC</td><td>*5(d)</td><td>A description including some of the following points

Advantages: (RA disadvantages) not quantitative
• A costs less to buy
• B lasts longer
• A uses less power
• B is on for shorter time
• A uses less electricity
• A costs less to run

Advantages: (RA disadvantages) quantitative
• Over 6 years B costs £200 less than A to buy
• A costs £300 less than B
• A lasts half as long as B
• B lasts three years longer than A
• The power of A is 0.1 kW less than B
• The compressor of A runs for 2 hours more per day
• A uses 1.35 kWh/day, B uses 1.75 kWh/day
• A costs 5.44 p less per day to run (18.36p vs 23.80p)

<table>
<tr><td></td><td>fridge A</td><td>fridge B</td></tr>
<tr><td>cost</td><td>£ 500</td><td>£ 800</td></tr>
<tr><td>lifetime</td><td>3 years</td><td>6 years</td></tr>
<tr><td>power of compressor</td><td>0.15 kW</td><td>0.25 kW</td></tr>
<tr><td>time the compressor is on in one day</td><td>9 hours</td><td>7 hours</td></tr>
<tr><td>cost of 1 kWh of electrical energy</td><td>13.6 p</td><td>13.6 p</td></tr>
</table>
</td><td>(6)</td></tr>
</table>

Level	0	No rewardable content
1	1 - 2	• A limited description of at least one advantage or one disadvantage e.g. Fridge A is cheaper (to buy/run) **OR** Correct values quoted from table and used to provide one comparison without calculations e.g. Fridge A costs £500 and Fridge B costs £800 • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	3 - 4	• A simple description of **two** different advantages / disadvantages comparing relevant data from the table but not involving relevant processing e.g. Fridge A is cheaper but does not last as long (as Fridge B) **OR** Correct values quoted from table and used to provide two comparisons without calculations e.g. Fridge A costs £500 and Fridge B costs £800, Fridge A lasts 3 years, Fridge B lasts 6 years. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	5 - 6	• A detailed description of two different advantages / disadvantages using **a quantitative** comparison for at least one. e.g. Fridge A is £300 cheaper but does not last as long (as Fridge B) OR The power of A is less than the power of B, but is on for two hours longer • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	Description to include any two from: • circles of radius = distance between earthquake and station (1) • earthquake possibly where circles cross / intersect / meet (1) • arrival time of S and P waves recorded (1) • S-P time used to get distance (from EQ) (1)	A diagram such as this  <u>One</u> circle from each point with at least one possible site of earthquake labelled would score 2 marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	D three results will pinpoint the exact position of the earthquake		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)	6 km = 6000 m at some stage (1) substitution (1) 6000 / 10 Evaluation (1) 600 (Hz)	Correct answer with no working scores three marks 6 x 10 to any power /10 (one mark) evaluation of acceptable substitution 0.6 scores (2 marks)	**(3)**

Question Number		Indicative Content	Mark
QWC	***6(c)**	An explanation linking some of the following points Aspects of model • biscuit pieces represent the (tectonic) plates (accept recognisable alternatives e.g. crust, continents) • syrup corresponds to the mantle/magma/ molten rock/lava • heaters are the same as the (hot) core/nuclear reactions Physical processes • convection currents in mantle/syrup • (convection currents) push the {plates/biscuits} around the surface • (convection currents cause) irregular movement due to uneven heating • the heater/core provides energy for movement • the heater/core heats the mantle/ magma/ molten rock/lava/syrup • collisions between moving objects can cause earthquakes or volcanoes	**(6)**

Level	**0**	no rewardable material	
1	**1-2**	• a limited explanation giving one aspect or physical process. e.g. heaters are the same as the core OR biscuits move on the surface. • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3-4**	• a simple explanation linking two aspects of the model with the Earth or the physical processes involved. e.g. heaters are the core and the syrup is the mantle OR heaters are the same as the core and cause the syrup to move around (idea of convection currents) • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5-6**	• a detailed explanation linking two aspects of the model with the Earth and a physical processes involved. e.g. the biscuits moving on the syrup can be likened to the plates moving on the mantle. The mantle moves the plates around (idea of convection current). OR heaters are the same as the core and cause the syrup, which is the mantle, to move around. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately. • spelling, punctuation and grammar are used with few errors.	

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Write your name here

Surname	Other names

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 ▶

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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 ☒.

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.



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 = ...

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(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?

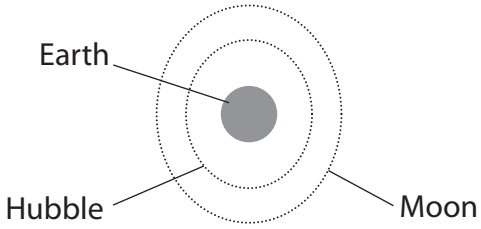
(1)

..... 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)



.....

.....

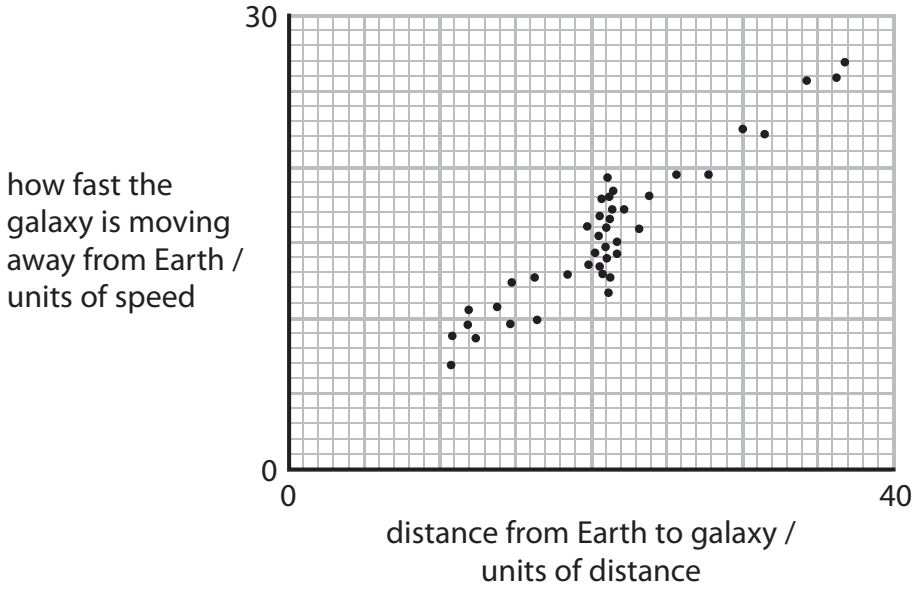
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(c) Hubble measured the distance of many galaxies from Earth.
He also measured the speed at which each galaxy moved away from Earth.

Hubble plotted his data on a graph like this.



(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)

.....

.....

.....

.....

(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)

.....

.....

.....

.....

(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

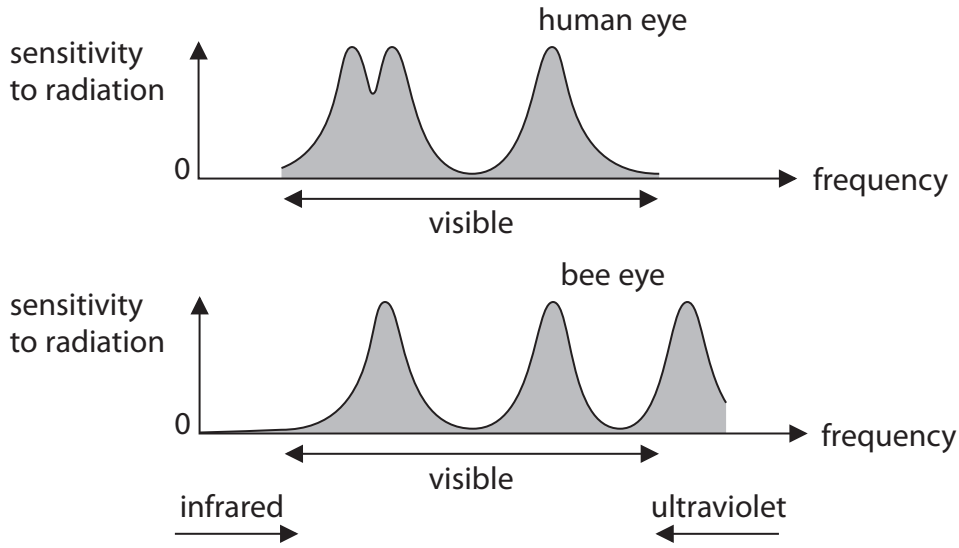
☒ **B** brown

☒ **C** white

☒ **D** yellow

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



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

(2)

(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)

.....

.....

.....

.....

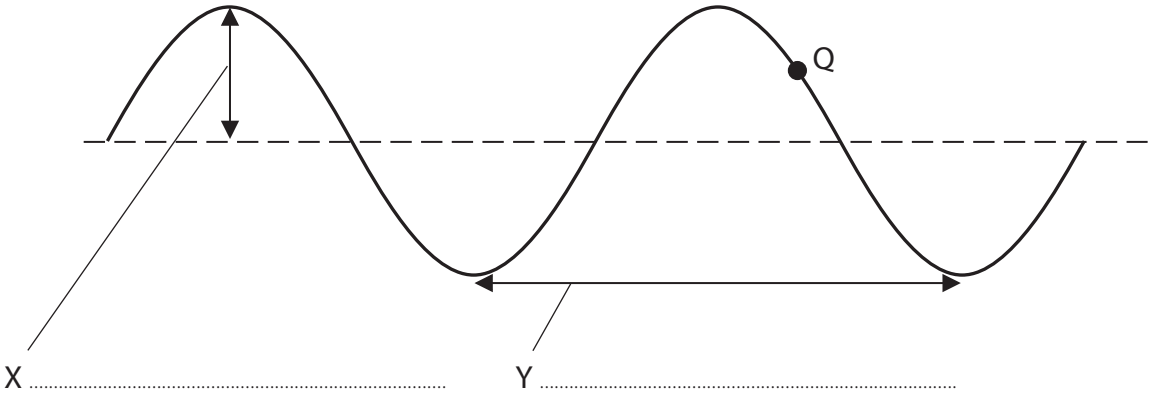
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(Total for Question 4 = 10 marks)

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5 (a) The diagram shows a transverse wave.



(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**



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(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)

.....

.....

.....

.....

(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)

.....

.....

*(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)

(Total for Question 5 = 12 marks)

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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)

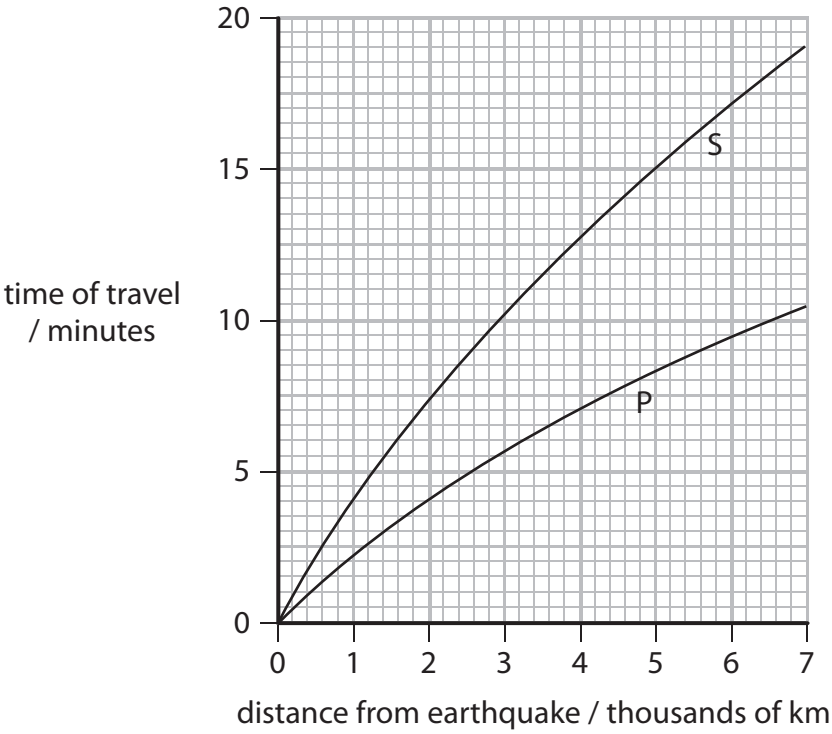
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(c) The graph shows how long it takes the P-waves and the S-waves from an earthquake to travel different distances.



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.

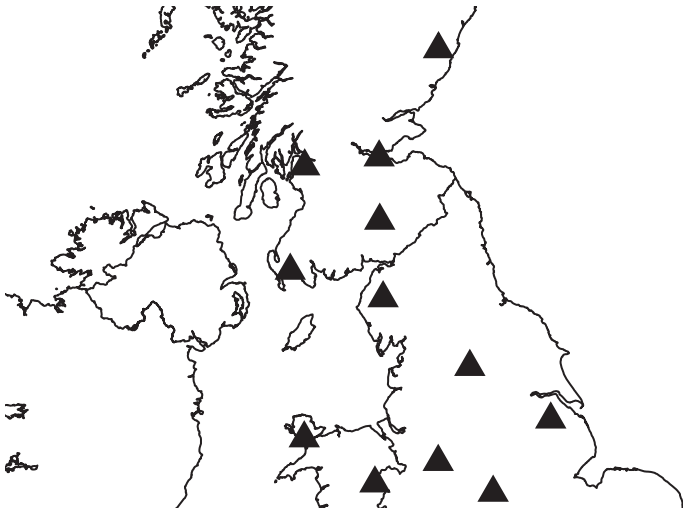
(3)

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)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2015

Pearson Edexcel GCSE in Physics (5PH1F) Paper 01 Unit P1: Universal Physics

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Answer	Acceptable answers	Mark
1(a)(i)	electrical	electric	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	chemical		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)(i)	20 (J)	200 – 180 (even if calculated value from this is incorrect)	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)(ii)	(changed to) {thermal energy / heat}	dissipated (lost) to {surroundings / motor / air / atmosphere} sound / noise **reject** if kinetic, light or chemical is mentioned	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)(iii)	$\frac{180}{200} \times 100$ (1) 90 (%) (1)	award full marks for correct answer with no working $\frac{180}{200}$ 0.9, 9/10 Or [100 – (20/200)] % not needed but if a unit is given then maximum score is 1	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)(i)	**D** dark : rough		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(c)(ii)	**C** the container is losing thermal energy at the same rate it is absorbing it	Heat for thermal Same amount in same time for same rate	**(1)**

Total for Question 1 = 8 marks

Question Number	Answer	Acceptable answers	Mark
2(a)	**C** Herschel discovered infrared radiation		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	384 440 (km)	385 000 – 560 (even if calculated value from this is incorrect) accept 384 000	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	An explanation linking any two of 1. change of relative positions in orbits (1) 2. different radii orbits (1) 3. different (orbital) {speeds / times} (1)	 on same side and opposite sides of Earth – may be shown by calculation or diagram different distances (from Earth) moon is further away (moon/Hubble) moves faster than other mention of {not perfect circle / elliptical / different orbital planes} on its own is insufficient – needs qualifying one moves faster than the other and overtakes it = 2 marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	Correct plotting (1)	+/- ½ a small square if line is drawn exactly through the point accept for the mark even if point is not obvious	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(ii)	Line of best fit drawn	straight line to be within lower two printed dots and upper 3 printed dots does not need to pass through origin **ignore** line below the given points	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(d)	A description including 1. expansion (of space) (1) and any one of 2. continuing (expansion) (1) 3. from very {hot/dense} start (1) 4. from a {point /small volume} (1) 5. origin of Universe (1)	 **ignore** expansion of Earth, particles and other objects unqualified 'explosion' is insufficient, a reference to expansion is needed (this point only is **dependent** on first) singularity {Universe / Space} still expanding = 2 marks	**(2)**

Total for Question 2 = 8 marks

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	<table><tr><th>component</th><th>☐</th></tr><tr><td>ammeter</td><td></td></tr><tr><td>coil of wire</td><td>☐</td></tr><tr><td>battery</td><td></td></tr><tr><td>magnet</td><td>☐</td></tr><tr><td>voltmeter</td><td></td></tr></table>	one mark for each correct tick deduct 1 mark for each extra tick	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	Explanation linking any two of • wind (speed) is not constant (1) • voltage depends on wind speed (1)	need idea of varying wind {electrical energy / electricity} depends on wind speed higher wind speed gives {higher voltage/more electrical energy/more electricity} = 2 marks voltage is alternating = 2 marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	(saving) = 2 × 3 × 15 (1) 90 (p) (1)	award full marks for correct answer with no working 2 × 3 × 0.15 (£) 0.90	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)	power = 2500 (W) (1) (current) = $\frac{2500}{230}$ (1) **ecf** 11 (A) (1)	award full marks for correct answer with no working [2.5/230 is 1 mark for these 2] 10.9 / 10.8... **accept** {0.01… / 0.11… / 1.1…} for 2 marks	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(c)	EITHER sometimes no / very little wind (1) OR some appliances rated above 2 kW (1)	need wind vague references to weather are insufficient may use more than one appliance at once **or** house needs more (than 2kW) power not enough power for kettle **ignore** references to electrical energy / electricity	**(1)**

Total for Question 3 = 10 marks

Question Number	Answer	Acceptable answers	Mark
4(a)	**B** cm		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)	**D** yellow		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)	A description including any two of human eye can only {react to /see} visible (light) (1) bee eye can {react to/see} {ultraviolet/infrared/different frequencies/different wavelengths} (1) {Maxima/peaks} more evenly spaced for bee (1)	 bee can 'see' outside (human) visible range smaller frequency range than bee **ignore** 'see more colours' human peaks are concentrated in lower frequencies	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(d)	**C** sound		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(e)	conversion of time 4x60 (1) substitution (1) 1608 / (4x60) **ecf if conversion shown** evaluation (1) 6.7 (m/s)	award full marks for correct answer with no working [1608 / 4 for 1 mark for these two] **allow** 402 for 2 marks **accept** for 2 marks: 5.36 (t=300 s 60→120→180→240→300, i.e. 4 steps of 60) 4.02 (t=400 s based on the misconception of 100 s to 1 minute) **allow** maximum of 1 mark for any other power of 10 error if no working	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(f)	A suggestion which includes any two of: 1. harmful effect e.g. damage to {skin (cells) / cancer / mutation / eyes} (1) 2. bee can 'see' objects reflecting UV radiation (1) 3. allows bees to find (more) food (1) 4. discussion of different (intensities /) {brightnesses / amounts} (1) 5. discussion of time of exposure compared to life span (1)	 sunburn {emitting/giving out} for reflecting **OWTTE** accept 'see pollen' for MP2 OR 3 **ignore** honey **ignore** making food relevant mention of more exposure/ absorption by humans discussion such as humans have long term exposure which can be cumulative	**(2)**

Total for Question 4 = 10 marks

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	**X** amplitude (1) **Y** wavelength (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	**A**  (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)(i)	mirror (1) linked to: (which is) converging / concave / parabolic (1)	reflector (reflection / reflects is insufficient) curved **ignore** any reference to lenses, converging lenses and eyepieces	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(b)(ii)	magnifies	makes it (look) bigger **ignore** closeness, clearness, more detail etc. **ignore** focus the image **ignore** zoomed in	**(1)**

Question Number		Indicative Content	Mark
QWC	***5 (c)**	A description including some of the following points evidence for • idea of Sun, Moon, stars or planets moving across the sky (not just orbiting) • in the same direction • pattern is repeated • appear to be going around the Earth • same every day evidence against • moons of {Jupiter/ other planet (with moons)} • appear to {orbit/ go around} {Jupiter/ other planet} • movement of Sun etc. not quite the same each day • planets do not move in a simple path • retrograde (west-east) motion of planets If no other marks scored • heliocentric model = Level 1	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description stating one fact for or against e.g. for – the Sun / stars move across the sky OR against - Jupiter has moons OR against - (Galileo) produced the {heliocentric / sun-centred} model • the answer communicates ideas using simple language and uses limited scientific terminology e.g. some correct names for the moving objects • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description involving (linked) facts e.g. the Sun and stars move across the sky **AND** do the same thing each day OR moons orbit Jupiter OR one fact for **AND** one against e.g. the sun moves across the sky but changes from day to day • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately e.g. correct names for the moving objects • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description of arguments for **AND** against, including at least one link. e.g. the Sun and stars move across the sky. Galileo observed moons, which orbit Jupiter. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for Question 5 = 12 marks

Question Number	Answer	Acceptable answers	Mark
6(a)	**A** longitudinal : yes		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)	An explanation linking any two of: 1. A cause or description of earthquakes (1) 2. why timing of earthquake is uncertain / complex (1) 3. we cannot see {what is happening deep inside the Earth / where the plates are rubbing} (1)	The release of {energy / pressure/friction force} (in Earth's surface) (caused when tectonic) plates slide past each other any idea of relative movement of plates e.g. move over each other, collide (movement of plates is) {sudden / random / jerky} it is too difficult to {work out / measure} when release of energy will happen "it is difficult to measure when the plates will collide" = 2 marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(c)	P-wave = 8 (minutes) (1) S-wave = 14.5 (minutes) (1) time difference = 6.5 (minutes) (1)	award full marks for correct answer (6.5) **with no working** (since 13 small squares = 6.5 mins) 7.5 – 8.5 (minutes) inclusive 14.0 - 15.0 (minutes) inclusive **ecf** for difference of wrong readings from graph **accept** time shown as m:ss (e.g. 6:30) if correct construction lines are shown on graph but no values written, the score is maximum of 1 of the three	**(3)**

Question Number		Indicative Content	Mark
QWC	***6 (d)**	A description including some of the following points **Data collection** • S and P arrival times found • Use or collect data from more than one station **Manipulation / Calculation for one station** • Circle drawn on map with station at centre • Circle drawn on map at appropriate distance from station • Earthquake on that circle • (Distance found from) S minus P time **Triangulation** • Repeat calculation / drawing with at least three stations • Epicentre / earthquake at point of intersection of all three (or more) circles • Triangulation • Meaning of triangulation **If no other marks scored** • Strength greatest nearer earthquake = Level 1 • Time shortest nearest the earthquake = Level 1	**(6)**

Level	0	No rewardable content
1	1 - 2	• a limited description of process involving isolated fact(s) from one section. e.g. Circle drawn on map with station at centre OR "triangulation" • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	3 - 4	• a simple description of process involving linked facts from two sections e.g. the S and P arrival time is recorded, and the difference noted. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	5 - 6	• a detailed description of process involving elements from all three sections e.g. showing how three stations can identify the epicentre of an earthquake using a calculation and intersecting circles. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Total for Question 6 = 12 marks

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Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Physics/Science

Unit P1: Universal Physics

Foundation Tier

Monday 19 May 2014 – 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 ▶

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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

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

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

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Questions begin on next page.

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 ☒.

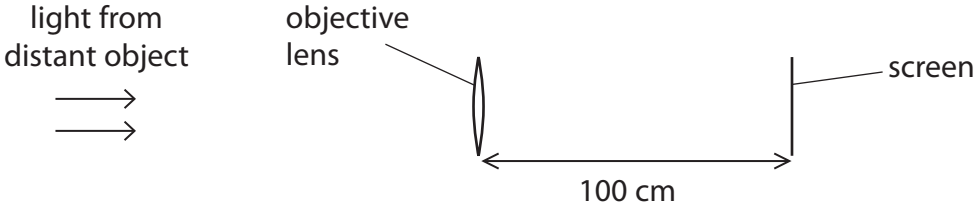
Telescopes

1 (a) This picture shows Galileo holding a telescope.



A student starts to make a similar telescope.

She places the objective lens near a screen to form a sharp image of a distant object.



(i) Use words from the box to complete the sentence.

(2)

bigger than the object	the right way up	the same size as the object
smaller than the object	upside down	

The sharp image formed is

..... and .....

(ii) State how you can tell that the image formed is real.

(1)

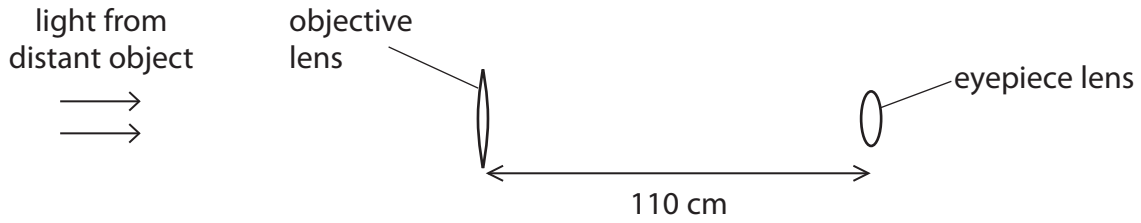
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(iii) She then removes the screen and replaces it with an eyepiece lens.
She moves the eyepiece lens until she can see a sharp, magnified image through it.

The diagram shows the position of the lenses.



The lenses are now separated by 110 cm.

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

The focal length of the eyepiece is about

(1)

☒ **A** 10 cm

☒ **B** 55 cm

☒ **C** 90 cm

☒ **D** 100 cm

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

At the eyepiece of this telescope there is

(1)

☒ **A** refraction by a converging lens

☒ **B** refraction by a converging mirror

☒ **C** reflection by a converging lens

☒ **D** reflection by a converging mirror

(b) State how the invention of the telescope improved the way scientists observed the Universe.

(1)

.....

.....

(c) The invention of the telescope helped to change ideas about the Solar System.
The heliocentric model replaced the geocentric model.
Describe the difference between the geocentric model and the heliocentric model.

(2)

.....

.....

.....

.....

(Total for Question 1 = 8 marks)

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Stars and planets

2 (a) Our Sun is a star.

(i) The life cycle of a star has several stages.
The Sun is in its main sequence stage.

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

The next stage in the life cycle of the Sun will be

(1)

☐ **A** a nebula

☐ **B** a red giant

☐ **C** a white dwarf

☐ **D** a black hole

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

The galaxy which contains our Sun is called

(1)

☐ **A** Andromeda

☐ **B** Orion

☐ **C** the Milky Way

☐ **D** the Solar System

(iii) Which of these is furthest from the Sun?

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

(1)

☐ **A** Earth

☐ **B** The Moon

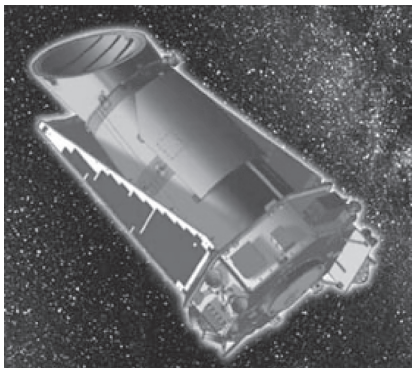
☐ **C** The planet Jupiter

☐ **D** The star Proxima Centauri

(b) Scientists search for signs of life on the planet Mars.
Describe **one** method they use to search for signs of life on the planet Mars.

(2)

(c) Scientists search for new planets orbiting distant stars.
The photograph shows the Kepler space telescope.



The Kepler space telescope records the brightness of light from distant stars.
When a planet passes in front of a distant star, there is a tiny dip in the brightness of the light from the star.

(i) Many telescopes are used on the Earth but the Kepler space telescope orbits above the Earth's atmosphere.
Explain why telescopes that search for planets are not on the Earth's surface.

(2)

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(ii) The Kepler space telescope was pointed towards one star.
It detected the same dip in the brightness of the star every 150 days.

Suggest what information this gives about the planet that orbits this star.

(1)

.....

.....

.....

(Total for Question 2 = 8 marks)

Energy

3 (a) A wind generator is used as the source of energy for a remote farmhouse.



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

If the farmhouse is about 7 m high, the height of the axle of the generator is

(1)

☒ **A** 20 m

☒ **B** 50 m

☒ **C** 100 m

☒ **D** 150 m

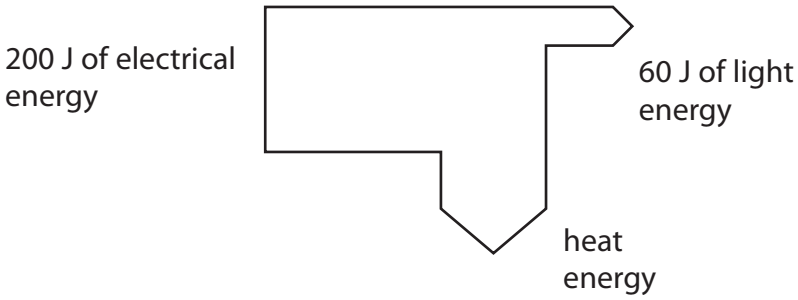
(ii) Complete the flow chart to show the energy transfers that take place from the wind to light a lamp.

(2)

wind	→	generator	→	lamp
..... energy		..... energy		light energy

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(b) A student produced a diagram to show energy changes in a lamp.



(i) Calculate the amount of heat energy produced by the lamp.

(1)

heat energy = ... J

(ii) Calculate the efficiency of the lamp.

(2)

efficiency = ...

(iii) When the lamp is first switched on, it heats up.
It then reaches a constant temperature.

Explain why the temperature of the lamp remains constant.

(2)

.....

.....

.....

.....

(c) A wind power system costs £6000 to install.
It saves £250 each year.

Calculate the payback time.

(2)

payback time = ...

(Total for Question 3 = 10 marks)

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Silent waves

4 (a) A man uses a dog whistle to call his dog.
The whistle uses ultrasound.

(i) The dog can hear the whistle but the man cannot.
Explain why the dog can hear the whistle but the man cannot hear the whistle.

(2)

.....

.....

.....

.....

(ii) The dog is 140 m away from the man.
The ultrasound takes 0.42 s to travel from the man to the dog.
Calculate the speed of ultrasound.
State the unit.

(3)

speed of ultrasound = ... unit = ...

(b) (i) An earthquake P-wave has a frequency of 15 Hz.

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

The earthquake P-wave is

(1)

☒ **A** an infrasound wave

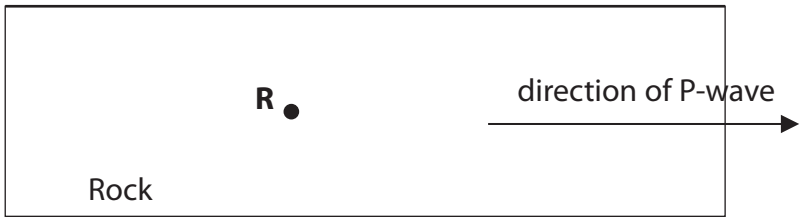
☒ **B** an ultrasound wave

☒ **C** an electromagnetic wave

☒ **D** a transverse wave

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(ii) The diagram shows the direction of an earthquake P-wave in some rock.



Draw arrows on the diagram to show how the piece of rock, labelled **R**, moves.

(2)

(c) Earthquakes occur when two tectonic plates move against each other.
Explain what causes the tectonic plates to move.

You may draw a diagram if it helps your answer.

(2)

(Total for Question 4 = 10 marks)

Electromagnetic spectrum

5 (a) The table shows most of the waves in the electromagnetic spectrum.
One type of wave is missing.

gamma rays
.....
ultraviolet
visible light
infrared
microwaves
radio waves

(i) Write the missing wave in the space in the table.

(1)

(ii) State which type of wave can be split into different colours.

(1)

.....

(iii) State which type of wave has the longest wavelength.

(1)

.....

(iv) State **one** type of wave that is ionising.

(1)

.....

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(b) The Sun emits all the waves in the electromagnetic spectrum.
Explain why all these waves take the same time to travel to Earth from the Sun.

(2)

*(c) Infrared and ultraviolet waves have different frequencies.
Both types of wave can have harmful effects on human beings.

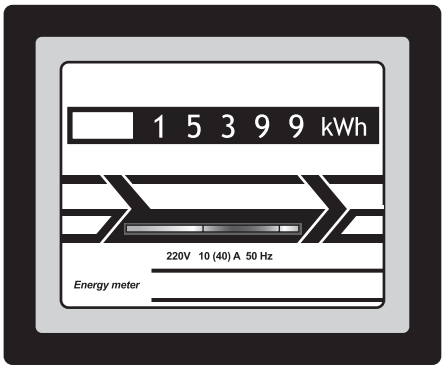
Describe the harmful effects of infrared and ultraviolet waves, relating them to the frequencies of the waves.

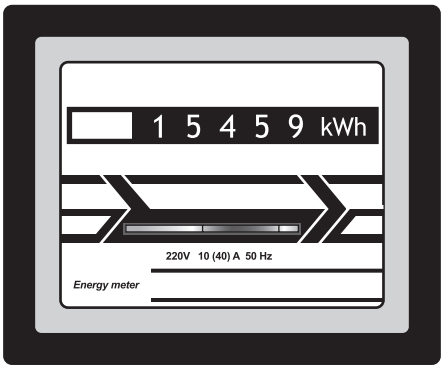
(6)

(Total for Question 5 = 12 marks)

Electrical power

6 (a) Electricity costs 20 p for each kW h.
The pictures show a domestic electricity meter at two different times.





(i) Calculate the cost of the electricity used between the two readings.

(2)

cost = ... p

(ii) The time between these two readings is 15 hours.

Calculate the average power supplied.

(2)

average power = ... kW

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(b) Explain why step-up transformers are used in the transmission of electricity in the National Grid.

(2)

.....

.....

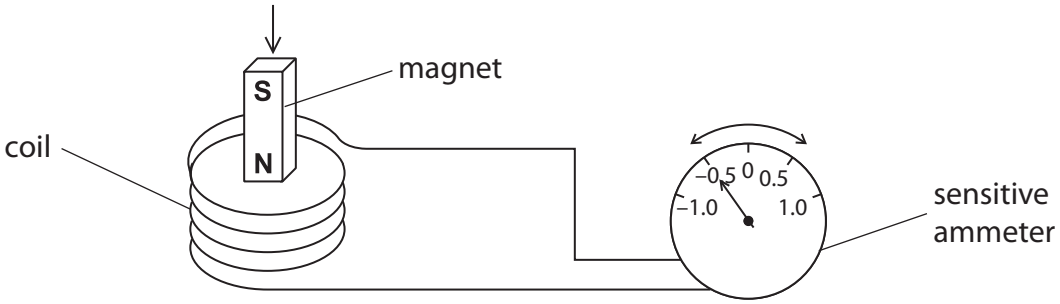
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Question 6 continues on the next page.

*(c) The diagram shows a magnet moving into a coil of wire.

The coil of wire is attached to a sensitive ammeter.



The moving magnet and the coil of wire are producing an electric current.

The size and direction of the current can be changed in a number of ways.

Describe changes that can be made to produce different currents and the effect of each change.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2014

Pearson Edexcel GCSE in Physics (5PH1F) Paper 01

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Question Number	Answer	Acceptable answers	Mark
1(a)(i)	In ANY order smaller than the object (1) upside down (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	The idea that it can be captured on a screen	appears where the rays (of light) meet ignore references to reflection	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(iii)	A (10)		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(iv)	A (refraction by a converging lens)		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)	image was larger/magnified (compared with naked eye).	better {information / detail} / see {further / clearer /further away} / fainter /more objects / zoom in OWTTE	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(c)	Description to include: Geo = Earth at the centre (of the Solar System) (1) Helio = Sun at the centre (of the Solar System) (1)	"everything goes around the Earth / us" the Sun goes around the Earth "everything goes around the Sun" we revolve around the Sun Allow answers in diagram form Allow 1 mark for **both** descriptions the wrong way round	**(2)**

(Total for Question 1 = 8 marks)

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	B red giant (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	C the Milky Way (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	D Proxima Centauri (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)	description to include: • method (1) • relevant detail (1)	 Telescope (inc. radio telescopes) Lander (e.g. robots/drones) Orbiter / Satellite has camera / takes photos / collecting samples (e.g rocks) / analyse atmosphere / climate / signs of water / gases that will support life / can test for water/nutrients ignore repeat of stem	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	explanation linking two from: • (on Earth) image is distorted / image not bright enough (ORA) (1) • planets very small / far away (1) • atmosphere (in way) / light pollution (1) • can detect different parts of em spectrum (that are not detectable on Earth) (1) • can keep it pointed at the same spot more easily (1)	Reverse arguments apply throughout (above atmosphere gives) more defined / clearer / better image obscured by clouds waves can be detected (that are not detectable on Earth) not affected by Earth's rotation	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(c)(ii)	Suggestion: • planet takes 150 days to orbit the star (1)	has 150 days in a year	**(1)**

(Total for Question 2 = 8 marks)

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	B (50 m)		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	kinetic (1) electrical (1) in this order.	movement electric, electricity poor spellings of electrical electronic Reject 2 forms of energy in one answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	140 (J)	200 – 60 140 in words	**(1)**

Question Number	Answer	Acceptable answers	**Mark**
3(b)(ii)	• substitution (1) $\frac{60}{200} \times 100$ % • evaluation (1) 30 %	$\frac{60}{200}$ 0.3 ignore units Award full marks for correct answer with no working	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(iii)	explanation linking: • energy supplied and radiated (1) • (at) equal (rate) (1)	allow used for radiated heat gained = heat lost 2 marks input energy = output energy 2 marks input power = output power 2 marks input = output 1 mark	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(c)	• substitution (1) $\frac{6000}{250}$ • evaluation (1) 24 (years)	Award full marks for correct answer with no working ignore units	**(2)**

(Total for Question 3 = 10 marks)

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	an explanation linking: • frequency / Hz (1) • above 20 000 (1)	Pitch too high to be heard by the man "it is above 20kHz" 2 marks "The frequency is too loud" gets 1st mark	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	substitution: (1) 140/0.42 evaluation: (1) 330 m/s (1)	award full marks for correct answer with no working allow 333(.333) independent mark allow ms^{-1}	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	A infrasound wave (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	• arrows to show vibration in opposite directions (1) • parallel to arrow on diagram (1)	arrows do not have to go through R horizontal and vertical – no marks multiple directions – no marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)	Explanation linking: • <u>convection</u> (currents) (1) • in mantle (1)	Accept answers in form of a labelled diagram in molten rock in magma below plates in the hot rock coming from the core under Earth's crust under surface ignore lava clear unlabelled diagram scores maximum 1 mark clear labelled diagram scores maximum 2 marks	**(2)**

(Total for Question 4 = 10 marks)

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	X-ray	X	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	(visible) light	visible (waves)	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(iii)	radio (waves)		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(iv)	gamma / X-rays / ultraviolet	☐☐☐ X / UV	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)	an explanation linking: • travel with same speed (1) • in a vacuum / in space (1)	They travel at the speed of light / same numerical speed for all	**(2)**

Question Number		Indicative Content	Mark
QWC	***5 (c)**	A description including some of the following points • Harmful effects include (skin) burns, eye damage, (skin) cancer, cell damage, mutation • IR and UV are on either side of visible light (in the em spectrum) • UV has shorter wavelength than IR • UV has higher frequency than IR • higher energy (associated) with UV • IR causes (skin) burns • UV causes damage to eyes / (skin) cancer / damage to cells (not just damage to skin) / sunburn • (potential) danger increases with frequency Ignore • irrelevant information e.g. UV used to scan unborn babies	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description stating one fact about a harmful effect or frequency e.g. skin burns **OR** UV has high frequency (no comparison) • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description making a correct <u>comparison</u> of harmful effects **OR** a frequency comparison e.g. IR causes skin burns and UV causes (skin) cancer **OR** the higher the frequency the more harm they cause **OR** UV has a high<u>er</u> frequency (than IR) • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • <u>spelling, punctuation and grammar are used with some accuracy</u>	
3	**5 - 6**	• a detailed description including harmful effects of both UV and IR **AND** relating at least one to <u>frequency</u> e.g. UV causes skin cancer but IR (only) causes skin burns as UV has a high(er) frequency • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for Question 5 = 12 marks)

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	60 (kW h/ units) (1) 60 x 20 (= 1200) (p) (1)	15459 - 15399 £12 ecf Award full marks for correct answer with no working £12 scores 2 Power of Ten error scores maximum 1 60 in answer space with no working scores 1	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	60 / 15 (1) 4 (kW) (1)	Allow ecf from 6(a)(i) marking point 1 Award full marks for correct answer with no working	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)	An explanation linking any two of: • increase voltage (1) • decrease current (1) • reduce {loss / waste} of {energy / heat} (1)	Increase efficiency (of energy transmission) Ignore "more efficient" by itself Accept power instead of energy Accept no energy loss	**(2)**

Question Number		Indicative content	Mark
QWC	***6(c)**	A description to include some of the following points • speed of movement • stronger / more powerful (ORA) magnet • more turns / coils (ORA) • iron core • reversing movement • turning the magnet round • effect of any / each change • more conducting / less resistant wire • allow stronger current • allow ammeter reading / recording / voltage for current • allow moving coil Correct ideas but using inaccurate scientific terminology • larger / bigger magnet • more / longer movement Ignore • irrelevant information • speeds up current or more electricity	**(6)**
Level	**0**	no rewardable material	
1	**1-2**	• a limited description of any one change e.g. use more coils **OR** a stronger magnet. • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3-4**	• a simple description of any two different changes **OR** one change and its effect e.g. use more coils and a weaker magnet **OR** more coils more current • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description of a change linked to its effect and a second different change e.g. using more turns of wire makes a bigger current. Moving the magnet out. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for Question 6 = 12 marks)

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Write your name here

Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Physics/Science

Unit P1: Universal Physics

Foundation Tier

Wednesday 5 June 2013 – 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 ▶

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

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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 The electromagnetic spectrum has many parts.

One of these parts is called visible light.

(a) (i) How many different colours are there in visible light?

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

(1)

- ☒ **A** five
- ☒ **B** seven
- ☒ **C** nine
- ☒ **D** eleven

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

Three colours of the spectrum of visible light in the correct order are

(1)

- ☒ **A** green, red, yellow
- ☒ **B** blue, red, green
- ☒ **C** red, orange, yellow
- ☒ **D** violet, orange, green

(b) Different parts of the electromagnetic spectrum have different uses.

Draw **one** straight line from each part to its use.

(2)

part	**use**
ultraviolet	detecting forged banknotes
gamma rays	cooking
microwaves	detecting cancer

P 4 1 9 4 2 A 0 4 2 0

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(c) Images of hands can be made using different parts of the electromagnetic spectrum.



Infrared image



X-ray image

Both images give information about a hand.

(i) Suggest what information the infrared image gives about a hand.

(2)

.....

.....

.....

.....

(ii) Explain why taking an X-ray image of a hand is more dangerous than taking an infrared image.

(2)

.....

.....

.....

(Total for Question 1 = 8 marks)

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Using waves

2 Ultrasound from a fishing boat is used to find fish.

(a) (i) Which of these is correct for ultrasound waves?

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

(1)

☒ **A** ultrasound waves have a frequency above 20 000 Hz

☒ **B** ultrasound waves have a frequency below 20 Hz

☒ **C** ultrasound waves have a wavelength above 20 000 Hz

☒ **D** ultrasound waves have a wavelength below 20 Hz

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

The system that uses ultrasound to find fish is called

(1)

☒ **A** fibre optics

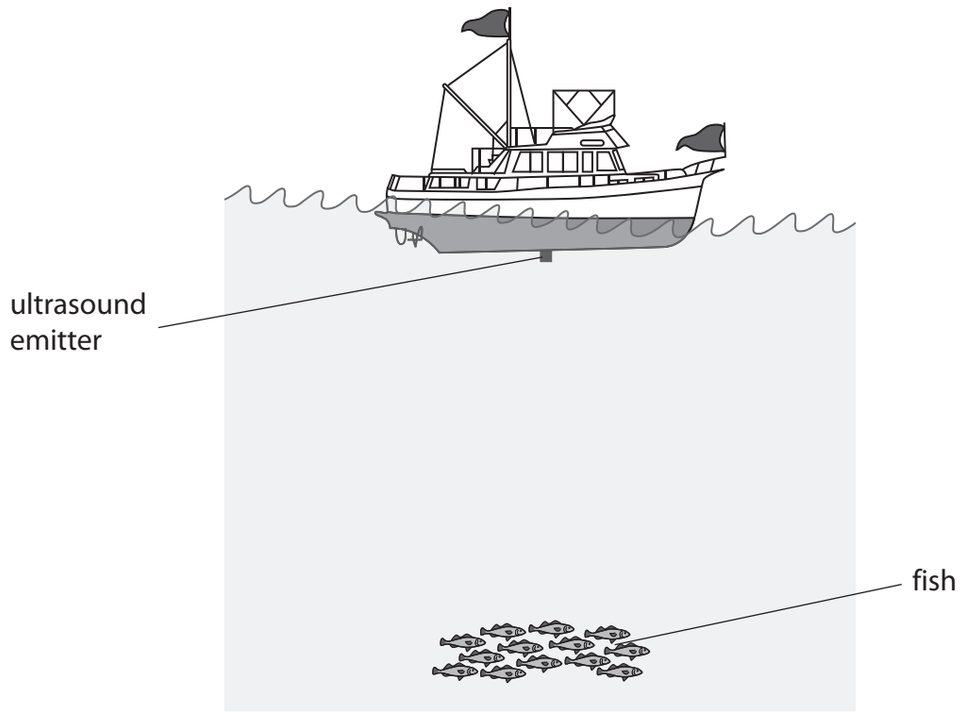
☒ **B** satellite transmission

☒ **C** sonar

☒ **D** thermal imaging

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(iii) The diagram shows a fishing boat above some fish.



Describe how ultrasound waves are used to detect the fish.

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

(2)

.....

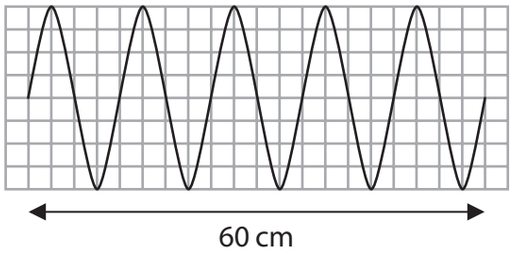
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(b) Some students are investigating waves.
They produce waves by moving a piece of wood up and down in a tank of water.
The diagram shows the waves over a distance of 60 cm.



(i) State the number of wavelengths shown on the diagram.

(1)

number of wavelengths = ...

(ii) Calculate the wavelength of the waves.

(1)

wavelength of waves = ... cm

(c) The students produce a different wave.
This wave has a frequency of 1.7 Hz and a wavelength of 8.0 cm.

Calculate the speed of this wave.

(2)

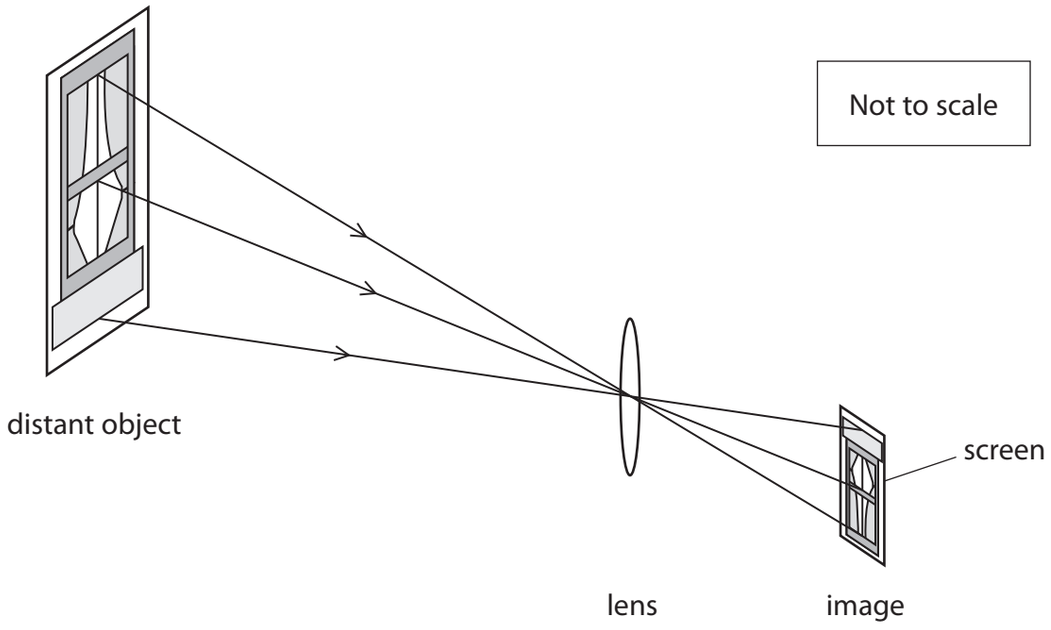
speed of wave = ... cm/s

(Total for Question 2 = 8 marks)

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Behaviour of light and sound

3 A lens can be used to produce a clear image of a distant object on a screen.



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

The image produced is real because it is

(1)

- ☒ **A** in focus
- ☒ **B** magnified
- ☒ **C** on a screen
- ☒ **D** smaller

(ii) Describe how to measure the focal length of the lens.

(2)

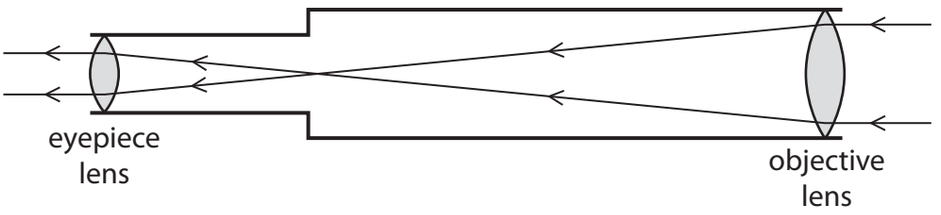
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(b) The diagram shows a simple telescope which uses two lenses to look at stars.



(i) Explain what the eyepiece lens does.

(2)

.....

.....

.....

.....

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

The light that travels from the stars transfers

(1)

☒ **A** charge

☒ **B** energy

☒ **C** mass

☒ **D** matter

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(c) Light and sound waves are produced at the same time by an explosion on Earth.

(i) The sound of the explosion is heard 1920 metres away 6.0 seconds after the explosion has happened.

Calculate the speed of sound in air.

(2)

speed of sound in air = ... m/s

(ii) A scientist is standing a long way from the explosion.

Explain why he hears the explosion a few seconds after he sees it.

(2)

.....

.....

.....

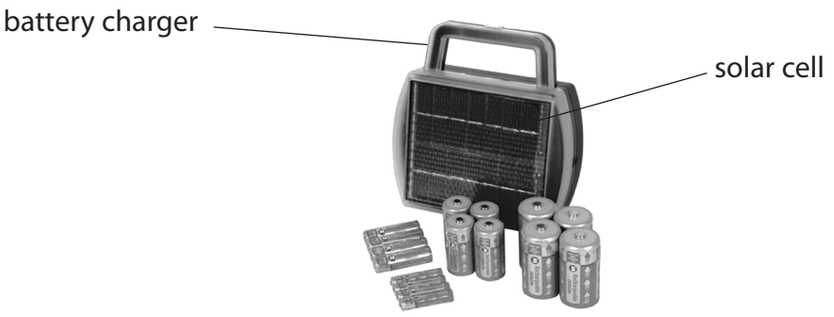
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(Total for Question 3 = 10 marks)

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Using solar energy

4 A student uses a solar powered battery charger to charge some batteries.



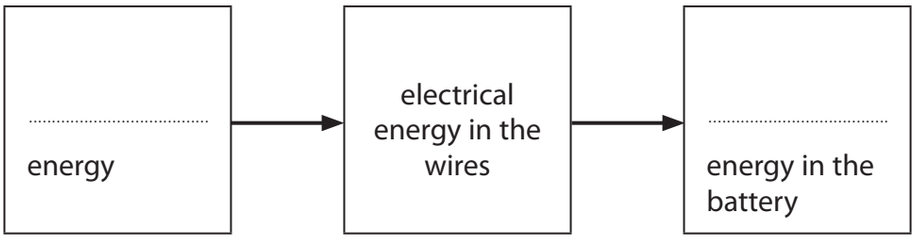
(a) The diagram is an energy transfer diagram for a battery being charged.

Use words from the box to complete the energy transfer diagram.

(2)

light	kinetic	sound
electrical	chemical	

Energy transfer diagram

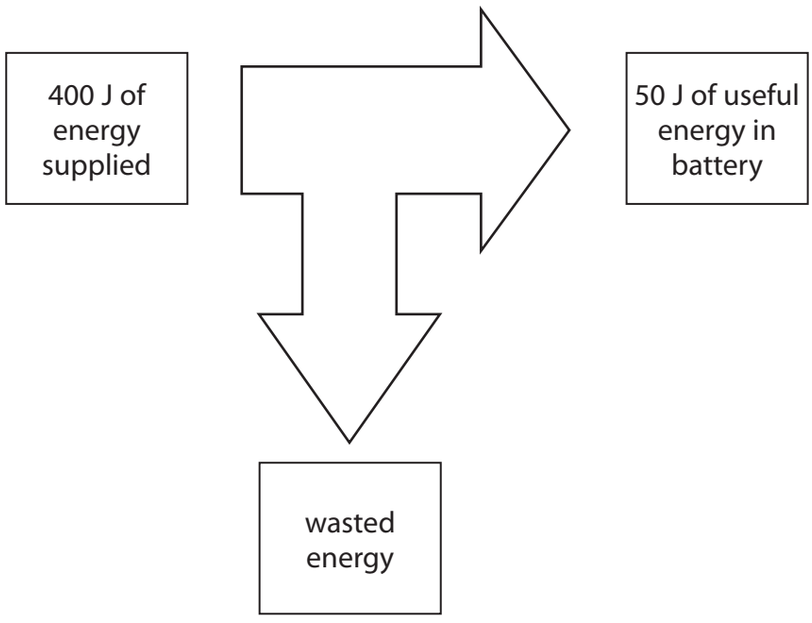


P 4 1 9 4 2 A 0 1 2 2 0

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(b) The diagram shows how much energy is usefully transferred by the battery charger.

Not to scale



(i) Calculate the amount of wasted energy.

(1)

wasted energy = ... J

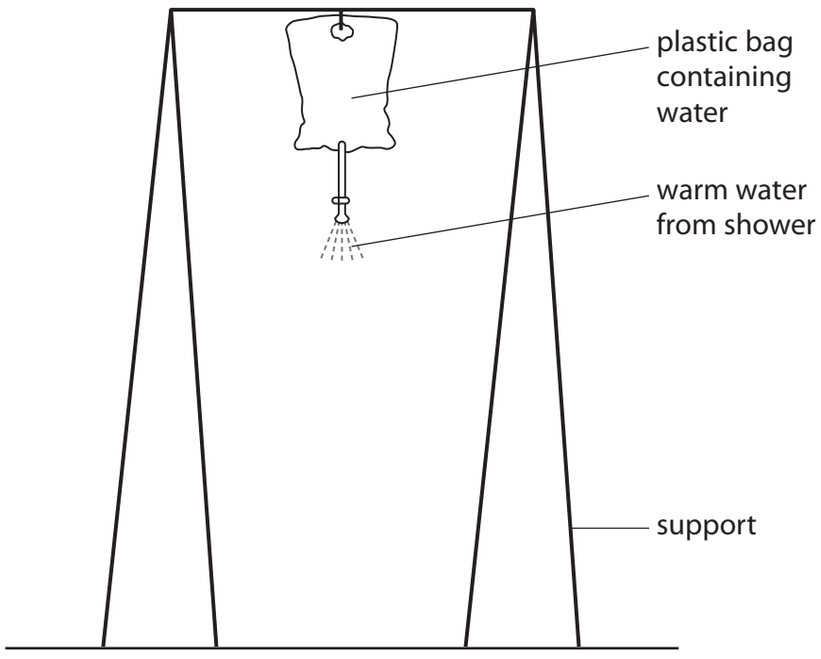
(ii) Calculate the efficiency of the battery charger.

(2)

efficiency of the battery charger = ... %

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(c) The following arrangement is used as a solar powered shower.



The bag is left out in the sunlight during the day.

(i) Explain what colour the bag should be to heat the water to the highest temperature.

(2)

.....

.....

.....

.....

(ii) On a sunny day the bag is filled with cold water.
Explain why the temperature of the water increases and then stays constant.

(3)

.....

.....

.....

.....

.....

.....

(Total for Question 4 = 10 marks)

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Using electricity

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

An electric current is the rate of flow of

(1)

☒ **A** atoms

☒ **B** charge

☒ **C** voltage

☒ **D** watts

(b) An electric kettle is connected to a mains voltage of 230 V.
The current in the kettle is 12 A.

Calculate the power of the kettle.

(2)

power of the kettle = ... W

(c) A television has a power of 400 W.
The cost of 1 kW h of electrical energy is 15p.

Calculate the cost of using the television for 10 hours.

(3)

cost of using the television for 10 hours = ... p

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*(d) Some students found this information about an energy saving lamp and a filament lamp that give out almost the same amount of light.

energy saving lamp



power = 15 W

cost = £1.50

lifetime = 10 000 hours

produces 20 J of light energy for each 100 J of electrical energy supplied

filament lamp



power = 60 W

cost = £0.30

lifetime = 1 000 hours

produces 5 J of light energy for each 100 J of electrical energy supplied

Describe the advantages and disadvantages of each type of lamp.

(6)

(Total for Question 5 = 12 marks)

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Solar System and beyond

6 (a) The Sun is at the centre of our Solar System.

(i) Complete the following sentence.

(1)

Our Solar System is near the edge of a galaxy called the .....

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

When the Sun nears the end of its life it will become a

(1)

☒ **A** black hole

☒ **B** neutron star

☒ **C** supernova

☒ **D** white dwarf

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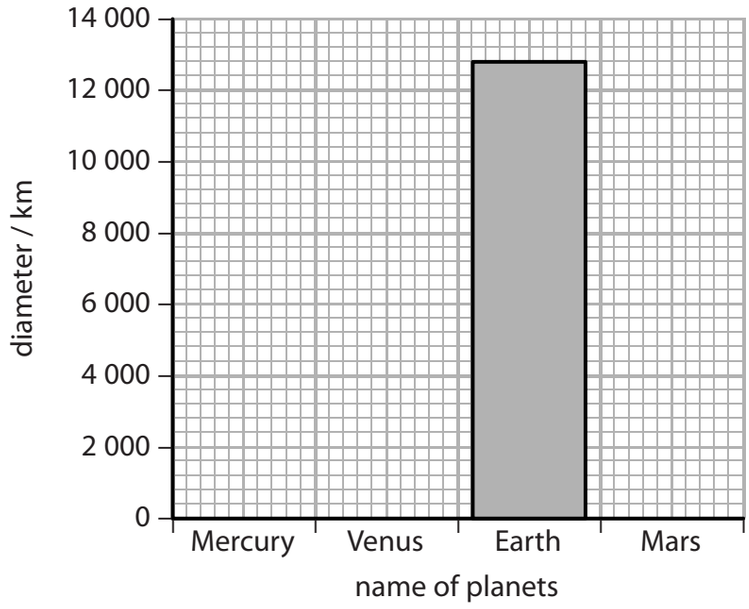
(b) The table gives information about the diameters and distances of the four planets closest to the Sun.

planet	distance from the Sun / AU	diameter of the planet / km
Mercury	0.39	4 900
Venus	0.72	12 100
Earth	1.00	12 800
Mars	1.52	6 800

(i) Put the information about the diameter of the planets on to the bar chart.

The diameter for Earth has been done for you.

(2)



(ii) The distance of the planets from the Sun has been given in Astronomical Units (AU).
1 AU is 150 000 000 km.
Calculate the distance of Mars from the Sun in kilometres.

(2)

distance of Mars from the Sun = ... km

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*(c) For many years scientists have searched for evidence of intelligent life in our Solar System and in the rest of the Universe.

Describe the methods scientists have used to help with this search in both our Solar System and the rest of the Universe.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2013

GCSE Physics (5PH1F)
Paper 01

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- For questions worth more than one mark, the answer column shows how partial credit can be allocated. This has been done by the inclusion of part marks eg (1).
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

Question Number	Answer	Acceptable answers	Mark
1(a)(i)	☒ **B** seven		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	☒ **C** red, orange, yellow		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)	ultraviolet → detecting forged bank notes gamma rays → detecting cancer microwaves → cooking three correct (2) one or two correct (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)(i)	a suggestion from any **two** of the following: (areas of the hand) show • Patches / (shaded) areas / brightness / colour(s) (1) • Indication of temperature / heat (1)	blood flow / veins / arteries / named part of hand thermal / hot / cold / warm / cool / hotter / colder / warmer / cooler any colour identified as hot or cold / any part of the hand identified as hot or cold (2) **Ignore** germs / bacteria / nerves	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)(ii)	an explanation linking **two** of the following: X-rays {mutate / damage / harm / ionise} cells or DNA (1) the {energy / frequency / wavelength / penetration} is different (1) Correctly identified difference (1)	 {kills/destroys} cells / causes cancer / tumours / ionising Penetrates the skin / body x-rays have {more energy / high(er) frequency / {short(er) / low(er)} wavelength / great(er) penetration} (2) RA for infrared **Ignore** power	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	☒ **A** ultrasound waves have a frequency above 20 000 Hz		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	☒ **C** sonar		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	a description including any **two** of the following: • (ultrasound waves / pulses) go down (through the water) (1) • (ultrasound waves are) reflected **off fish** (1) • (reflected ultrasound waves) are received by boat (1) • time delay (shows how deep fish are) (1)	 on diagram, wave or ray indicated as downwards idea of wave moving towards or hitting fish on diagram, waves or rays reflected **off fish** idea of wave bouncing **off fish** signal is timed **ignore** fish emitting ultrasound	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	(number of waves =) 5 (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	**Either** 60 ÷ 5 (1) **or** 60 ÷ (their answer to 2(b)(i)) (1)	12 (cm) **or** ecf from number of waves	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)	Substitution 1.7 x 8 (1) Evaluation 14 (cm/s) (1)	 13.6 (cm/s) give full marks for correct answer, no working Power of 10 error max. 1 mark.	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	☒ C on a screen		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	Explanation linking the following:- (measure) distance / length / from / line (1) lens to image / screen / focal point (1)	 how far away use ruler / tape measure measure u(object distance) and v(image distance) calculate focal length using $1/u + 1/v = 1/f$ (measure) from lens to image (2)	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	A description including the following: • magnifies • the image • refracts the light	 brings nearer / zooms in / looks closer / makes bigger / enlarges intermediate / real image	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	☒ B energy		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)(i)	Substitution v = 1920/6.0 (1) Evaluation (1) 320 (m/s)	 300 (m/s) give full marks for correct answer, no working (2) Power of 10 error max. 1 mark.	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(c)(ii)	Suggestions including the following: • recognition of any difference in speed / velocity (1) • correct difference in speed (1)	e.g. sound travels faster / quicker than light (1) c>v / v<c / c>320 (m/s) Light travels (much) faster (2) RA **Ignore** 'sound takes longer' or other references to time.	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)	**light** energy (1) → electrical energy (1) → **chemical** energy	These answers must be in the correct order	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	350 (J)	400 – 50 (J)	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	Substitution 50 ÷ 400 (1) or $\frac{50 \times 100}{400}$ (%) Evaluation 13(%) (1)	12.5(%), 0.125, 0.13 or 1/8 Give full marks for correct answer, no working	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)(i)	An explanation linking the following points: black (1) (because) (good) absorber (of thermal radiation) (1)	{absorbs / takes in} heat radiation **ignore** references to: attract good emitter light dark / darker	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)(ii)	an explanation linking any **three** of the following points: • (bag / water) absorbs {thermal energy / heat / radiation} (1) • (bag / water) {radiates / emits} {thermal energy / heat / radiation} (1) • more heat radiated at higher temperature (1) • input and output are balanced (at steady temperature) (1)	idea of energy input e.g. “sun heats the bag up” idea of energy output idea of more heat lost (to surroundings)at higher temperature “absorbing heat at same rate as radiating heat” (3) **ignore** (sun) light / rays	**(3)**

Question Number	Answer	Acceptable answers	Mark
5(a)	☒ **B** charge		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)	Substitution 12 x 230 (1) evaluation 2800 (W) (1)	2760 (W) give full marks for correct answer, no working Power of 10 error max. 1 mark.	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(c)	Conversion 0.4 (kW) (1) Substitution 0.4 x 10 x 15 (p) (1) or 0.4 x 10 x 0.15 (£) Evaluation 60(p) or £0.6 (1)	give marks for correct answer, no working 60(p) or £0.6 (3) 60,000(p) or £600 (2) 6 to any other power of 10 (1) (400/40/4) x 10 x (15/0.15) gains one mark if no mark can be awarded for evaluation.	**(3)**

<table>
<tr><th colspan="2">Question Number</th><th>Indicative Content</th><th>Mark</th></tr>
<tr><td>QWC</td><td>*5(d)</td><td>A discussion including some of the following points
<table>
<tr><th>Energy saving lamp</th><th>Filament lamp</th></tr>
<tr><td>Advantages
• Saves energy / uses energy more efficiently
• Cost efficient
• Lasts longer
• Lower power (needed)
• Less fossil fuels burnt
• Cool to touch
• Efficiency 20%
• Lasts 9000 hours longer
• Lasts 10 times longer
• Produces 4 times as much light energy for every 100J of electrical energy supplied.
• More readily available

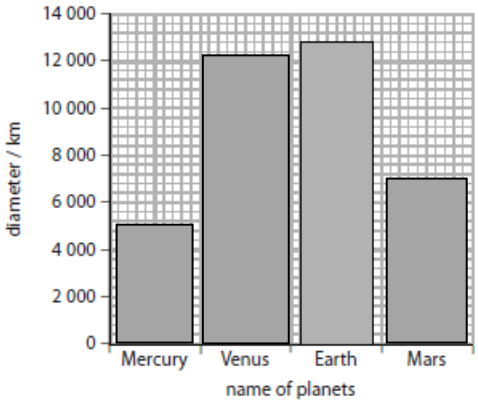
Disadvantages
• Higher initial cost
• May contain harmful gases
• Takes longer to reach maximum brightness
• Not such a bright light
• Costs 5 times as much
• Costs £1.20 more</td><td>Disadvantages
• Wastes more energy
• Less efficient
• Shorter lifetime
• Higher power (needed)
• More fossil fuels burnt
• Gets very hot
• Only 5% efficient
• Wastes 95% of energy supplied
• Uses 4 times as much power
• Less readily available

Advantages
• Costs less to buy
• Do not contain harmful gases
• Lights immediately
• Bright light</td></tr>
</table>
Table of information given in the question
<table>
<tr><th>Energy saving lamp</th><th>Filament lamp</th></tr>
<tr><td>power =15 W</td><td>power =60W</td></tr>
<tr><td>Cost = £1.50</td><td>Cost = £0.30</td></tr>
<tr><td>Lifetime = 10 000 hours</td><td>Lifetime = 1000 hours</td></tr>
<tr><td>Produces 20J of light energy for every 100J of electrical energy supplied</td><td>Produces 5J of light energy for every 100J of electrical energy supplied</td></tr>
</table>
</td><td>(6)</td></tr>
</table>

Level	**0**	No rewardable content	
1	**1 - 2**	• A limited description of one advantage or one disadvantage e.g. energy saving lamps last a long time/ filament lamps get very hot **OR** A correct value quoted from information with no comparison. • The answer communicates ideas using simple language and uses limited scientific terminology • Spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple description of two different advantages / disadvantages e.g. energy saving lamps cost more but last longer / filament lamps have a short life time and use more power **OR** Correct values quoted from table and used to provide two comparisons without calculations • The answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • Spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed description of two different advantages / disadvantages using a **quantitative** comparison. e.g. energy saving lamps cost 5 times more but last 10 times longer. / Energy saving lamps produce 4 times as much light energy for every 100J of electrical energy supplied and are much more efficient. / Energy saving lamps last 9,000 hours longer than and they use less power. • The answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • Spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	Milky Way	Accept any spelling	**(1)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	☒ **D** white dwarf		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)(i)	 Mercury 4 900 km Venus 12 100 km Mars 6 800 km Three correct (2) One or two correct (1) + or – one square Judge by eye		**(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)(ii)	Correct information from table 1.52 (1) Conversion to kilometres (1.52) x 150 000 000 (1)	Seen anywhere in the answer Incorrect information shown to be used correctly (1) Correct answer, no working scores full marks 228 000 000 / 2.28 x 10^8 (km) 228 to any power of 10, allow 1 mark if no other mark awarded. 225 000 000 / 2.25 x 10^8 (km), allow max 1 mark if no working shown.	**(2)**

Question Number		Indicative Content	Mark
QWC	***6(c)**	A description including some of the following points In Solar System • Use of telescopes • Search for evidence of conditions needed for life e.g. water/oxygen/bacteria on other planets • Manned missions (to the Moon) • Unmanned missions/probes to other planets e.g. Mars, Jupiter, Saturn, Mercury • Landers / robots / rovers sample soil • Information transmitted back to Earth Throughout the Universe • Search for extra-terrestrial intelligence (SETI) • Use radio telescopes • Search for (regular pattern of) radio signals • Search for other planetary systems • Discovery of other planetary systems (capable of supporting life) • Broadcasting signals/ sending out messages (to extra terrestrial intelligences)	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited description giving a (named) way of searching for evidence e.g. SETI **OR** using telescopes **OR** send messages to space **OR** spacecraft • The answer communicates ideas using simple language and uses limited scientific terminology • Spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple description of any TWO of the searches for evidence e.g space probes go to other planets and telescopes are used **OR** radio telescopes and looking for radio waves from space. • The answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • Spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed description of searches for evidence within **AND** outside the solar system e.g. Unmanned space probes go to other planets and radio telescopes search for radio signals from space. • The answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • Spelling, punctuation and grammar are used with few errors	

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Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

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 ▶

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P 4 1 9 5 8 A 0 1 2 0

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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

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

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

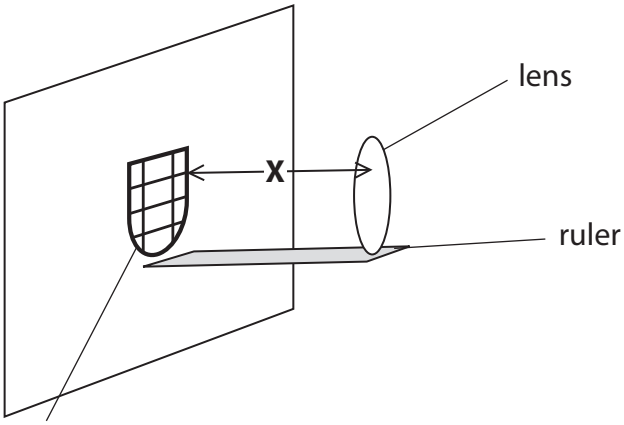
Answer ALL questions.

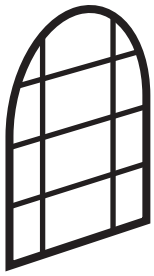
Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Lenses and waves

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

Not to scale





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.

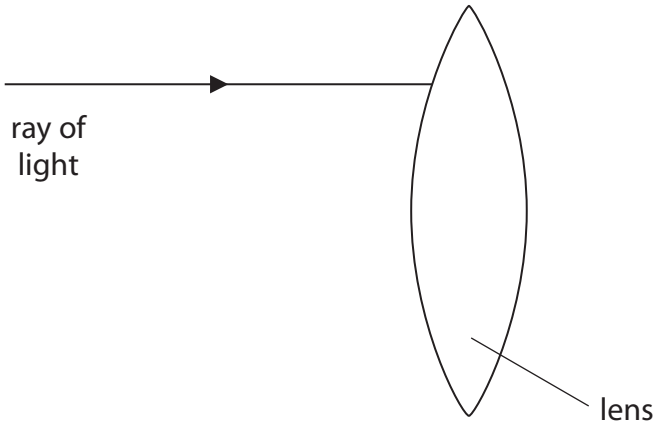
(2)

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

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(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)

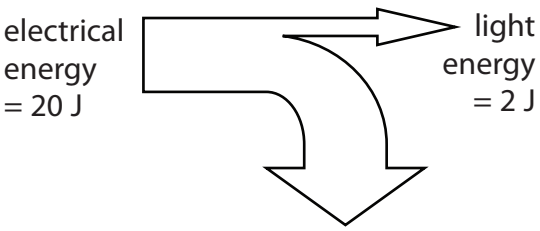
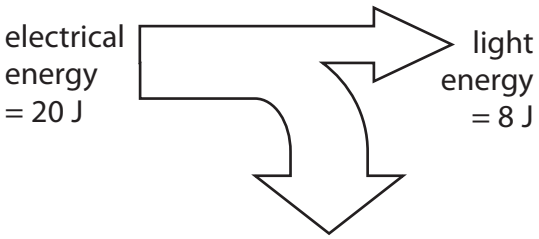
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(b) Many appliances are sold with an energy efficiency rating.

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  	energy transfer in one second 

(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)

.....

.....

.....

.....

(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)

.....

.....

.....

.....

(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.

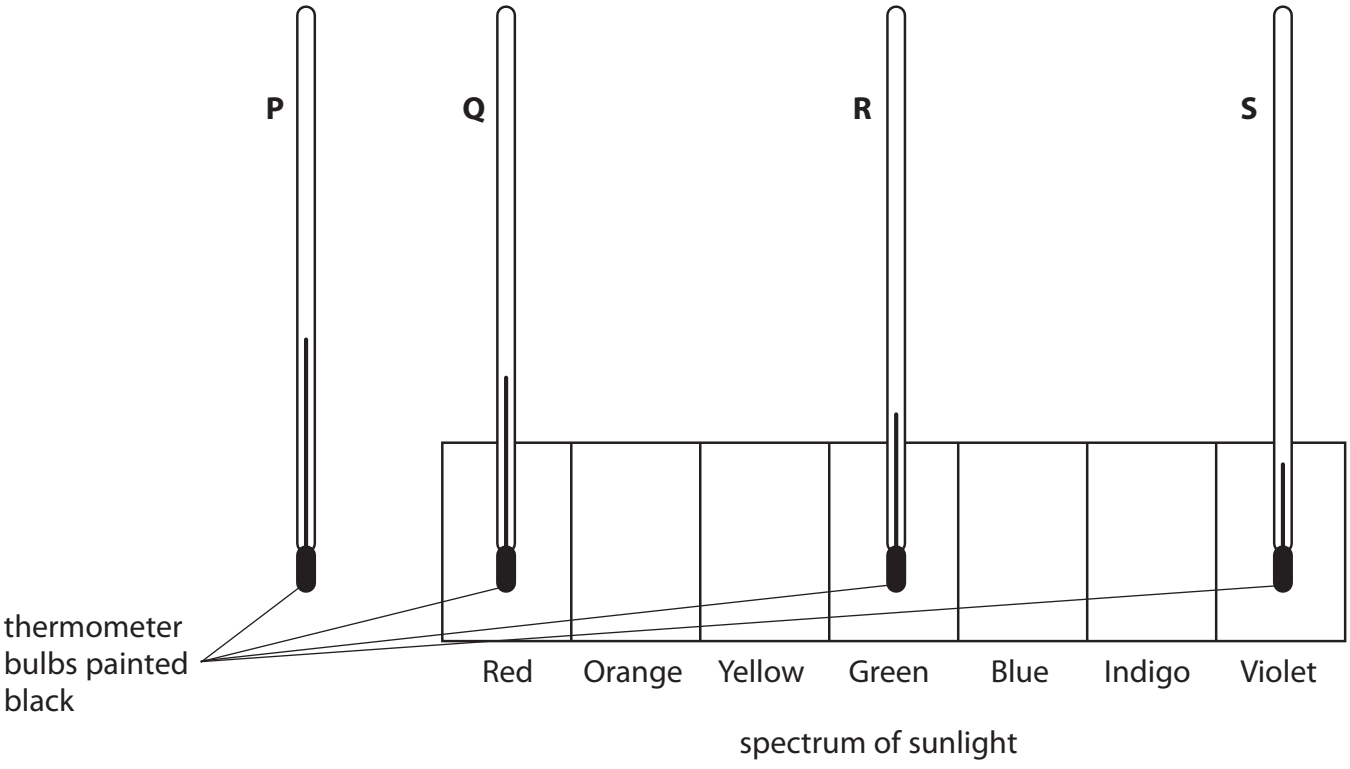
The table shows some of the readings on the thermometers in the shade.

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)

.....

.....

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(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)

.....

.....

.....

.....

(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

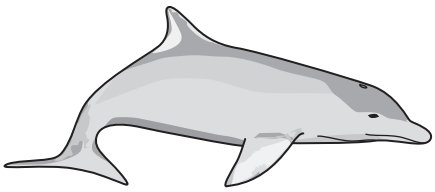
(ii) A dolphin is near to a group of fish.

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

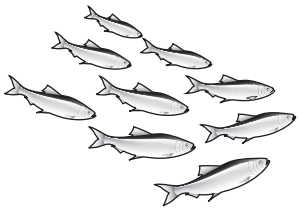
You may add to the diagram to help with your answer.

(3)

DOLPHIN

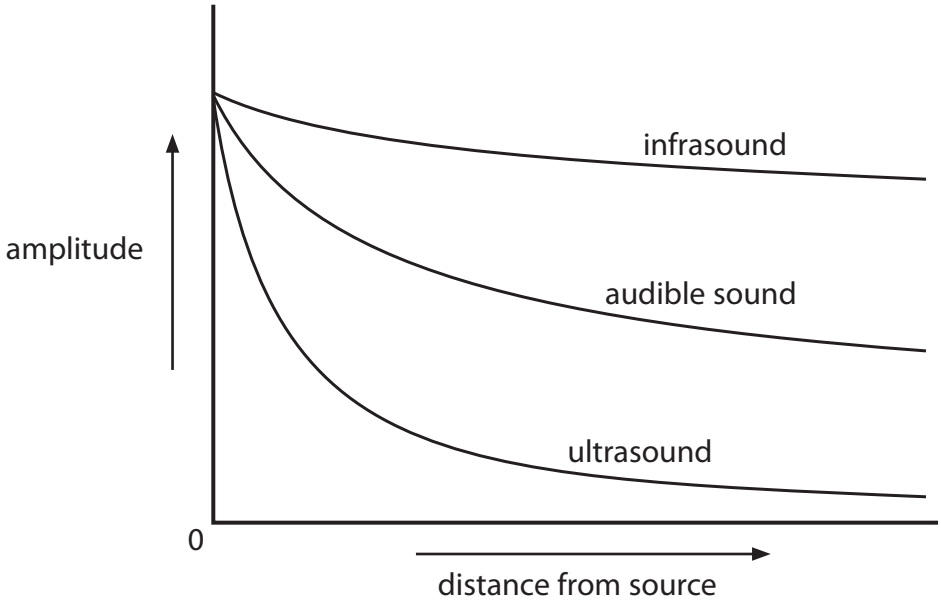


FISH



(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)

.....

.....

.....

(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

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(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

.....

.....

.....

(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)

.....

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(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)

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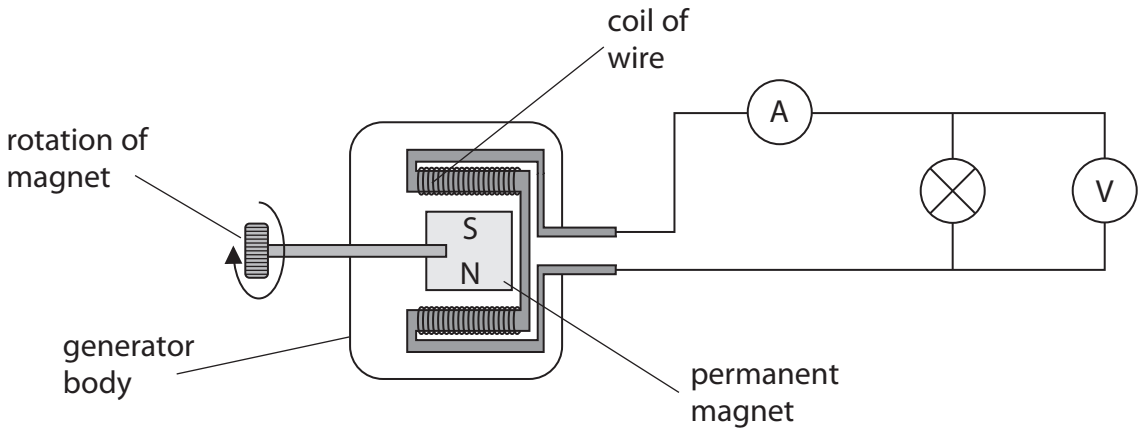
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(Total for Question 5 = 12 marks)

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 .....

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(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)

*(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)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

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Question Number	Answer	Acceptable answers	Mark
1(a)(i)	A the focal length (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	smaller than (1) real (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)	• Any (more or less) straight ray which changes direction inside the lens (1)	Ray does not need to touch far side. Allow slight discontinuities Ignore any ray drawn beyond the 2nd surface and any reflected ray(s). Ignore any extra incident rays.	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(c)	substitution into given equation (1) 1.3 x 300 000 evaluation (1) 390 000 (km)	Power of 10 error max 1 mark 3.9×10^5 (km) 2 marks for correct numerical answer with no working shown Ignore any unit given by candidate.	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(d)	D energy and information (1)		**(1)**

Total for Question 1 = 7 marks

Question Number	Answer	Acceptable answers	Mark
2(ai)	(Bow and arrow:) kinetic (1) (Electric kettle:) heat (thermal) (1) (Microphone:) sound (1)	Heat/thermal	**(3)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	Any **one** from (transferred into) {thermal/heat/sound}(energy) (1) (Energy) is dissipated (1)	Do not accept light energy or it disappears goes into surroundings/air (energy) is wasted/lost	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	12 (J) Ignore any unit given by candidate.	20 - 8 (J)	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	An explanation linking any **two** of • (For the) same amount of {electrical/supplied} (energy/power) (1) • (CFL/it) has a greater output (of light energy) (1) • (CFL/it) wastes less (electrical energy) (1)	Same input (energy) gives out/produces more {light/useful} (energy) Do not accept more energy is used in the (CFL/it) Ignore brightness. (CFL/it) produces less thermal/heat (energy) Accept explanations using data from the energy transfer diagrams as comparisons eg (CFL/it) is four times as efficient gains both marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(c)	An explanation linking • dissipating heat (1) • at same (rate)/as quickly as energy is being supplied (1)	{gives out/radiates/conducts/ convects /loses /produces} {heat/thermal/ energy} gives out as much energy/power as it takes in(each second) Gains both marks If no other marks scored: There is a constant current/ steady flow of energy into the heater gains one mark Ignore refs to thermostat	**(2)**

Total for Question 2 = 9 marks

Question Number	Answer	Acceptable answers	Mark
3(a)	18 (°C) (1) Ignore any unit given by candidate.		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	(black is the) best absorber (of radiation/heat)(compared to other colours) (1)	(Black/it) absorbs more (Black/it) is a good absorber (of radiation/heat) (black is) good at taking in (radiation/heat) Ignore (black is a) good emitter Ignore light. Reject black attracts heat/radiation	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	• Heating effect/temperature greatest at/beyond red (1) • (There is) radiation beyond red (end of spectrum)(1)	(idea of) different colours have different heating effects (Radiation from) sunlight causes a heating effect accept reverse argument Infrared/IR (beyond red end of spectrum)	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(iii)	Any **one** from • To check the thermometers produce the same readings/ temperature (under the same conditions) (1) • To show that temperature changes.	(To check) they were all at the same temperature (before starting the experiment.) To be able to make a comparison (between shade and light) (To allow them to carry out a) fair test	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)(i)	C damage to the eyes (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)(ii)	D all three signals arrive at the same time (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)iii	Description linking **one** of the following pairs: • security marking (1) • ink absorbs UV and re-radiates (visible) light (1) • fluorescent lamps (1) • coating absorbs UV and re-radiates (visible) light (1) • genuine bank notes (1) • watermark absorbs UV and re-radiates (visible) light (1) • disinfecting water (1) • UV kills bacteria (1) • sun beds (1) • UV absorbed by (melanin in) skin (1) Any suitable use gains 1 mark Any suitable use + detail gains 2 marks	 invisible ink/smart water glows under UV (outside of) lamp glows when hit by UV forgeries/fake bank notes/passports/fingerprints/ body fluids etc markings glow under UV tanning beds tans the skin /the body e.g. disco lighting (1) makes clothing glow (1)	**(2)**

Total for Question 3 = 9 marks

Question Number	Answer	Acceptable answers	Mark
4 (ai)	D ultrasound waves (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
4 (aii)	Any 3 from • emits (high frequency/ultra) (sound)(1) • (sound is) reflected (off fish) (1) • (reflection) detected by Dolphin (1) • dolphin (estimates) time between (sending and receiving) sounds (1) • dolphin is able to change time into (estimate of) distance (1)	Makes/sends out/produces (ultra sound/signal/wave) Uses 'high frequency sound' is insufficient (sound) bounces off (fish) or echoes towards dolphin 1st three marks can be scored on the diagram. ie unless stated otherwise, assume any waves/rays starting at dolphin are ultrasound. Rays do not need to be straight	**(3)**

Question Number	Answer	Acceptable answers	Mark
4 (b)	An explanation including: • Infrasound (1) Plus one from: • Decrease/change in amplitude is least (1) • can be detected/'heard' further away (1)	Marks are independent Stays the biggest/stays high. Has a bigger amplitude would travel the furthest/further	**(2)**

Question Number	Answer	Acceptable answers	Mark
4 (ci)	B seismic waves (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
4 (cii)	(there is a) difference/change in density (1)	more/less/too dense (reach a) boundary (between different materials) Ignore 'the waves cannot travel through liquids/oil'	**(1)**

Question Number	Answer	Acceptable answers	Mark
4 (d)	Substitution into correct equation(1) v = 15 x 125 Evaluation (1) 1875 Unit (1) m/s	Power of 10 error max 1 mark for numerical answer 2 marks for correct numerical answer even with no working shown ms^{-1} **not** mps 1.875 km/s or 6750 km/h gain 3 marks If numerical answer incorrect, accept any correctly-written unit of speed: eg **k**m/s or km/hr or miles per hour / mph	**(3)**

Total for Question 4 = 11 marks

Question Number	Answer	Acceptable answers	Mark
5(a)	D the Universe (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)	(nebula) main sequence (star) (1) AND red giant white dwarf (1) All three in correct order for 2 marks	Red Giant White Dwarf (Main sequence) (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(c)i	infrared (radiation)/(rays) (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(c)ii	An explanation linking any two from • above the clouds / no clouds/ no weather (1) • image is clearer/more detailed/ not distorted/not blurred (1) • no light pollution (1) • (some) telescopes use gamma/ X-rays/ultraviolet /infrared/microwaves (1) • no absorption (by atmosphere) of gamma/ X-rays/ultraviolet /infrared/ microwaves (1)	Credit to be given for stating that all telescopes would be better in space, but size and weight may exclude e.g. Jodrell Bank from space. no {air/dust/pollution} wider field of view/ can use anytime IGNORE 'see further' IGNORE 'it is closer (to the stars/planets)' IGNORE: references to improving understanding / knowledge of space	**(2)**

Question Number		Indicative Content	Mark
QWC	***5(d)**	A description including some of the following points • improved QUALITY eg higher or better magnification/ detail/resolution or clearer/brighter image **OR** MORE INFORMATION (than with naked eye) of image/data eg new planets/stars/nebulae/pulsars (This could be extra detail for greater magnification/resolution only) • detection of (non-visible) electromagnetic WAVES eg X-ray / UV / IR/ radio • TECHNOLOGY that enable collection of more data eg reflecting telescope/arrays ***and/or*** additions eg computer-aided /photographic connections or larger (objective) lens/mirror • POSITION of telescopes – eg orbital/outside atmosphere/on top of mountains/away from atmosphere/rays not absorbed/obscured/scattered by atmosphere. Ignore 'Hubble' or 'Compton'.	**(6) Exp**
Level	**0**	No rewardable content	
1	**1 - 2**	a limited description e.g. mention of any one example such as "magnifies stars/planets" OR "discovering new planets/stars" • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3- 4**	• a simple description e.g. mention of either two of the improvements **OR** extra detail about one of the improvements eg improvement **plus** example (ie Magnifies planets *so that craters/mountains may be seen)* • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description e.g. mention of three (or more) improvements **OR** two improvements **plus extra detail about one of them (ie Telescopes in space can detect X-Rays *that would be absorbed by the atmosphere*)** • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Suitable extra detail shown in italics in examples above)

Total for Question 5 = 12 marks

Question Number	Answer	Acceptable answers	Mark
6 (ai)	Substitution (1) 1.5 x 6 Evaluation (1) 9 (W) Ignore any unit given by candidate.	Power of 10 error max 1 mark Give full marks for correct answer with no working shown	**(2)**

Question Number	Answer	Acceptable answers	Mark
6 (aii)	• More turns on the coil (1) • More powerful/stronger magnet(s) (1)	Wrap coils on iron (core/former)/ more coils/twists/loops. Bigger coil is insufficient. More magnets. Bigger/larger magnet is insufficient. Ignore increase speed of rotation	**(2)**

Question Number	Answer	Acceptable answers	Mark
6 (aiii)	A description including • in one direction only for DC (1) • reversing direction for AC (1)	 'DC goes straight' is insufficient AC switches/changes direction OR moves to and fro 'AC goes different ways' is insufficient. Diagram with labelled arrows could get 2 marks.	**(2)**

Question Number		Indicative Content	Mark
QWC	***6(b)**	A comparison including some of the following ideas • Transformers can be used or {voltages/currents} can be {changed/transformed} • AC (can transmit) at lower current/high(er) voltage • National Grid is (usually) over ground (DC cables (were) underground) • Less energy lost in transmission • National Grid system can supply to customers further away • Possible to create a grid linking power stations • More flexibility in voltage for consumer • Consumer can draw large(r) current • More flexibility in power drawn • Great(er) range of devices can be powered Ignore methods of electricity production	**(6)** **Exp**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited (maybe implied) comparison giving one fact e.g: AC can be at high(er) voltage OR the National Grid can supply houses not close to a power station/ further (away/than the New York system.) • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple comparison including two ideas which may be linked or not eg Nat. Grid can supply whole country and can be used for more appliances (than just lighting). e.g: AC can be transmitted further (than DC) (because it) wastes less energy • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed comparison including at least three ideas, with at least one direct link between two of them. • e.g. AC can be transmitted further (than DC) because AC can be transformed to {lower current/high(er) voltages}. OR AC can be transformed to {lower current/high(er) voltages}. Greater range of devices used. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for Question 6 = 12 mark

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Edexcel GCSE

Centre Number	Candidate Number

Physics/Science

Unit P1: Universal Physics

Foundation Tier

Thursday 8 November 2012 – 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 ▶

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P 4 1 7 6 3 A 0 1 2 0

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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

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

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

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Questions begin on next page.

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) The diagram shows a section of the electromagnetic spectrum.

Five parts of this have been named.

infrared	1	2	3	green	blue	indigo	4	ultraviolet

State the names of the other four parts, 1, 2, 3 and 4, in the spaces below.

(2)

Part 1 .....

Part 2 .....

Part 3 .....

Part 4 .....

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

Infrared radiation is used for

(1)

☒ **A** cooking

☒ **B** suntanning

☒ **C** curing cancer

☒ **D** sterilising water

(c) Describe how ultraviolet radiation is used in the detection of forged bank notes.

(2)

.....

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(d) Explain the difference in potential danger between ultraviolet radiation and infrared radiation.

(2)

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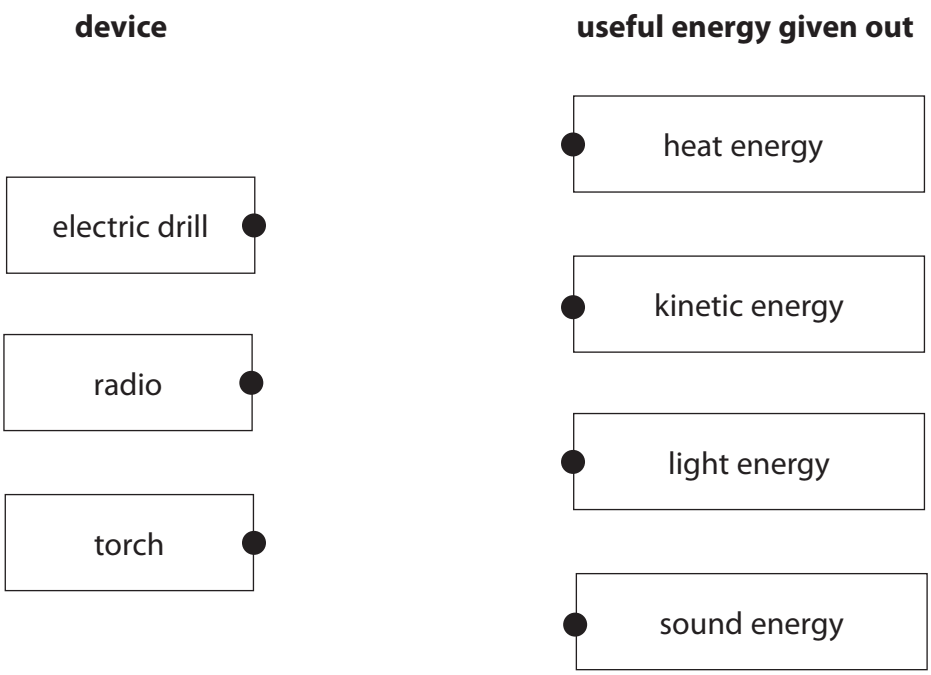
(Total for Question 1 = 7 marks)

Energy transfers

2 (a) An electric drill, a radio and a torch all convert electrical energy into other forms of energy.

(i) Draw one straight line from each device to the most useful form of energy that it gives out.

(3)



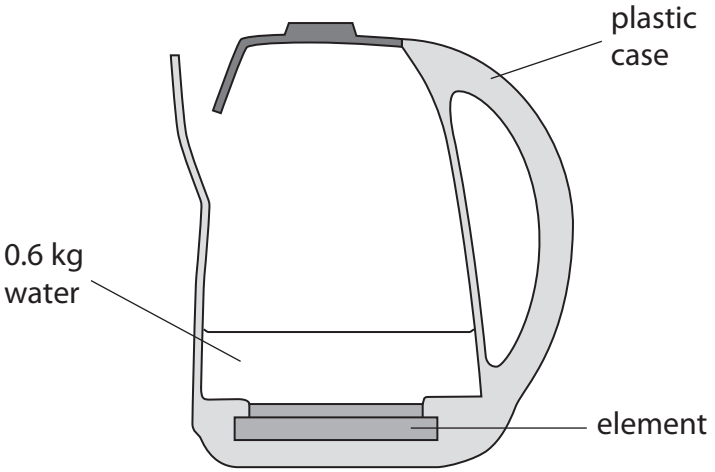
(ii) State the name of the one form of energy that is wasted by these devices.

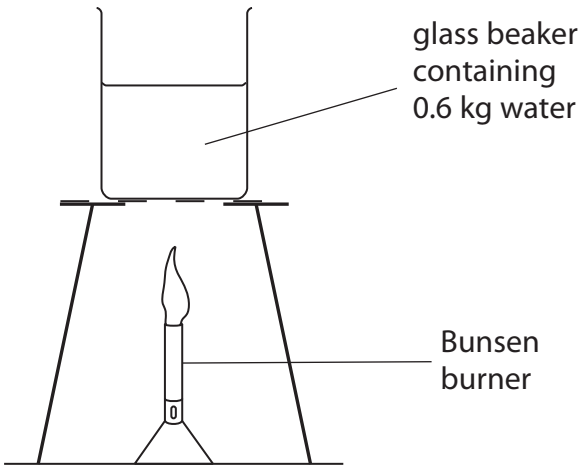
(1)

.....

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(b) The diagrams show two ways of heating water.





(i) The electric kettle is supplied with 2500 joules of energy each second.

The water in the kettle gains 2200 joules of heat energy each second.

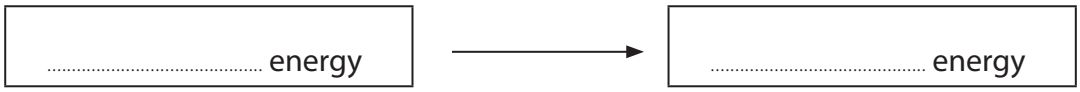
Calculate the amount of energy wasted each second.

(1)

energy wasted each second = ... J

(ii) Complete the diagram to show the main energy transfer that takes place when the Bunsen burner is used to heat the water.

(1)



(iii) Explain why heating the water using the kettle and the Bunsen burner waste different amounts of energy.

(2)

.....

.....

.....

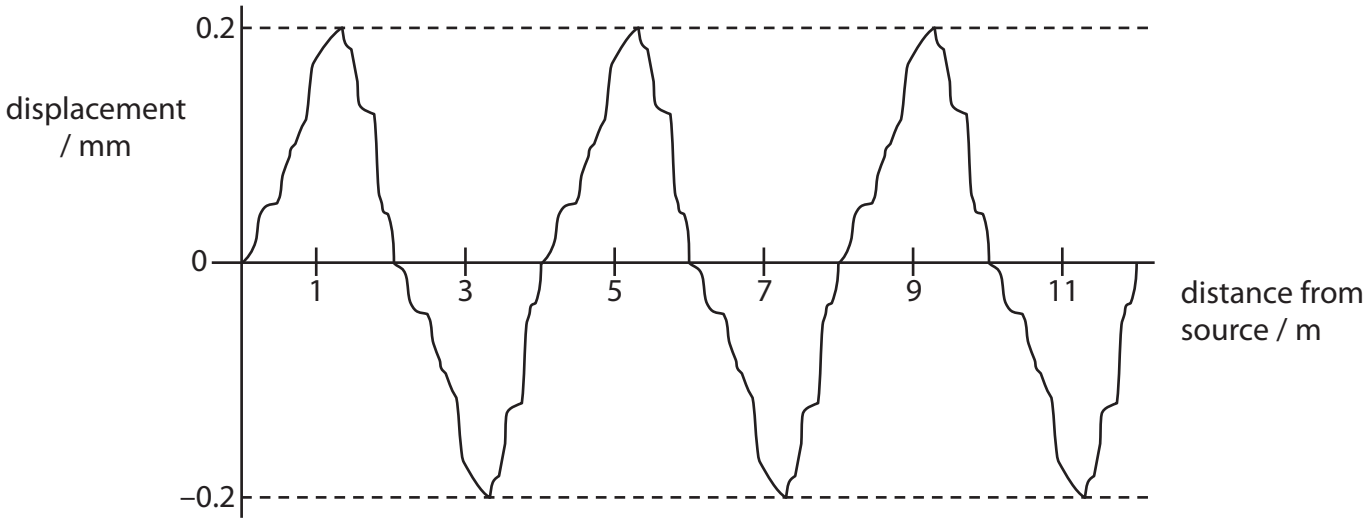
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(Total for Question 2 = 8 marks)

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Sound waves and music

3 (a) Here is a graph of a sound wave.



(i) Calculate the wavelength of this sound wave.

(2)

wavelength = ... m

(ii) A second sound wave has a longer wavelength but a smaller amplitude.

Sketch a graph of this second wave, on the axes above.

(2)

(b) (i) Sound is a longitudinal wave.

State another example of a longitudinal wave.

(1)

.....

(ii) Explain how a longitudinal wave is different from a transverse wave.

You may draw a diagram to help with your answer.

(2)

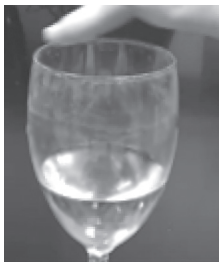
(c) Musical notes can be made by rubbing the top of a drinking glass with a wet finger.

The photographs show four different amounts of water in the glass.

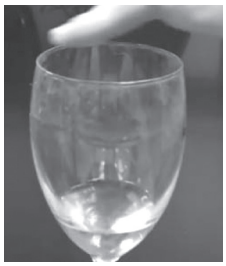
The frequencies of the musical notes produced with three amounts of water are shown.



1047 Hz



1174 Hz



1245 Hz



f Hz

(i) Which of these numbers could be the frequency, **f**, if it follows the same pattern?

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

(1)

- ☒ **A** 960
- ☒ **B** 1109
- ☒ **C** 1200
- ☒ **D** 1290

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(ii)

wavelength = speed / frequency

The speed of sound in air is 340 m/s.

A student listens to the sound from the glass when it contains the largest amount of water.

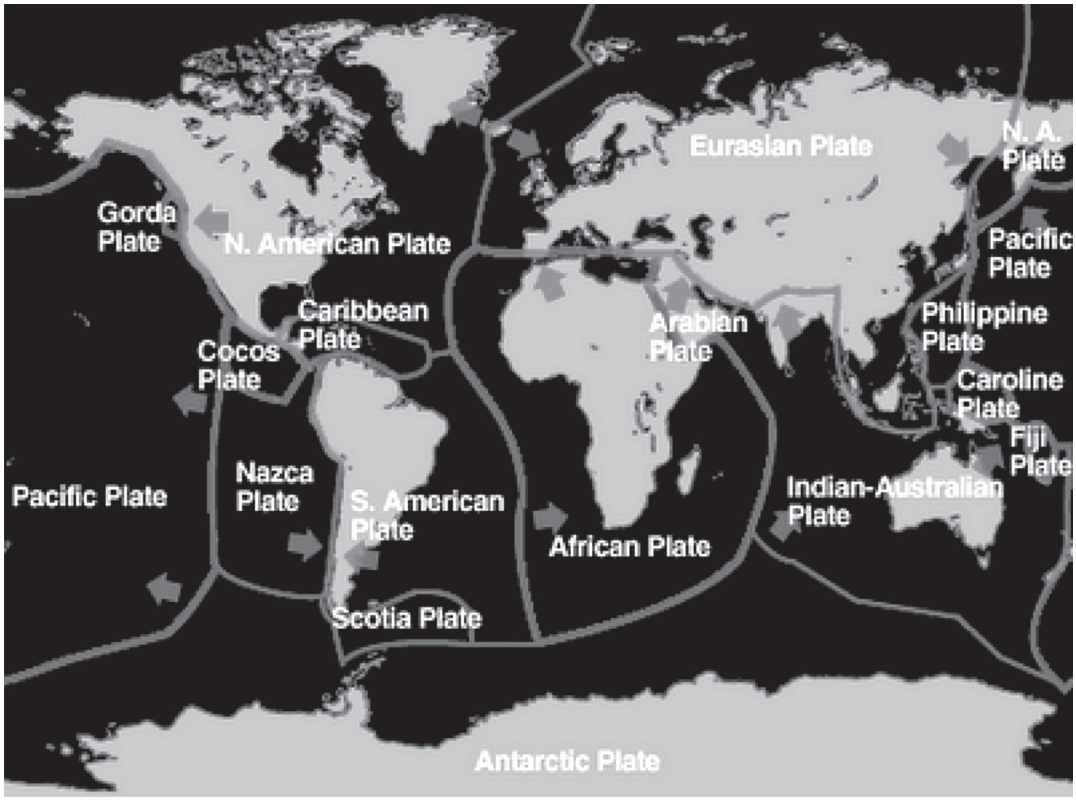
Show that the wavelength of the wave he hears is about 30 cm.

(3)

(Total for Question 3 = 11 marks)

Earthquakes

4 The diagram shows the plates which make up the Earth's outermost layer.



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

Earthquakes happen when plates

(1)

- ☒ **A** float on the mantle
- ☒ **B** rub against each other
- ☒ **C** move away from each other
- ☒ **D** erupt from volcanoes

(ii) Explain what causes the plates to move.

(2)

.....

.....

.....

.....

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

The instrument used to detect earthquakes is a

(1)

- ☒ **A** hydrometer
- ☒ **B** manometer
- ☒ **C** seismometer
- ☒ **D** thermometer

(c) Earthquakes produce P-waves and S-waves.

(i) Describe what can happen to these waves when they reach the boundary between the crust and the mantle.

(2)

.....

.....

.....

.....

(ii) A P-wave takes 200 s to travel a distance of 1200 km.

Calculate its speed in km/s.

(2)

speed of P-wave = ... km/s

(d) Explain why scientists find it difficult to predict when a tsunami may happen.

(2)

.....

.....

.....

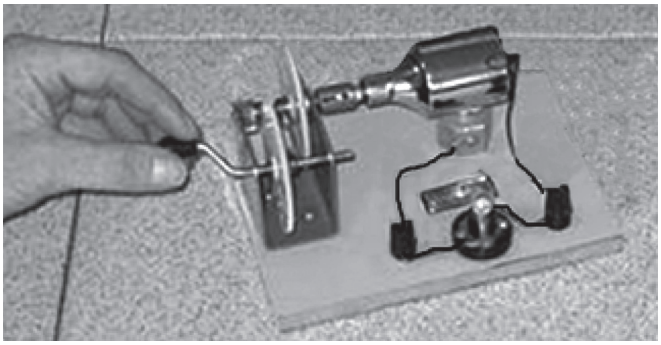
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(Total for Question 4 = 10 marks)

Generating electricity

5 The photograph shows a small generator.

When the handle is turned the current produced lights a lamp.



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

The current produced

(1)

- ☒ **A** usually comes from a battery
- ☒ **B** always has the same frequency
- ☒ **C** is always the same size
- ☒ **D** is usually alternating in direction

(ii) State the unit in which electric current is usually measured.

(1)

.....

(b) (i) Describe what happens inside the generator to produce the current.

(3)

.....

.....

.....

.....

.....

.....

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(ii) State **one** way in which the size of the current could be increased.

(1)

*(c) The National Grid is supplied with electricity from large-scale electrical generators.

These generators may be driven using different energy sources.

Compare the use of a non-renewable energy source with the use of a renewable energy source to produce electricity for the National Grid.

(6)

(Total for Question 5 = 12 marks)

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The Solar System

6 The diagram shows four moons which orbit Jupiter.



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

Jupiter is

(1)

- ☒ **A** a comet
- ☒ **B** a galaxy
- ☒ **C** a planet
- ☒ **D** a universe

(ii) Galileo used a new invention to observe these moons.

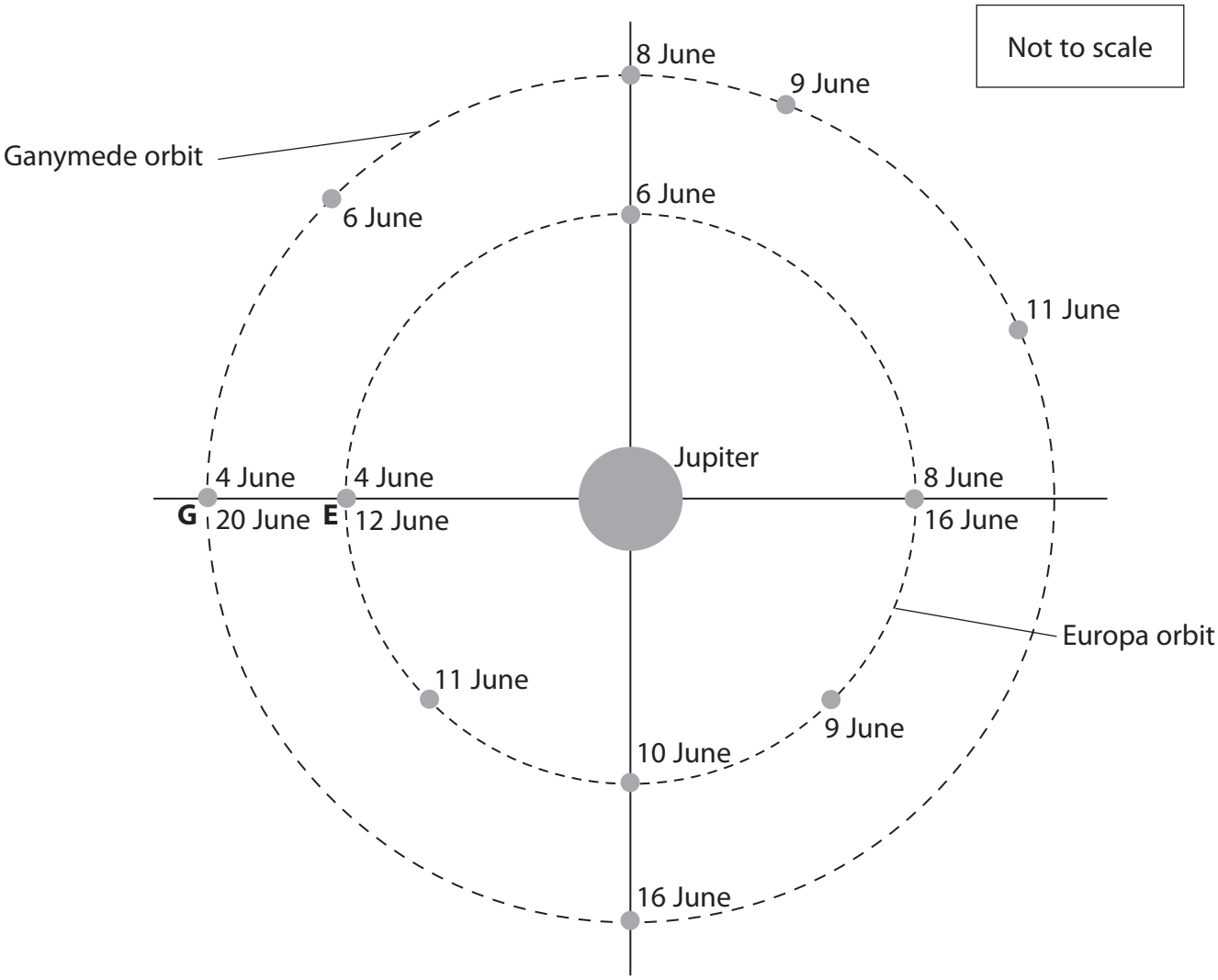
The invention he used was called a .....

(1)

(b) The diagram shows the moons Europa (**E**) and Ganymede (**G**) in orbit round Jupiter.

The radius of Europa's orbit is 671 000 km.

The radius of Ganymede's orbit is 1 070 000 km.



The positions of the moons on some dates are marked.

(i) On which one of the marked dates were the moons closest together?

(1)

.....

(ii) Use information from the diagram to calculate the time for Ganymede to complete one orbit of Jupiter.

(1)

time for one orbit = ... days

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(iii) Calculate the distance from Europa to Ganymede on 12 June.

(2)

distance apart = ... km

*(iv) Describe how the distance between Europa and Ganymede changes during three orbits of Europa.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

November 2012

GCSE Physics
5PH1F/01

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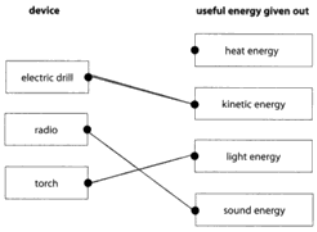
GCSE Physics 5PH1F/01 Mark Scheme – November 2012

Question Number	Answer	Acceptable answers	Mark
1(a)	1 red 2 orange 3 yellow 4 violet 1 mark for red **or** violet in correct place 1 mark for two of the three others in correct order		**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)	A		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(c)	• Idea of shining UV light on note (1) • genuine notes (makes them) glow **ORA** (1)	Scan / (put) under fluoresce/emit light/show symbol/Queen's head/markings	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(d)	An explanation including two of the following points: • (potential) danger increases with frequency (1) • UV has a higher frequency than IR (1) • UV is more dangerous **ORA**(1) • IR causes burns (1) • UV causes (skin)cancer(1)	danger is greater at higher frequency damages/ mutates cells IGNORE eye damage/sunburn	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	 drill → kinetic energy radio → sound torch → light	More than one line to or from a box gets no mark for that box.	**(3)**

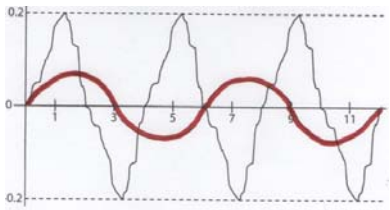
Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	heat/thermal/internal		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	300 / 2500-2200 (J)	Accept correct working with wrong answer	**(1)**

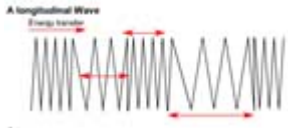
Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	chemical to heat/thermal/internal		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)(iii)	An explanation linking any two of the following: • Kettle insulated / beaker is not insulated (1) • kettle loses/wastes less heat or energy **ORA** (1) • element inside kettle / bunsen or flame open (to surroundings) (1)	Kettle is plastic/more closed/has a lid/keeps in heat or energy **ORA** kettle is more efficient **ORA** Kettle keeps in more energy = 2 marks **ORA** IGNORE references to gas/electricity or light/sound energy or speed of boiling	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	12/3 (1) 4 (m) (1)	the wave shown is for 3 wavelengths any correct ratio give full marks for correct answer, no working	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	all amplitudes smaller (1) all wavelengths longer (1)	Accept smaller peak to trough distance wherever it is drawn all wavelengths shown must be longer than original can be any shape must be at least half a wavelength shown 	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	{P-wave / ultrasound / infrasound / shock} (1)	P/primary/pressure (wave) **IGNORE** slinky/spring/push-pull	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	Any two from: vibrations different direction (1) In longitudinal (vibrations) move in same direction as {wave/energy} moves (1) In transverse (vibrations) move at right angles to direction {wave/energy} moves (1)	 In one is up and down, other is backwards and forwards / any two different motions  **AND**  in longitudinal (particles) move backwards and forwards  in transverse (particles) move up and down/ side to side 	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(c)(i)	B		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)(ii)	substitution (1) ie 340 / 1047 evaluation (to at least 2 sf) (1) ie between 0.32 and 0.33 (m) inclusive conversion of m to cm (1)	No **RA** If incorrect value chosen for frequency cannot get substitution mark but can get evaluation mark and conversion mark frequency (Hz) evaluation(m) 1290 0.26 1245 0.27 1200 0.28 1174 0.29 1109 0.31 960 0.35	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	B		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	An explanation linking two of the following: • (uneven) heat (from the core) (1) • convection (currents) (1) • (that are in) the mantle (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)	C		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)(i)	Description to include: • (they can be) reflected (1) • (and/or) refracted (1)	bounce off/back change direction/speed	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)(ii)	Substitution (1) 1200/200 Evaluation (1) 6 (km/s)	Power of 10 error max 1 mark give full marks for correct answer, no working	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(d)	An explanation linking • tsunamis are caused by underwater earthquakes / volcanic eruption (1) • are random/irregular (1)	Underwater movements of the plates / landslip into the sea / meteorite strike into the sea can happen at any time / do not know when it will happen	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	D		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	ampere(s), amp(s), A		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)(i)	A description linking magnet (1) (in/near) coil (1) (magnet/coil) spins/moves/turns (1)	 IGNORE handle turns	 **(3)**

Question Number	Answer	Acceptable answers	Mark
5(b)(ii)	Any one from the following: Increase strength of magnet (1) Increase number of coils/turns of wire (1) Increase speed of rotation (1)	 add another magnet / move magnets closer turn handle/magnet/coil faster IGNORE bigger magnet/coil/ generator / longer wire	**(1)**

Question Number		Indicative Content	Mark
QWC	***5(c)**	A comparison including some of the following points Non- renewable sources • coal, oil, gas and nuclear • coal, oil, gas are fossil fuels • fossil fuels will run out • fossil fuels burn and produce CO_2 • fossil fuels burn to produce atmospheric pollution • CO_2 contributes to global warming • are a more expensive source • Nuclear power stations do not produce CO_2 • Nuclear power produces radioactive waste • Radioactive waste is dangerous and difficult to store safely Renewable resources • Wind, waves, solar, biofuels, geothermal and hydroelectric • are a free/cheaper source • The energy source is unreliable • No (net) CO_2 produced • No atmospheric pollution (except biofuels) • Waves and hydroelectric cause environmental changes • Wind farms and solar panels give visual pollution • Wind farms can be built off shore Comparison • Fossil fuel power stations are cheaper to build than wind farms for the same power output • Coal, oil, gas and nuclear fuel will run out, wind, waves and sun will always be available • Fossil fuel power stations produce CO_2 which may increase global warming, renewable energy generators (wind farms) do not • Renewable energy generators have a free/cheaper source of fuel • fossil fuels have to be taken out of the ground • Nuclear power stations produce radioactive waste, which is dangerous, none of the other energy generators do this. • Wind, waves and sun are unreliable sources of energy but fossil and nuclear fuels are always available	**(6)**

Level	0	No rewardable content
1	1 - 2	• a limited statement about either renewable or non-renewable e.g. Coal is non-renewable **OR** renewable energy will not run out **OR** oil will run out • the answer communicates ideas using simple language and uses limited scientific terminology. • spelling, punctuation and grammar are used with limited accuracy.
2	3 - 4	• a simple comparison including 2 statements covering renewable and non-renewable e.g. Coal is non-renewable and solar power is renewable **OR** renewable energy sources will not run out and non-renewable sources do not pollute the atmosphere **OR** oil will run out, solar will not • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately. • spelling, punctuation and grammar are used with some accuracy.
3	5 -6	• a detailed comparison including at least 3 statements with a direct comparison between a renewable and a non-renewable source, at least one named e.g. Renewables will not run out but non-renewables like coal will. **OR** Coal is non-renewable. When it is burnt carbon dioxide is produced. Wind farms do not produce any carbon dioxide. **OR** Carbon dioxide is produced when coal is used. Wind farms do not produce any carbon dioxide. Wind farms are noisy. **OR** Oil will run out, solar will not. Oil causes air pollution • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately. • spelling, punctuation and grammar are used with few errors.

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	C		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	telescope	(astronomical/refracting/light) telescope **IGNORE** any other type of telescope	**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)(i)	4 (June)	4-6; 6-4 (UK/US dates) 20 (June); 20-6; 6-20	**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)(ii)	16 (days)		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)(iii)	1 741 000 (km) (2) **OR** 1 070 000 + 671 000 (km) (2) **OR** 399 000 + {2 x 671 000} (km) (2)	Power of 10 error max 1 mark Use of 1 070 000 and 671 000 (km)/ Use of 399 000 and 2 x 671 000 (km)/ 12 June marked correctly on the orbit for Ganymede/ answer of 399,000 with no working gets 1 mark	**(2)**

Question Number		Indicative Content	Mark
QWC	***6(b)(iv)**	A description including some of the following points reasons for the distance changing appreciation of a difference in time/speed/size of orbit smallest separation on 4/20th June smallest separation 399 000 km largest separation 1 741 000 km largest separation on 12/28 June moon separation increases after 4th June. distance between moons increases and then decreases as they orbit distance increased after 4 June which was smallest separation of 399 000 km Distance increases from a minimum on4th June to a maximum on 12th June, back to a minimum on 20th June and maximum on 28th June distance change is not linear	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description giving 1 relevant piece of information taken from the diagram e.g. Europa orbits in a shorter time **OR** The moons have different sized orbits **OR** Europa orbits in 8 days • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description giving either the size or the date of smallest or largest separation **OR** giving increase and/or decrease of separation e.g. The moons are closest on the 4th June **OR** Moon separation increases after 4th June **OR** the distance between the moons increases then it decreases • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description indicating an increase and decrease in separation plus a date or distance **OR** describes 3 orbits e.g. The distance between the moons increases till 12 June then it decreases **OR** the distance between the moons increases, then decreases, then increases again • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

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Centre Number	Candidate Number

Physics/Science

Unit P1: Universal Physics

Foundation Tier

Thursday 24 May 2012 – 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 ▶

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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

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

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

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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 ☒.

Scaring cats with ultrasound

1 Anna uses a device to keep cats away from her garden.
This device emits some ultrasound waves that cats do not like.



(a) Which of these could be the frequency of the ultrasound waves?

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

(1)

- ☒ **A** 23 000 Hz
- ☒ **B** 2300 Hz
- ☒ **C** 230 Hz
- ☒ **D** 23 Hz

(b) State another use for ultrasound waves.

(1)

.....

(c) Anna has good hearing but she cannot hear the ultrasound waves from the device. However, a cat can hear them.

Explain this difference.

(2)

.....

.....

.....

.....

(d) Anna finds a leaflet about how the device works.

- A cat approaches the device.
- Heat from the cat is emitted as infrared rays.
- The device detects these infrared rays.
- Then the device emits ultrasound waves.
- These waves scare the cat away.

(i) The speed of the ultrasound waves is 340 m/s.
The ultrasound takes 0.047 s to reach the cat.

Calculate the distance between the device and the cat.

distance (m) = wave speed (m/s) × time (s)

(2)

distance = ... m

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(ii) The infrared rays from the cat take much less than 0.047 s to reach the device.
The infrared rays and the ultrasound waves travel the same distance.

Suggest why the infrared rays take much less time than the ultrasound waves.

(2)

.....

.....

.....

.....

(Total for Question 1 = 8 marks)

Ionising radiations

2 A radioactive source emits three types of ionising radiation

alpha
beta
gamma

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

Radioactive sources emit radiation

(1)

☒ **A** all the time

☒ **B** at regular intervals

☒ **C** every few minutes

☒ **D** only when they are heated

(b) Use words from the box to complete the table.

(3)

atom	energy	molecule
particle	source	wave

radiation	type	transfer
alpha	particle	energy
beta	.....	energy
gamma	.....	.....

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(c) State **two** uses of gamma radiation.

(2)

.....

.....

.....

.....

(d) Stars can emit gamma waves and light waves.
Gamma waves and light waves are both parts of the electromagnetic spectrum.

Explain why it takes the same time for both of these waves to travel from the star to a space telescope.

(2)

.....

.....

.....

.....

(Total for Question 2 = 8 marks)

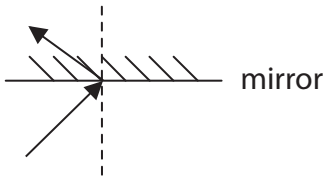
Visible light

3 Mirrors and lenses can be used in telescopes.

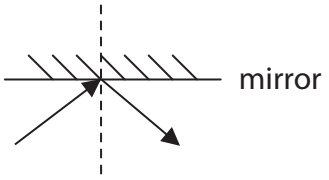
(a) Which diagram best shows what happens to a ray of light when it hits a plane mirror?

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

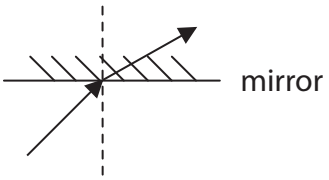
(1)



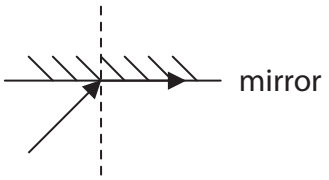
☒ **A**



☒ **B**



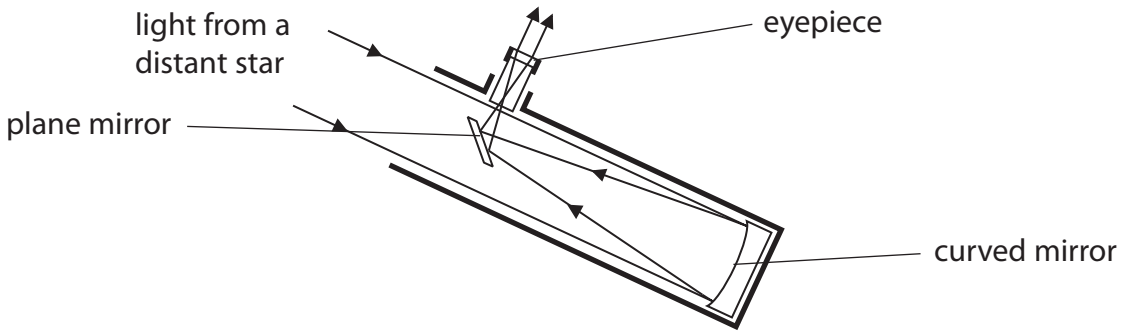
☒ **C**



☒ **D**

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(b) The diagram shows light rays in a reflecting telescope.



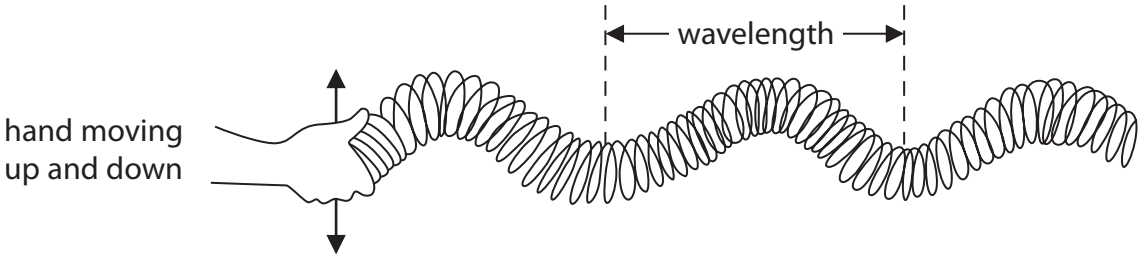
(i) Describe what the mirrors and the eyepiece do to the light rays to form an image of a distant star.

(3)

(ii) Explain an advantage of using a telescope instead of the naked eye to look at stars.

(2)

(c) Light travels through space as a wave.
A model of this type of wave can be made using a Slinky spring.
A Slinky spring is a long coil of wire like the one shown in the diagram.



(i) State the name of this type of wave.

(1)

.....

(ii) How could the movement of the hand be changed to make the amplitude of this wave bigger?

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

(1)

☒ **A** move up and down a smaller distance

☒ **B** move up and down at a faster rate

☒ **C** move up and down a bigger distance

☒ **D** move up and down at a slower rate

(iii) The wave shown in the model has a wavelength of 0.5 m and the frequency is 4 Hz.

Calculate the speed of the wave.

(2)

speed of wave = ... m/s

(Total for Question 3 = 10 marks)

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The power of television

4 Modern televisions use small amounts of power.

(a) Which of these describes power?

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

(1)

- ☐ **A** distance travelled per second
- ☐ **B** energy transferred
- ☐ **C** energy transferred per second
- ☐ **D** work done

(b) A television is connected to the 230 V mains.
When it is switched on, the current in the television is 0.25 A.

(i) Calculate the power consumption of the television when it is switched on.

(2)

power consumption = ... W

(ii) Describe what is meant by **current**.

(2)

.....

.....

.....

.....

(c) When the television is switched to standby, the power consumption falls to 0.5 W.

(i) State how this changes the current in the television.

(1)

.....

(ii) The cost of electricity is 26p per kW h.

Show that the cost of leaving the television on standby for 48 hours is less than 1p.

(3)

(iii) It is cheaper to switch the television off instead of leaving it on standby.

Suggest another reason why it is better not to leave the television on standby.

(1)

.....

.....

(Total for Question 4 = 10 marks)

Running like clockwork

5 The diagram shows Simon's clock.
Once a week, Simon turns a key to tighten the spring.
The spring uncoils slowly to keep the clock working.



(a) Which type of energy is stored in the tightened spring?

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

(1)

☒ **A** chemical energy

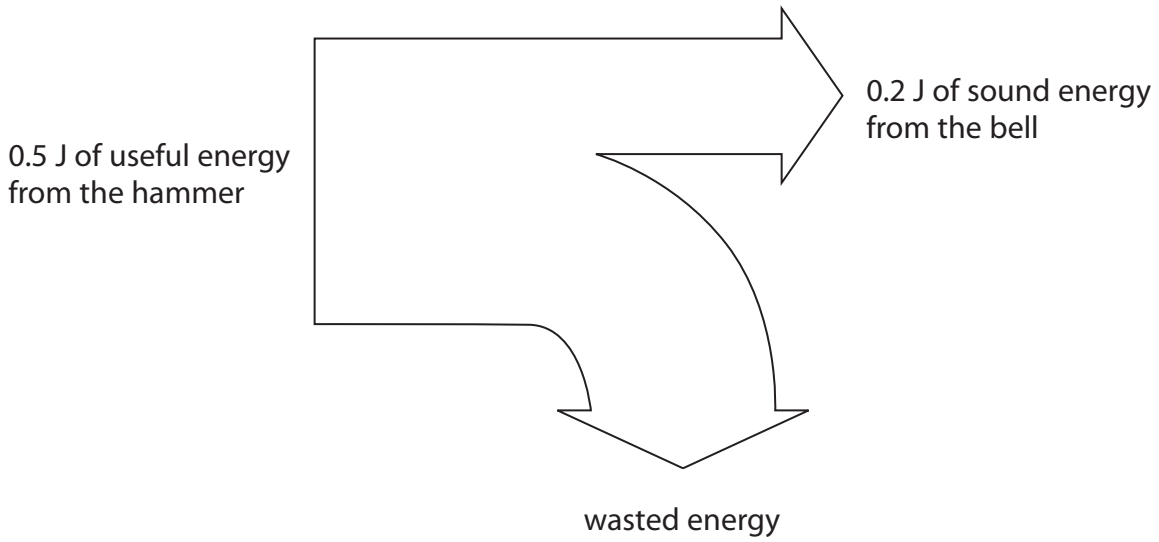
☒ **B** elastic potential energy

☒ **C** gravitational potential energy

☒ **D** thermal energy

(b) Every hour, the clock chimes to remind Simon of the time.
The clock lifts a small hammer.
The hammer falls and rings a little bell.

The diagram shows what happens to the energy from the falling hammer.



(i) Calculate the energy wasted.

(1)

wasted energy = ... J

(ii) Calculate the efficiency of this process.

(2)

efficiency = ...

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(iii) Suggest what happens to the wasted energy.

(2)

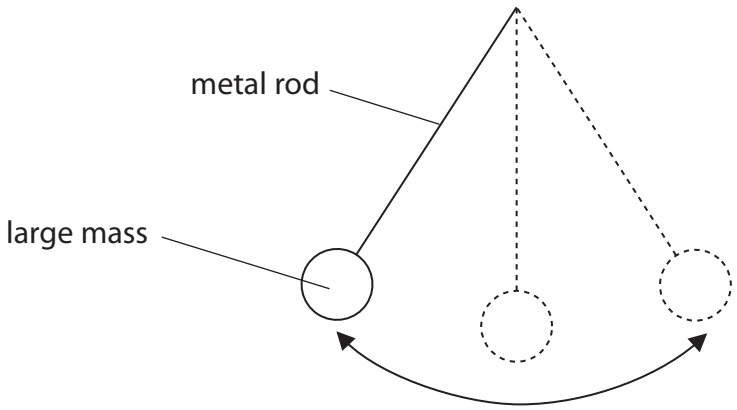
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.....

*(c) The clock uses a pendulum.
The pendulum is a metal rod with a large mass at the end.
The mass swings from side to side.



The spring keeps the pendulum swinging without stopping.

Describe the energy changes that happen as the pendulum continues to swing from side to side.

(6)

(Total for Question 5 = 12 marks)

Stars and galaxies

6 (a) The image shows the Andromeda galaxy.



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

Andromeda is just one of many millions of galaxies that form the

(1)

☒ **A** constellations

☒ **B** planets

☒ **C** stars

☒ **D** Universe

(ii) State the name of the galaxy that contains our Solar System.

(1)

(b) When astronomers study distant galaxies, they notice changes to the waves they observe.

(i) Describe the changes to the waves they observe.

(2)

.....

.....

.....

.....

(ii) State the evidence that astronomers have observed to support the Big Bang theory for the origin of the Universe.

(2)

.....

.....

.....

.....

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*(c) By observing stars in distant galaxies, astronomers have been able to identify the different stages in the life of a star.

Describe the life cycle, from birth to death, of a star that is similar in mass to our Sun.
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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Mark Scheme (Results)

Summer 2012

GCSE Physics
5PH1F/01

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GCSE Physics 5PH1F/01 Mark Scheme – Summer 2012

Question Number	Answer	Acceptable answers	Mark
1(a)	**A** 23 000 Hz		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)	Any one from the following points • sonar / ranging (1) • (medical) scanning(1) • medical treatment (1) • animal communication (1) • cleaning(1)	**Accept** foetal/tumours shattering kidney stones /destroying cancer cells dog whistles	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(c)	An explanation linking the following points • a reference to frequency/pitch/hearing range (1) • (frequency/pitch) is high(er) for cats RA (1) [The points must be linked for the second mark]	Accept Hz Cat detects high(er) frequency/pitch for 2 mark ignore incorrect value of frequency for ultrasound if a comparison made (tested in 1a) cat can hear >20000 Hz (2) humans cannot hear > 20000 Hz / ORA (2) amplitude too low / too quiet is 1 mark only if no other marks awarded	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(d)(i)	substitution (1) 340 x 0.047 evaluation (1) 16 (m)	 15.9(8) (m) give full marks for correct answer, no working	 **(2)**

Question Number	Answer	Acceptable answers	Mark
1(d)(ii)	Any two from the following points • Idea of speed (1) • correct difference identified e.g. sound slower RA (1)	 It/ infrared/light/em waves travel(s) faster/quicker scores 2 marks Ignore references to time	 **(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)	**A** all the time		**(1)**

Question Number	Answer	Mark
2(b)	<table><tr><th>radiation</th><th>type</th><th>transfer</th></tr><tr><td>alpha</td><td>particle</td><td>energy</td></tr><tr><td>beta</td><td>particle (1)</td><td>energy</td></tr><tr><td>gamma</td><td>wave (1)</td><td>energy (1)</td></tr></table> 2 words in 1 box scores 0 for that box	**(3)**

Question Number	Answer	Acceptable answers	Mark
2(c)	Any **two** from the following points • sterilising food (1) • sterilising medical equipment(1) • detection of cancer(1) • treatment of cancer(1)	cleaning water PET scan gamma camera Radiotherapy Industrial uses eg Measuring thickness Tracers (Gamma) telescopes	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(d)	A description including the following points • travel at the same speed (1) • in a vacuum/space (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
3 (a)	**B**		**(1)**

Question Number	Answer	Acceptable answers	Mark
3b(i)	A description including **three** of the following points • reflection (of light) at (either) mirror (1) • (the curved mirror) focuses the light (1) • (mirror) inverts (1) • (lens / eyepiece) magnifies image (1) • image is formed where the light rays cross (1)	Bounces for reflects flips it over/turns over lens/eyepiece refracts light Image is real(1) Accept for 1 mark if no other mark awarded: (Telescope) reflects <u>and</u> refracts light (1)	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	An explanation including two from • collects more light (1) • produces a magnified/bigger image (1) • shows more detail (1) • shows stars the naked eye is unable to see (1) • can observe stars day and night (1)	brighter looks closer/zooms in makes it clearer/better see further/more (stars)	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(c)(i)	transverse (wave)	mechanical	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)(ii)	**C** move up and down a bigger distance		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)(iii)	substitution (1) 4 x 0.5 evaluation (1) 2 (m/s)	 give full marks for correct answer, no working Accept power of ten error for 1 mark eg. 0.2, 20, 200, 2000	 **(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)	**C** energy transferred per second		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	substitution (1) 0.25 x 230 evaluation (1) 58 (W)	 accept 57 to 58, and 60 (W) give full marks for correct answer, no working	 **(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	A description including the following points • (rate) of flow (1) • (of) charge (1)	 per second/flows/flowing electrons/ions/coulombs/C IGNORE electricity/amps/A	 **(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)(i)	(current) it is reduced	gets smaller/ decreases/ slows down/ drops/ lower	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)(ii)	conversion of watts to kilowatts (1) substitution (1) 0.0005 x 48 x 26 evaluation (1) 0.62(4)(p) Note: 0.0005 x 48 x 26 scores 2 (conversion and substitution marks)	This is a 'show that' so marks are only awarded if working is shown. For no conversion of power but otherwise correct, 0.5 x 48 x 26 (1) 624 (p) (1) Any other power of ten error in power or cost seen in substitution 1 mark maximum Answers with no working get zero marks.	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(c)(iii)	Any **one** of the following points • ideas of energy conservation (1) • ideas of **atmospheric** polluting effects (1) • ideas of possible dangers (1) • reduces life of parts (TV) (1)	wastes energy (if left on) RA (NOT wastes electricity) CO_2 / SO_2 production/global warming/acid rain/greenhouse gases fire hazards/overheating /safer(when off) Ignore ozone layer references	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)	**B** elastic potential energy		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)(i)	0.3(J) (1)	0.5-0.2 (J)	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)(ii)	substitution (1) 0.2÷0.5 evaluation (1) 0.4 / 40(%) / $^{2}/_{5}$	Give full marks for correct answer with no working	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(b)(iii)	Any two of the following • thermal/heat (1) • (idea that energy is) dissipated/spreads out (1) • to the surroundings (1)	Ignore transferred to Atmosphere/air **Accept** makes surroundings warmer (2) Ignore lost	**(2)**

Question Number		Indicative content	Mark
QWC	***5(c)**	A description including some of the following points **Forms of energy** • gravitational potential energy • kinetic energy • elastic potential energy • heat(thermal) and sound **Location of energy** • gravitational potential energy of mass as it rises • kinetic energy of mass as it moves • Elastic potential energy stored in spring • Heat/sound dissipated to surroundings **Linked ideas** • As the pendulum falls, gravitational potential energy changes to kinetic energy. • the kinetic energy from the pendulum ends up as heat, warming the surroundings. • the elastic potential energy in the clockspring becomes kinetic energy of the pendulum to keep the pendulum swinging.	**(6)**
Level	**0**	no rewardable material	
1	**1-2**	• a limited description including the name of one form of energy that is involved in the pendulum swing eg. the pendulum has kinetic energy. • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3-4**	• a simple description of the pendulum swing indicating where the energy can be found **OR** a simple transfer eg. When the pendulum is moving it has kinetic energy / the pendulum is high at the side of the swing so it has gravitational potential energy / As the pendulum swings it loses heat to the air / kinetic energy changes to potential energy / KE to PE. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description of an energy transfer indicating where the energy can be found **and** where the transfer takes place eg. as the pendulum swings to and fro, gravitational potential energy changes to kinetic energy / kinetic energy is dissipated as heat and sound to the surroundings • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	**D** Universe		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	Milky Way		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)(i)	A description including: • change in wavelength / frequency (1) • Correct change(s) (1)	wavelength increases (2) frequency decreases (2)	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)(ii)	An explanation linking **two** of the following points • red shift (1) • universe expanding (1) • (cosmic) microwave (background)(radiation) (1)	Accept initials (eg CMB)	**(2)**

Question Number		Indicative content	Mark
QWC	***6(c)**	A description including some of the following points Life cycle of a star similar of mass similar to that of our sun a. nebula / stellar nursery • clouds of dust and gas • pulled together or collapsed by gravitational forces b. Our sun / main sequence • stable state • hydrogen being converted to helium, nuclear fusion • huge amounts of heat and light produced • continues for many millions of years c. red giant • hydrogen runs out • star expands • star gets colder • uses up all its helium • outward forces decrease d. white dwarf • eventually collapses • due to own gravity • becomes much smaller and very dense e. Sequence: • Nebula / stellar nursery • (Protostar) • Star (main sequence) • Red Giant • White Dwarf • (Black Dwarf) ignore references to planetary nebula) Credit is given for correctly labelled diagrams.	**(6)**
Level	**0**	no rewardable material	
1	**1-2**	• a limited description including naming one of the stages (star alone is insufficient) e.g. A star can be a red giant • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3-4**	• a simple description including two consecutive stages in the correct sequence OR a description of one of the stages e.g. a nebula forms a (main sequence) star / Nebulae are clouds of dust and gas • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description including naming three consecutive stages in the correct order AND a description of one stage e.g. A nebula is a cloud of gas and dust that forms a star which then becomes a red giant. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

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Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Physics/Science

Unit P1: Universal Physics

Foundation Tier

Friday 2 March 2012 – 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 ▶

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1/1/1/1/

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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

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

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

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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) The chart shows the electromagnetic spectrum.
Most of the parts have been labelled.

gamma rays	X-rays	ultraviolet	visible light		microwaves	

(i) Use words from the box to complete the chart.

(2)

infrared	infrasound	radio waves	seismic waves	ultrasound

(ii) Which part of the electromagnetic spectrum has the highest frequency?

(1)

.....

(b) A special ink is invisible when looked at under normal light.
It glows when ultraviolet radiation is shone on it.

(i) Describe how this ink could be used.

(2)

.....

.....

.....

(ii) State **one** harmful effect of ultraviolet radiation.

(1)

.....

.....

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(c) X-rays have many uses.

Describe **one** use for X-rays other than medical uses.

(2)

.....

.....

.....

.....

(Total for Question 1 = 8 marks)

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Using lenses

2 (a) Sunita prepares some equipment for a class practical.



She measures the focal length of different lenses.
She uses a metre rule, some white card and the light from a distant window.

Describe how she could measure the focal length of a lens using this equipment.

(2)

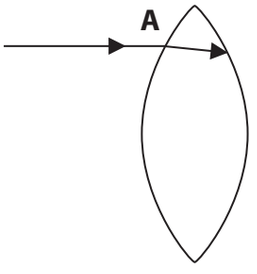
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(b) The diagram shows the path of a ray of light through a converging lens.



(i) The ray of light has changed direction at **A**.

State the name of this effect.

(1)

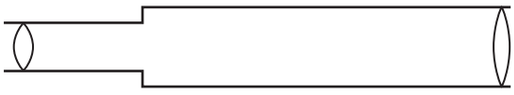
.....

(ii) Complete the diagram to show the path of the ray after it has left the lens.

(1)

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(c) Some students use two lenses to make a simple telescope.
They use the telescope to look at a tree.



eyepiece lens objective lens

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

(i) The objective lens

(1)

☒ **A** forms an image outside the telescope

☒ **B** gathers incoming light to form an image

☒ **C** forms a magnified image

☒ **D** forms an image the right way up

(ii) The eyepiece lens makes this first image

(1)

☒ **A** magnified

☒ **B** nearer to the eye

☒ **C** real

☒ **D** the right way up

(d) Early astronomers thought that everything orbited the Earth.
Galileo used a telescope to observe Jupiter.

Describe what Galileo saw that made him think the early astronomers might be wrong.

(2)

.....

.....

.....

.....

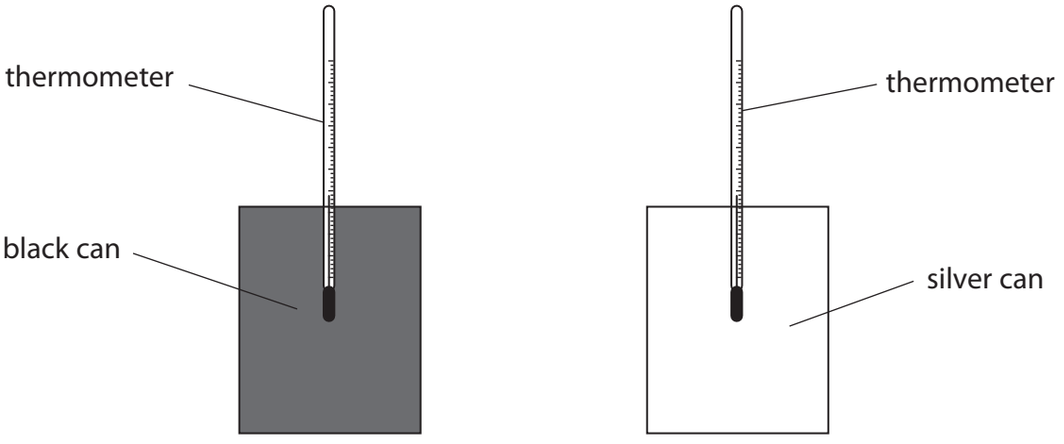
(Total for Question 2 = 8 marks)

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Thermal radiation

3 Some students investigate the cooling of different coloured cans.

They use two cans each fitted with a thermometer.



Hot water is poured into the cans and the temperature of the water in each can is measured every two minutes.

(a) The students want to find out if a black can cools quicker than a silver can.

Which row of the table shows the conditions they should use?

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

(1)

	the volume of water in each can should be	the size of cans should be
☒ **A**	the same	the same
☒ **B**	the same	different
☒ **C**	different	the same
☒ **D**	different	different

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QUESTION 3 CONTINUES ON THE NEXT PAGE

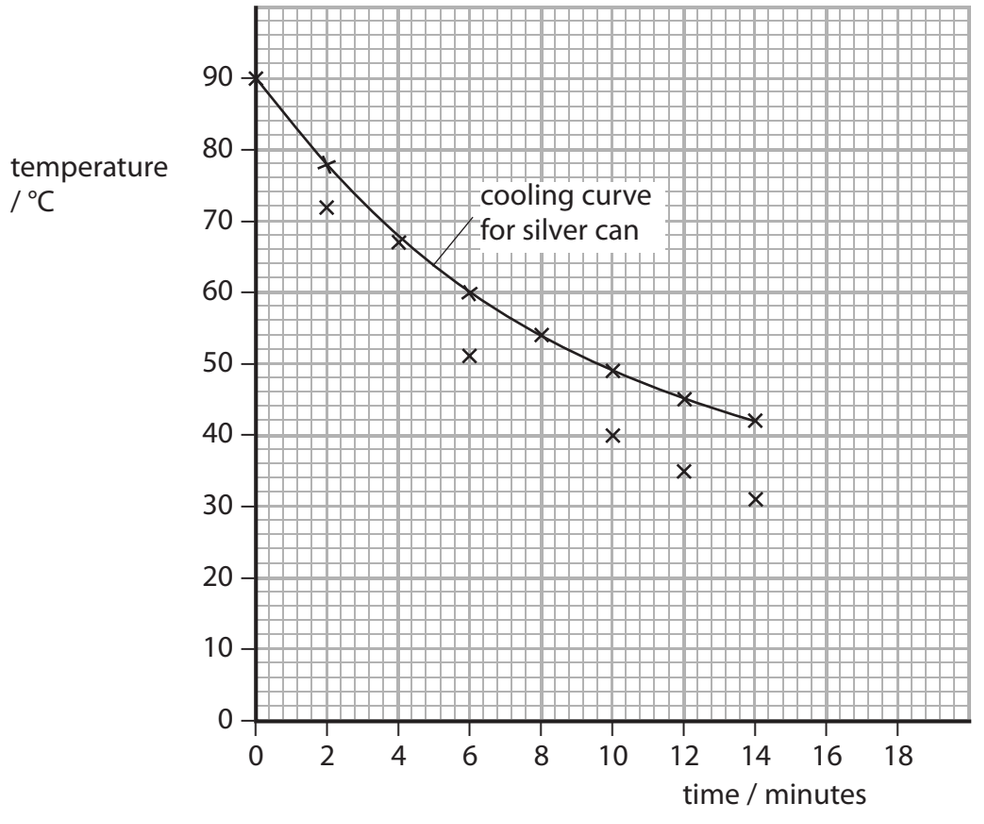
(b) The table shows the students results.

time / minutes	temperature / °C	
	black can	silver can
0	90	90
2	72	78
4	60	67
6	51	60
8	45	54
10	40	49
12	35	45
14	31	42

(i) The graph for the silver can has been plotted on the axes.
Six points for the black can have been plotted.

Plot the points for 4 minutes and 8 minutes for the black can.

(1)



P 4 0 1 9 9 A 0 1 0 2 4

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(ii) The line of best fit has been drawn for the silver can.
Draw the line of best fit for the black can.

(1)

(iii) Estimate the temperature of the silver can when the time is 18 minutes.

(1)

temperature = ... °C

(iv) The room temperature is kept at a temperature of 21 °C.
Suggest what the temperature of the cans will be after two hours.

(1)

temperature = ... °C

(c) The photograph shows a solar water heater.



(i) State why the pipes in the solar water heater are painted black.

(1)

.....

.....

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(ii) The heater supplies 9000 J of thermal energy in 20 seconds.

Calculate the power output of the heater.

(2)

power output = ... W

(iii) To produce the 9000 J of thermal energy, the heater needs 18 000 J of energy from the Sun.

Calculate the efficiency of the solar water heater.

(2)

efficiency = ...

(Total for Question 3 = 10 marks)

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Observing our Universe

4 (a) The photograph was taken by the Hubble Space Telescope.
Some of the objects in the photograph are galaxies.



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

A galaxy is a collection of

(1)

☒ **A** stars

☒ **B** moons

☒ **C** asteroids

☒ **D** planets

(ii) The photograph was taken using visible light.
Describe a benefit of using a telescope in space.

(2)

.....

.....

.....

.....

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(b) This photograph shows a line of radio telescopes.



(i) Name **one** type of electromagnetic radiation that they can detect.

(1)

.....

(ii) Radio telescopes are one type of modern telescope.

Describe how the use of modern telescopes like these has helped our understanding of the Universe.

(2)

.....

.....

.....

.....

(c) The Hubble telescope has recently detected a nebula like the one in this picture.



(i) State what a nebula is.

(1)

.....

.....

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(ii) A nebula eventually becomes a star.

Describe how a nebula becomes a star.

(3)

.....

.....

.....

.....

.....

.....

(Total for Question 4 = 10 marks)

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Ultrasound

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

The frequency of ultrasound is

(1)

- ☒ **A** less than 20 Hz
- ☒ **B** between 20 Hz and 2000 Hz
- ☒ **C** between 2000 Hz and 20 000 Hz
- ☒ **D** more than 20 000 Hz

(b) Describe how bats use ultrasound to locate prey.
You may add to the diagram to help with your answer.

(2)



bat



moth

.....

.....

.....

.....

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*(c) Ultrasound and X-rays are used for medical scans.

Compare and contrast the advantages of using ultrasound and X-rays for medical scans.

(6)

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(d) Ultrasound is used to scan metal pipes to measure their thickness.



The ultrasound wave travels through the metal and is reflected at the inner surface of the metal.
The reflected wave is detected after 0.003 ms (0.000 003 s).
The speed of the ultrasound in the metal is 5000 m/s.

Calculate the thickness of the metal.

(3)

distance = speed × time

thickness of metal = ... m

(Total for Question 5 = 12 marks)

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Generating electrical energy

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

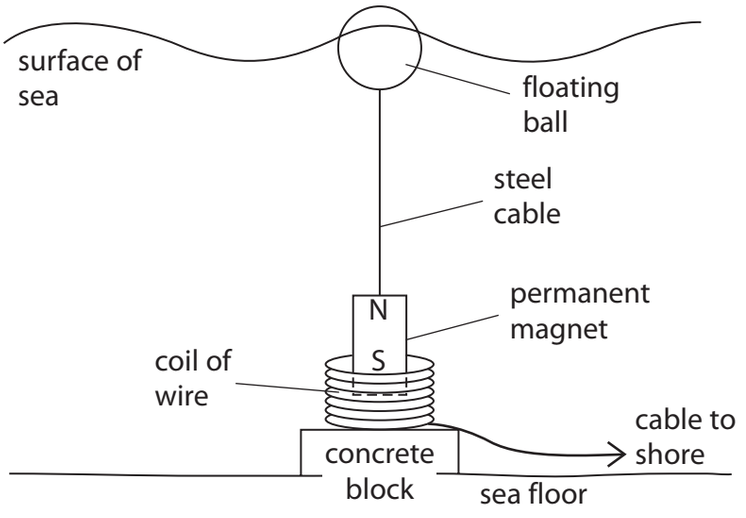
Electrical energy can be measured in

(1)

- ☒ **A** amps
- ☒ **B** kilowatt-hours
- ☒ **C** volts
- ☒ **D** watts

(b) Scientists are looking for new ways to produce electricity from renewable resources.

The diagram shows a model of a device to generate electricity from waves.
The coil is fixed to the concrete block.
The magnet can move freely inside the coil.



P 4 0 1 9 9 A 0 2 0 2 4

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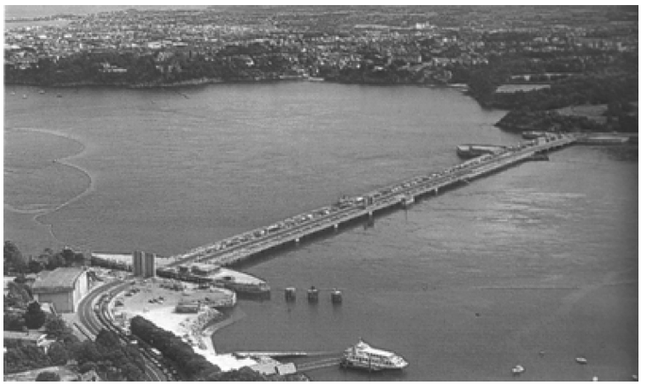
(i) Explain how this device produces an electric current.

(3)

(ii) Describe how the device can be altered to increase the electric current.

(2)

*(c) Another way of producing electricity from a renewable source is tidal power.
A dam is built across the mouth of a river.
Tidal water gets trapped behind the dam.



The trapped water is used to generate electricity.

Discuss the advantages and disadvantages of using tidal power rather than other methods of generating electricity.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

March 2012

GCSE Physics
5PH1F/01

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5PH1F/01 Mark Scheme
March 2012

<table>
<tr><th>Question Number</th><th>Answer</th><th>Acceptable answers</th><th>Mark</th></tr>
<tr><td>1(a)(i)</td><td>

infrared (1)
radio waves (1)
2 marks if both correct i.e.

<table>
<tr><td>gamma rays</td><td>X-rays</td><td>ultraviolet</td><td>visible light</td><td>infrared / IR</td><td>microwaves</td><td>radio (waves)</td></tr>
</table>

1 mark for one correct
1 mark if answers interchanged i.e.

<table>
<tr><td>gamma rays</td><td>X-rays</td><td>ultraviolet</td><td>visible light</td><td>radio (waves)</td><td>microwaves</td><td>infrared / IR</td></tr>
</table>
</td><td></td><td>(2)</td></tr>
</table>

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	gamma (rays)	or symbol for gamma e.g. γ	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)(i)	A description linking **one** of the following pairs • on items (1) • assist in identification (if stolen) (1) • on document/currency (1) • help to identify forgery (1) • write (on paper) (1) • secret message (1) • stamp / on (back of) hand (1) • as pass out for an event (1)	• named item • to identify (owner) • banknotes eq (1) • (to identify) genuine notes/forgeries (1) • write (message /note)(1) • (that) other people cannot see(1) • (print on) t-shirt (1) • shows up in club (1) **Allow** to detect UV (radiation) for 1mark **Ignore** uv light uses not on ink, e.g. forensic use on blood/ use in the dark (as it glows)/ etc.	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)(ii)	causes damage to (unprotected) eyes/skin/DNA/ cells (1)	blindness /(skin) cancer/(sun)burn (to skin)/mutations	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(c)	A description linking **one** of the following pairs	statement of recognised application detail of how it works/ how it is used	
	• (at the) airport /customs / docks / security checks (1) • for dangerous/illegal items (1)	• to scan {luggage / people/ vehicles} (1) • (check) for things that are not meant to be there e.g. liquids, knives, guns, explosives, drugs etc (1)	
	• checking welds (1)	checking pipes/engines/aircraft/structures etc	
	• to examine under the surface (1)	for cracks	
	• checking paintings eq (1) • to look for detail under the top paint layer (1)	**IGNORE** idea of X-ray vision	
	• X-ray telescopes/astronomy • to study/look at objects in space	e.g. stars/ galaxies/ space/black holes/neutron stars/planets	
	• check packaging e.g. cans/packets • (to see if) filled to correct level	for 'foreign' objects	
	• sterilising (1) • food/hospital equipment (1)	killing bacteria **NOT** to scan (the body) for broken bones	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)	a description including any **two** of the following • (shine) light/image from (lens(es)/ window) on(to) card (1) • move the card/lens (1) • (to give) sharp/clear image (1) • measure (distance) from lens to card/focal point (1)	ignore any other measurements	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	refraction	refracted /refracting/refract **ignore** converging **NOT** reflection/reflected reflecting/reflacting	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	any change of direction (by eye) no arrow required (1) allow slight bends/bumps if freehand line/ mark 1st cm of ray	ignore discontinuities/gaps at boundary ignore extra lines ignore reflected rays	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	B		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(ii)	A		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(d)	A description including any **two** from the following • (four) object(s) /star(s)(near Jupiter) (1) • orbiting Jupiter/planet (1) • moon(s) (1)	Galileo's observations of phases of Venus also supported heliocentrism. Accept for 2 marks (4) moon(s) of Jupiter = 2 marks Jupiter had (4) moon(s) = 2 marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)	A		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	both points correctly plotted (1)	allow +/- half square	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	smooth curve (1) (does not need to go through all points i.e. can miss out top section)	allow slight discontinuities/double lines/ thick lines NOT dot to dot /two straight lines	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(iii)	temperature from 34 °C to 39 °C inclusive (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(iv)	21(°C) (1)	22(°C) /23(°C)	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)(i)	it/black is a good absorber of heat /energy/radiation/IR (1) i.e. it absorbs/takes in more infrared/IR	**allow** it/black absorbs/takes in heat **ignore** attracts/emitter/conductor **NOT** (so it) cools down quickly	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)(ii)	substitution (1) 9000 ÷ 20 evaluation (1) 450 (W)	ignore powers of 10 until evaluation e.g. 90 ÷ 2 gains 1 mark 45 gains 1 mark give full marks for correct answer, no working	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(c)(iii)	substitution (1) 9000 ÷ 18 000 (x 100%) evaluation (1) 50 (%)	ignore powers of 10 until evaluation e.g. 90 000 ÷ 1800 gains 1 mark 5 gains 1 mark 0.5 or ½ or half gains both marks give full marks for correct answer, no working	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	A		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	A description including any **two** of the following • above the/no atmosphere (1) • above the clouds / no clouds/no weather (1) • image is clearer/ more detailed/ not distorted/not blurred (1) • no light pollution (1) • no absorption (by atmosphere) of other named radiations e.g. X-rays (1)	no air/dust/pollution can see further /wider field of view/can use anytime **IGNORE** it is closer (to the stars/planets) **IGNORE** references to improving understanding / knowledge of space	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	Either **one** of the following • radio (waves) (1) • microwaves (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	a description including any **two** of the following • collect more information / waves /data (1) • greater resolution /detail/ magnification (1) • other regions of the EM spectrum are used (1)	mention of specific data e.g. black holes/ red shift discover /new planets/stars/ galaxies etc (see) clearer/better images /closer view (can) see further (into space)/ smaller objects accept idea that they are not restricted to light e.g. (can) detect radiation /radio waves (from Big Bang/stars)/CMB **IGNORE** any references to "hearing".	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)(i)	(cloud of) dust and/or gases (1)	Accept hydrogen/helium Accept idea that it is where stars/planets are formed Ignore rocks/smoke	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)(ii)	A description linking **three** of the following • when nebula reaches a critical mass (1) • nebula collapses/contracts (1) • (due to) gravitational attraction (1) • (gets) hot/ (makes) heat (1) • forms a protostar (1) • emits/produces light /radiation(1)	correct sequence is not required when nebula or dust/gas cloud is big (enough) gases/dust/nebula come together/pulled together/spiral /move faster gravity/gravitational (potential) energy transformed into thermal energy ignore starts to burn/explodes/friction starts nuclear reaction/fusion/ hydrogen turns into helium/new elements	**(3)**

Question Number	Answer	Acceptable answers	Mark
5(a)	D		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)	A description including **two** of the following • (bat) emits /sends /makes (ultra)sound /it / signal/wave(1) • signal/wave /(ultra)sound reflects/bounces(back)/ rebounds (off moth/prey) (1) • bat's (ears) detect reflected (ultra)sound (1) • reflection is used to estimate distance (to moth) (1)	On diagram idea of something emitted e.g. line (with arrow) from anywhere on /near bat or outgoing waves On diagram idea of something reflected e.g. line with arrow from anywhere on /near moth or reflected waves (from moth) idea of reflection detected e.g. bat hears the reflected (ultra)sound/wave/signal idea of bat analyses data e.g. bat times how long (it takes) for reflected wave to get back **Ignore** idea that it listens for noises from prey	**(2)**

Question Number		Indicative content	Mark
QWC	***5(c)**	A description linking some of the following • ultrasound does not cause damage to (healthy) cells / ORA • idea of real-time image with ultrasound • ultrasound uses non-ionising radiation • idea that (consultant) can change image position during ultrasound scan • 3D image possible with ultrasound • ultrasound safer for consultant • ultrasound machines more portable • ultrasound can be used to measure blood flow rates • ultrasound gives detail of soft tissue • X-rays are more suitable for bony structures • X-rays produce higher resolution images • X- rays are more suitable for parts of body containing gas (lungs, intestines) This list is not exhaustive. Give credit for other plausible suggestions	**(6)**
Level	**0**	No rewardable material	
1	**1-2**	• a limited description with no comparison or contrast ie describes a use/fact about ultrasound OR X-rays eg Ultrasound can be used to look at a foetus (unborn child) • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3-4**	• a description giving some attempt at comparison or contrast ie describes a use of ultrasound AND X-rays eg Ultrasound can be used to look at a fetus. X-rays are used to detect broken bones OR Ultrasound can be used to look at a fetus because it's safer (than X-rays) • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description with clear comparison and/or contrast ie describes a use of ultrasound AND X-rays, one of which is detailed, AND a clear comparison Ultrasound can be used to monitor a fetus. In ultrasound the waves reflect off soft tissue. X-rays (are used to look at bones because they) are absorbed by bones OR Ultrasound can be used to monitor a fetus. In ultrasound the waves reflect off soft tissue. X-rays are used to look at bones but not used for fetus because they can damage DNA/cause mutations of cells • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
5 (d)	substitution (1) 5000 x 0.000 003 evaluation (1) 0.015 (m) evidence of dividing by 2 (1) (5000 ÷2) x 0.000003 7.5 x 10^{-3} (m) scores 3 marks	ignore powers of 10 until evaluation e.g. 5000 x 0.0003 etc gains 1 mark or .15 /1.5/15 etc gains 1 mark 1.5x 10^{-2}/ 0.015 gains 2 marks 7.5/0.75/0.075 etc gains 2 0.0075 (m) scores 3 marks give full marks for correct answer, no working	**(3)**

Question Number	Answer	Acceptable answers	Mark
6(a)	B		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)(i)	an explanation linking **three** of the following • (waves cause) float to move (up and down)(1) • (this causes) magnet to move (in and out of coil) (1) • (hence) magnetic field (of magnet) (1) • cuts across/links/ interacts wire in coil (1) • <u>inducing/generating</u> potential difference across ends of coil (1)	magnet moves (in the coil) **Allow**{current/voltage/volts/amps} <u>induced/generated</u> in coil	**(3)**

Question Number	Answer	Acceptable answers	Mark
6(b)(ii)	a description including **two** of the following • increase the number of turns on the coil (1) • use a more powerful magnet (1) • use full scale device (1)	more coils (of wire) ignore bigger coil stronger/more magnets **Ignore** bigger magnet **Allow** idea of more/bigger/ faster waves	**(2)**

Question Number		Indicative content	Mark
QWC	***6(c)**	A discussion linking some of the following **Advantages of tidal power** • renewable energy source • reduction in greenhouse gases/atmospheric pollution (compared to fossil fuel) • reduces reliance on fossil fuels • conserves stocks of fossil fuels • predictable source of energy • regular/reliable supply of energy • barrages at different areas would give energy supply at different times **Disadvantages of tidal power** • does not give continuous supply of energy • destruction of plant/animal/bird habitats • problems with passage of ships • affects migration of fish • high capital cost /very long payback time • pollution caused from producing /transporting building materials • visual pollution This list is not exhaustive. Give credit for other plausible suggestions	**(6)**
Level	**0**	No rewardable material	
1	**1-2**	• there is limited discussion of the advantages or disadvantages of tidal power ie gives one advantage OR one disadvantage of tidal power. e.g. tidal power is not available 24 hours a day/ The barrage will save fuel for motorists going to the town on the other side (of the estuary) • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3-4**	• there is some discussion of the advantages and disadvantages of tidal power ie gives one advantage AND one disadvantage of tidal power e.g. an advantage of tidal power is that it uses a renewable energy resource and a disadvantage is that they damage birds' habitats • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• there is detailed discussion of the advantages and disadvantages of tidal power ie gives one advantage AND one disadvantage of tidal power, one of which is detailed, AND a clear link to another method e.g. tidal power stations are a good idea because they use a renewable energy resource and will help to conserve fossil fuel stocks. However, it causes problems for migrating fish • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

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Surname	Other names

Centre Number | Candidate Number

Edexcel GCSE

Physics/Science

Unit P1: Universal Physics

Foundation Tier

Wednesday 9 November 2011 – 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.

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P 4 0 1 7 8 A 0 1 2 4

Turn over ▶

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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

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

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

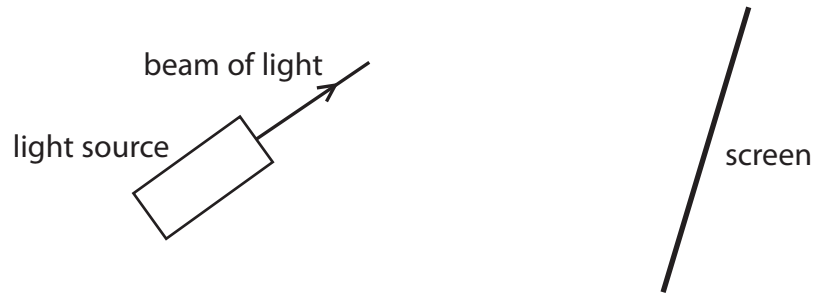
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Answer ALL questions.

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 waves

1 (a) A student investigates the spectrum produced by visible light.
The diagram shows some of the equipment she uses.

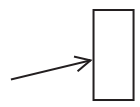


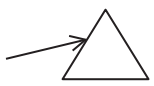
She uses a piece of glass to split up the light into its colours.

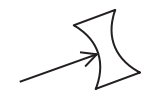
(i) Which of the following would be the best shape to use?

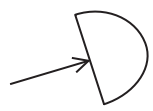
Put a cross (☒) in the box next to your answer.

(1)

☒ **A** 

☒ **B** 

☒ **C** 

☒ **D** 

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(ii) Each colour has a different wavelength.
List the other colours in order of wavelength.
Three have been done for you.

(2)

Longest wavelength .....

.....

Yellow

Green

Blue

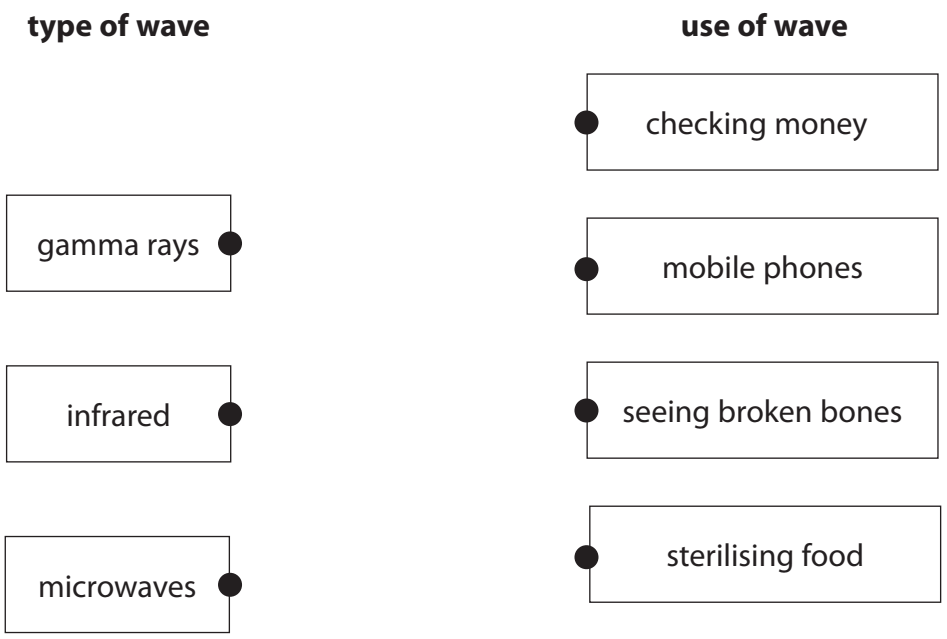
.....

Shortest wavelength .....

(b) Electromagnetic waves have many uses.

Draw **one** straight line from each type of wave to show one use of the wave.

(3)



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(c) Both infrared and ultraviolet rays can have harmful effects on our bodies.

Describe how the harmful effects of these rays are different.

(2)

.....

.....

.....

.....

(Total for Question 1 = 8 marks)

Earthquake waves

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

Earthquakes can produce infrasound waves.

Compared to normal sound waves, infrasound waves always have a **smaller**

(1)

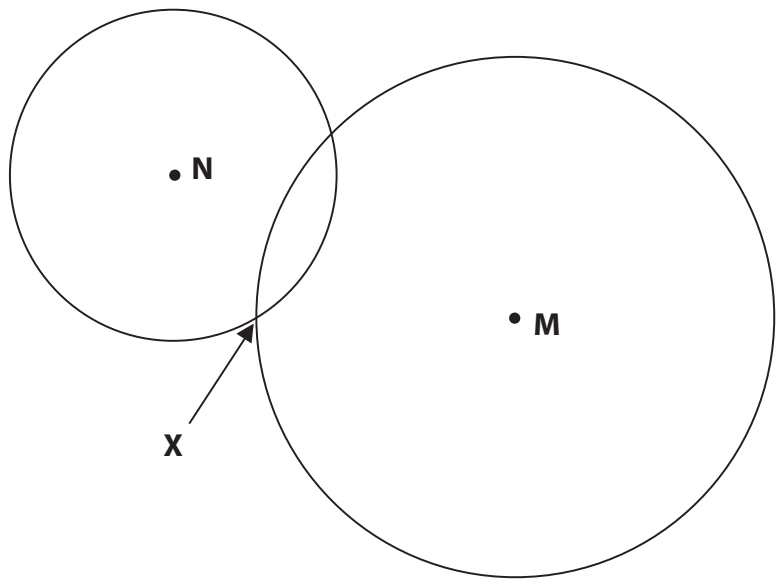
☒ **A** amplitude

☒ **B** energy

☒ **C** frequency

☒ **D** wavelength

(b) The diagram shows circles drawn around two research stations, **M** and **N**.
The stations are for detecting earthquakes.
Each circle shows the distance of the earthquake from that station.



(i) Two students discuss the diagram.
Student A said: the earthquake **must** have been at X.
Student B said: the earthquake **might** have been at X.

Explain why the statement from student B is better.

(2)

.....

.....

.....

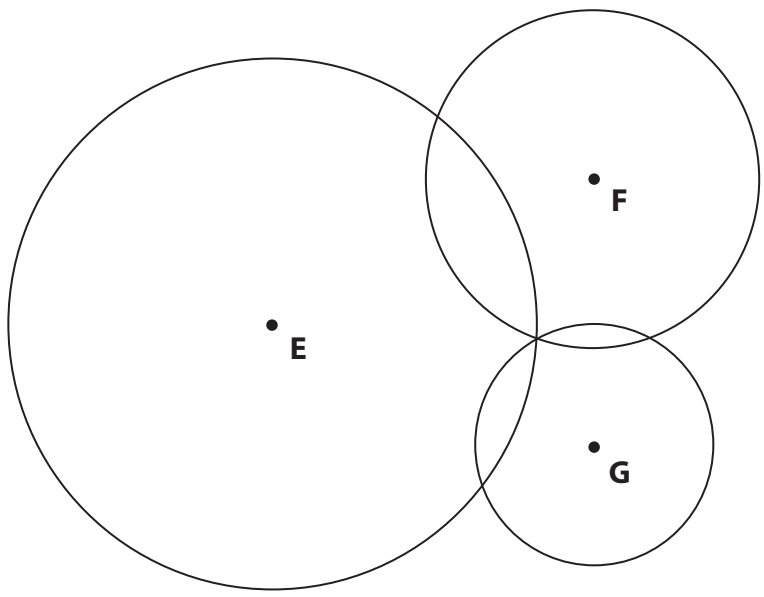
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(ii) The diagram shows circles drawn round three research stations, **E**, **F** and **G**, for another earthquake.

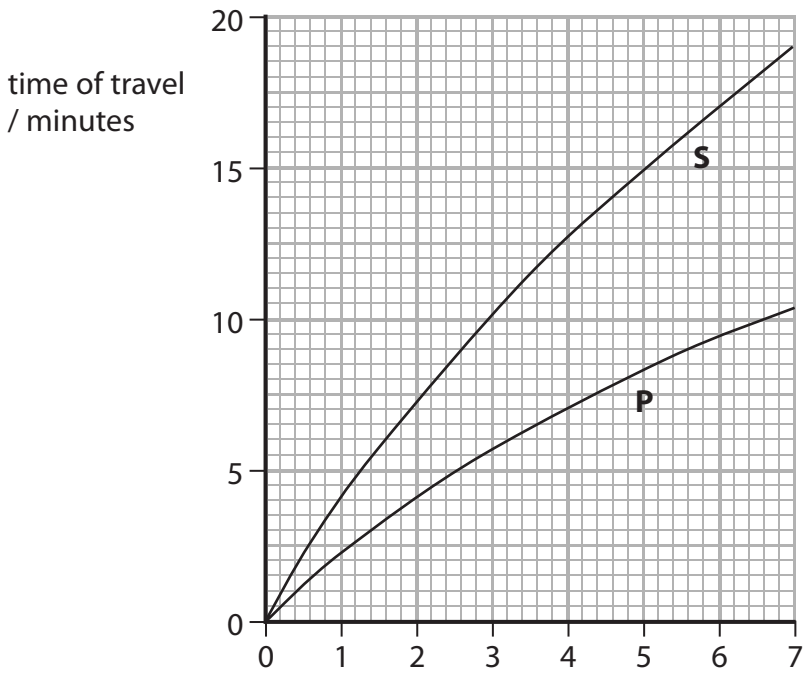
Draw an arrow on the diagram to show where this earthquake probably happened.

(1)



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(c) The graph shows information about P-waves and S-waves from an earthquake.



An earthquake station is 6000 km from an earthquake.
The P-wave reaches the earthquake station before the S-wave.

Use the graph to find the difference in the arrival time of the S-wave and P-wave.

(2)

difference in arrival time = ... minutes

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(d) P-waves are longitudinal.

Describe how particles in the ground move when P-waves pass through it.

(2)

.....

.....

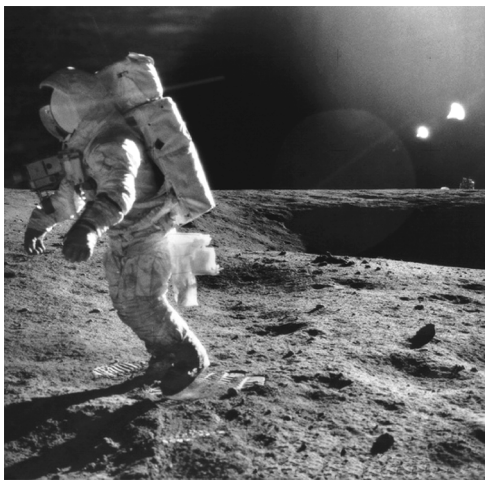
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(Total for Question 2 = 8 marks)

Exploring space

3 (a) The photograph shows an Apollo 12 astronaut walking on the Moon.



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

Manned space crafts have landed on the Moon but have not yet landed on Mars.

One of the reasons is because

(1)

☒ **A** the Moon is closer to Earth than Mars

☒ **B** the Moon is closer to the Sun than Mars

☒ **C** Mars is closer to the Earth than the Moon

☒ **D** Mars is closer to the Sun than the Moon

(b) A scientist compares the sizes of some objects in space.

Which of these is the smallest?

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

(1)

☒ **A** Jupiter

☒ **B** the Milky Way galaxy

☒ **C** the Moon

☒ **D** the Sun

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(c) Some scientists look for signs of water on other planets.

Suggest why they do this.

(1)

.....

.....

(d) The Earth is 150 000 000 km from the Sun.
It takes light 500 s to reach the Earth from the Sun.

Calculate the speed of light in km/s.

(3)

speed = ... km/s

(e) The photograph was taken using a powerful telescope on Earth.
It shows a nebula and many stars.



(i) Explain why photographs from telescopes in space show the nebula more clearly.

(2)

.....

.....

.....

.....

(ii) A nebula is a cloud of gas and dust where stars are formed.
A hot object forms when gas and dust in a nebula come together.

Explain why the gas and dust come together and form a hot object.

(2)

.....

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.....

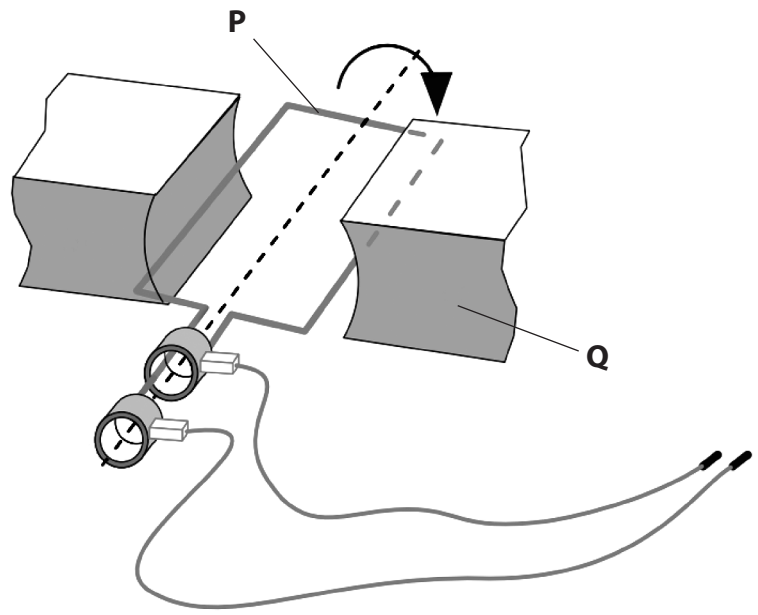
(Total for Question 3 = 10 marks)

P 4 0 1 7 8 A 0 1 2 2 4

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Alternating current and its uses

4 The diagram shows a generator producing an alternating voltage.



(a) Draw **one** straight line from each letter to its correct label.

(2)

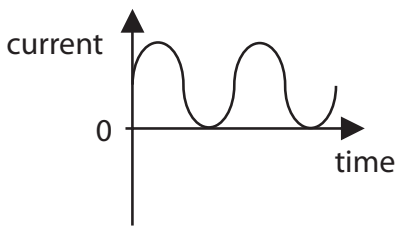
letter	**label**
P	slip ring
Q	coil
	axle
	brush
	magnet

(b) The generator is connected to a lamp.
The current in the lamp is alternating.

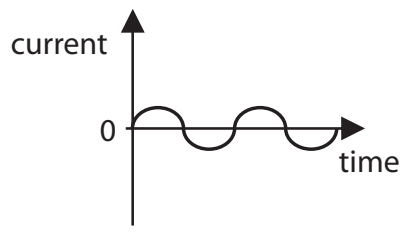
(i) Which of these is an alternating current?

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

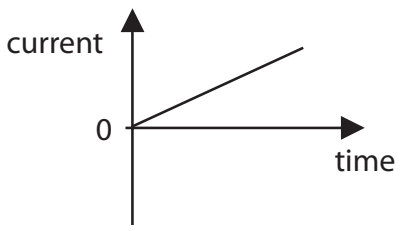
(1)



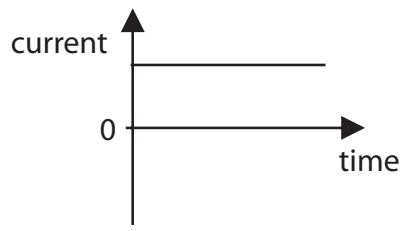
☒ **A**



☒ **B**



☒ **C**



☒ **D**

(ii) The generator is turned faster.

Explain what happens to the lamp.

(2)

.....

.....

.....

.....

(c) A larger generator produces a current of 2 A at a voltage of 12 V.

Calculate the electrical power generated.
State the unit.

(3)

power generated = ... unit = ...

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(d) Transformers are designed to use alternating current.

Describe what change happens when a step-up transformer is used.

(2)

.....

.....

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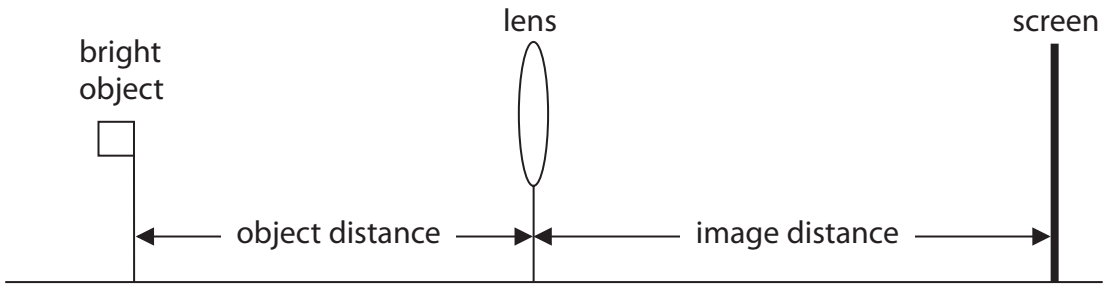
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(Total for Question 4 = 10 marks)

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Optical instruments

5 (a) A student uses this apparatus to investigate a converging lens.



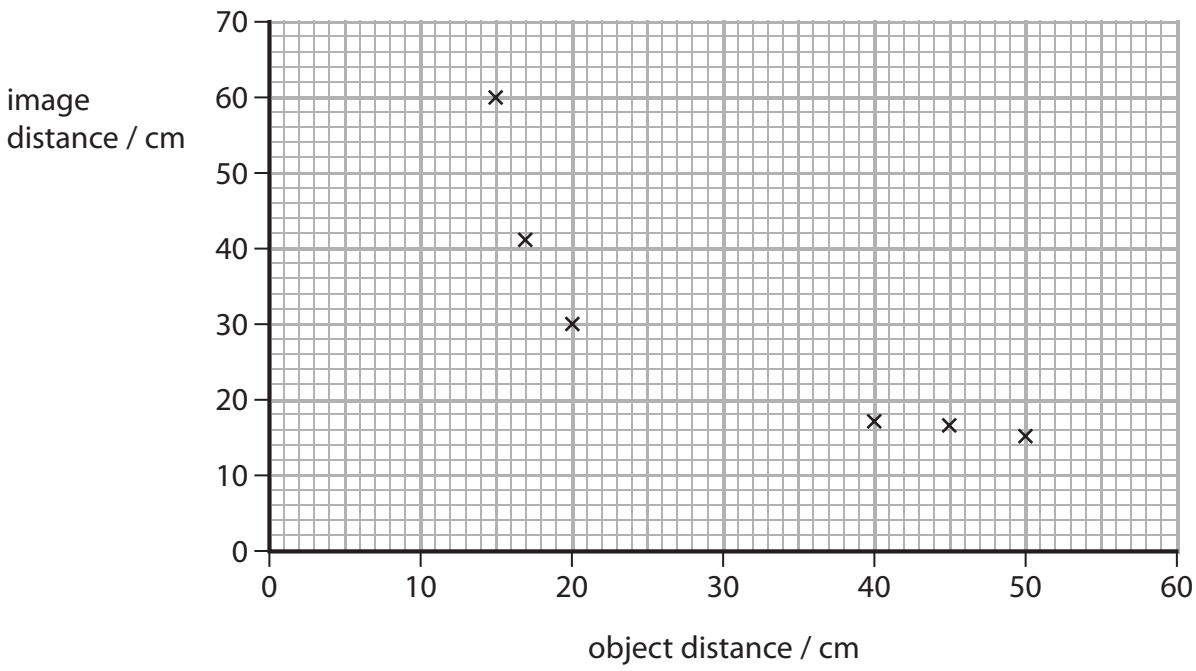
He sets the object distance at 15.0 cm.
He moves the screen until he can see a clear image and then he measures the image distance.
He repeats this for several other object distances.

The table shows his results.

object distance / cm	image distance / cm
15.0	60.0
17.0	40.8
20.0	30.0
30.0	20.0
40.0	17.1
45.0	16.4
50.0	15.8

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He plots a graph of image distance against object distance.



(i) Add to the graph the point for the object distance of 30.0 cm.

(1)

(ii) Draw the curve of best fit.

(1)

(iii) Describe how the image distance changes as the object distance changes.

(2)

.....

.....

.....

.....

(iv) The focal length of this lens is 12 cm.
The student takes the lens and holds it 6 cm away from an object.

Describe the image the student sees when he looks through the lens.

(2)

.....

.....

.....

.....

*(b) Describe the similarities and differences between refracting telescopes and reflecting telescopes.

(6)

(Total for Question 5 = 12 marks)

P 4 0 1 7 8 A 0 1 8 2 4

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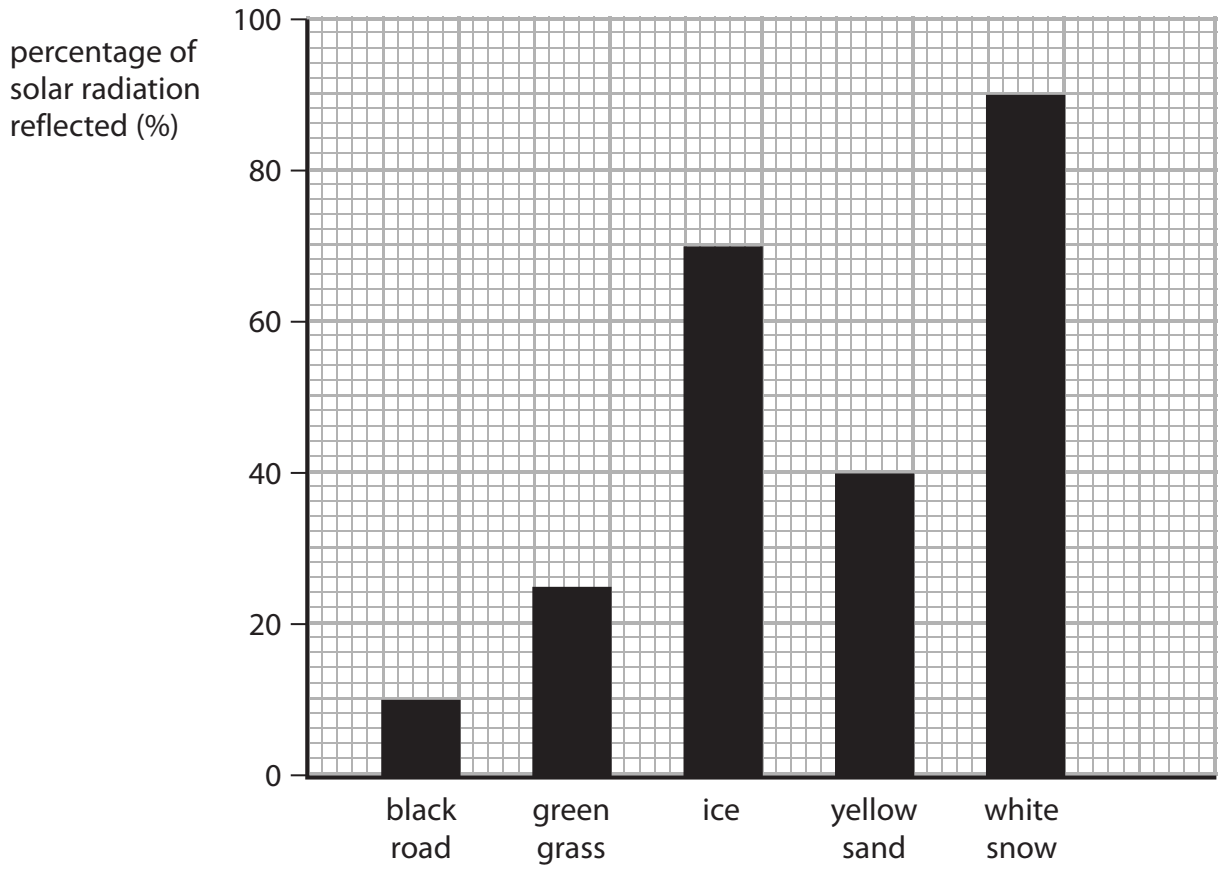
Turn over for Question 6

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Solar radiation

6 Most of the energy we receive on Earth comes from the Sun.

The bar chart shows the percentages of solar radiation reflected by some materials.



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

A student used the bar chart to estimate the percentage of solar radiation **reflected** by a rough piece of coal.

The percentage is most likely to be about

(1)

☒ **A** 10%

☒ **B** 40%

☒ **C** 60%

☒ **D** 80%

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(b) Radiation from the Sun which is not absorbed is reflected.
For water, the amount of solar radiation absorbed (taken in) is 94%.

(i) Calculate the percentage of solar radiation reflected by water.

(1)

.....

percentage of solar radiation reflected by water .....

(ii) Use the graph to show how this information supports the idea that solid surfaces reflect better than liquid surfaces.

(1)

.....

.....

(c) As Antarctic ice melts, its surface area decreases.
At the same time, the area of water surface increases.

(i) Explain what happens to the amount of radiation absorbed.

(2)

.....

.....

.....

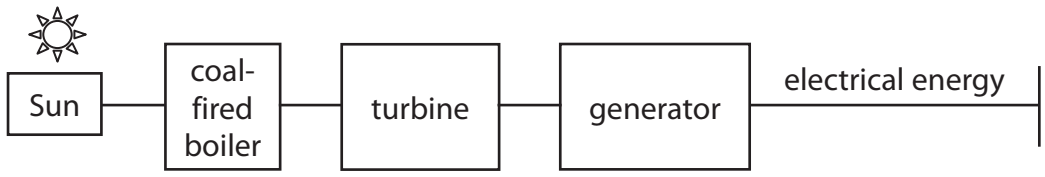
.....

(ii) State the effect that this change in the amount of radiation absorbed will have on the water.

(1)

.....

*(d) The diagram shows how some of the energy released by the Sun is converted into electrical energy.



A student boils some water using energy which came from the Sun.

Using the information in the diagram, describe the energy transfers involved in producing the electrical energy he used.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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P 4 0 1 7 8 A 0 2 3 2 4

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P 4 0 1 7 8 A 0 2 4 2 4

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Mark Scheme (Results)

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GCSE Physics
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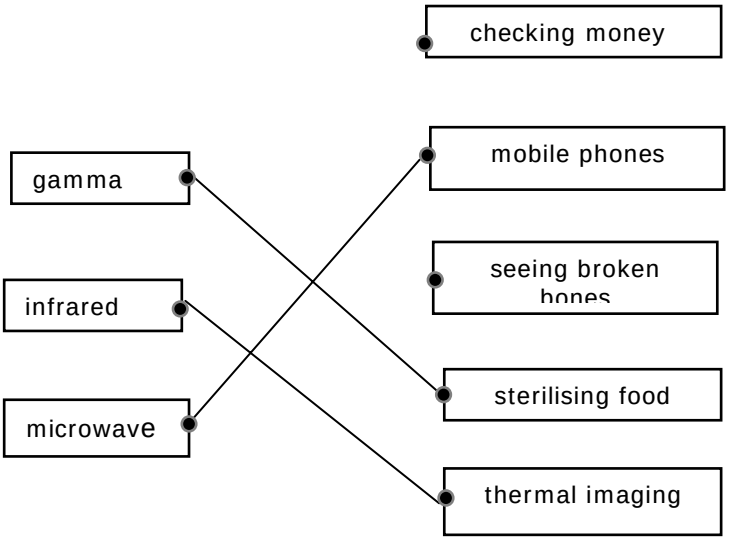
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5PH1F/01 Mark Scheme
November 2011

Question Number	Answer	Acceptable answers	Mark
1(a)(i)	B		**(1)**

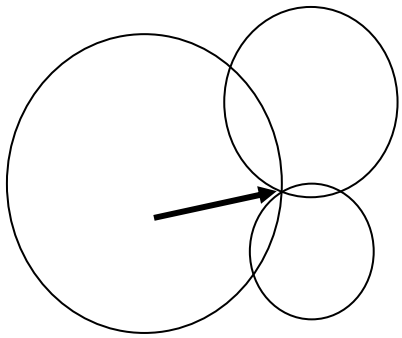
Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	• starting with red (1) • any two others in correct sequence (1)	roygbiv	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)		3 correct 3 marks 2 correct 2 marks 1 correct 1 mark more than 1 line from a wave box no marks for that box	**(3)**

Question Number	Answer	Acceptable answers	Mark
1(c)	A description including the following: • infrared causes burns (to the skin) /('skin) blistering (1) • (whereas) ultraviolet causes {cell damage / (skin) cancer / sunburn} (1)	Ignore {sunburn / cancer} damage to eyes U-V (potentially) more dangerous than IR=1	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)	C		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	An explanation linking the following • the earthquake will be one of the points of intersection (1) • (but) there are two points (of intersection) (1)	(might implies) further evidence needed possibly at a different place (NOT places) 50:50 chance	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)		any arrow clearly indicating the common point of intersection ignore ambiguous arrows a small circle or cross at the common intersection	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)	• S- wave arrives at 17 minutes P-wave arrives 9.5 minutes (1 for both) • difference in arrival time = 7.5 (minutes) (1)	7.0 to 8.0 inclusive 7.30/7:30 give full marks for correct answer, no working e.c.f from readings marked on graph or stated for a different distance on graph	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(d)	A description including the following • vibration (1) • in same direction as wave/energy moves (1)	up and down/side to side/shake backwards and forwards/back and forth scores 2	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)	A		**(1)**

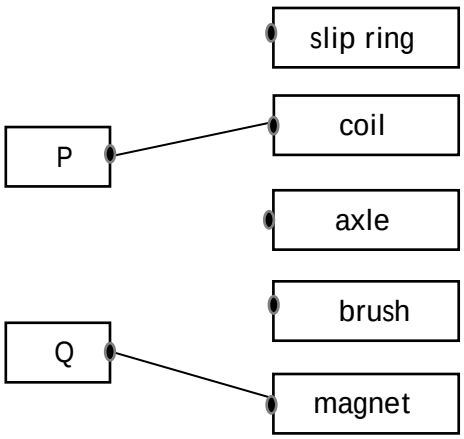
Question Number	Answer	Acceptable answers	Mark
3(b)	C		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)	reference to the connection between water and life	water is needed for life see if we could live there could sustain life water gives possibility of life a definite statement that water shows life scores ZERO e.g. prove that there is life there shows signs of life	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(d)	substitution (1)e.g. $\frac{150\ 000\ 000}{500}$ evaluation (1) 3 (00 000) evaluation consistent with unit (1) 300 000 (km/s)	$\frac{150\ 000\ 000\ 000}{500}$ **Ignore** powers of ten e.g. bald 30 000 = 2 bald 0.3 = 2 give full marks for correct answer, no working {300 000 000 m/s (with some working) = 3 marks bald 300 000 000 m/s =2}	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(e)(i)	An explanation linking any two from • (telescope {above / out of}) {atmosphere/air} (1) • dust/clouds/obstructions etc (in atmosphere) (1) • no light pollution in space (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
3(e)(ii)	An explanation linking the following • pulled together by gravity (1) • (converting) {potential / kinetic} energy to {thermal/heat} (1)	collisions create friction (not bald friction) friction produces {thermal/heat} (very) high pressure produced	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)		More than one line from either P or Q (or both) loses the mark for that box	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	B		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	An explanation linking the following • increased brightness (1) • (due to) increased voltage (1)	'fuses' / 'blows' / gets hotter {increased / faster} current increased {power / energy}	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)	substitution (1) 2 x 12 evaluation (1) 24 unit (1) W	Give full marks (2) for correct answer, no working (accept bald 2.4 for substitution) = 1 watt(s), AV, VA, J/s If only one number and one unit their position is immaterial otherwise, mark the number in the power generated space and the unit in the unit space	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(d)	A description including the following • voltage (1) • increases (1)	current decreases (ignore speed of current) Accept for 1 mark • increases current AND reduces voltage • voltage higher and bigger {current/power} • power decreases 'it' increases/decreases = 0	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	point plotted = +/- ½ square		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	attempt at smooth curve through at least 5 crosses	Reject • clear tramlining • dot to dot Ignore extrapolations	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(iii)	A description including the following • as the object distance increases the image distance decreases (1) • non linear / not in proportion (1)	reverse argument at a changing rate	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(a)(iv)	A description including **two** of the following • magnified (1) • erect (1) • virtual (1)	bigger the right way up not real	**(2)**

Question Number		Indicative content	Mark
QWC	**5(b)**	A description including some of the following **Similarities** • both use lenses • (lenses) acts as eyepieces • both produce images of distant objects • eyepiece magnifies • (eyepiece magnifies) real image produced by objective in both • other **Differences** • reflector uses mirror • (reflector uses mirror) {as objective / to collect light} • refractor uses lens • (refractor uses lens) {as objective / to collect light} • reflector can collect more light than a refractor • reflector reduces {abberation /gives better quality image} / ORA • refractors are easier to support / ORA • other	**(6)**
Level	**0**	no rewardable material	
1	**1-2**	• a limited description of **either** a similarity **or** a difference e.g. both magnify distant objects • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3-4**	• a simple description which includes at least one similarity **and** one difference / a detailed description of a similarity or a difference e.g. both magnify distant objects but the reflector uses a mirror and a lens while the refractor has only lenses • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5-6**	• a detailed description to include both similarities **and** differences with a clear description of the comparison e.g. the eyepiece in each produces a magnified image of the objective image. The reflector has a mirror as the objective while the refractor has a lens • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
6(a)	A		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)(i)	6%	100 - 94	**(1)**
(ii)	comparing reflected amount for water with any one of the others (1)	saying one {named material (on the graph) is/all materials (on the graph) are} solid	**(1)**

Question Number	Answer	Acceptable answers	Mark
6(c)(i)	An explanation to include the following • more thermal (heat) energy is absorbed (1) • because water (liquid) absorbs more than ice (solid) (1)	more radiation is absorbed because water (liquid) reflects less than ice (solid) because less ice surface to reflect because more water surface to absorb	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(c)(ii)	its temperature rises	gets hotter water level increases/gets higher Ignore '{water/it} {increases/rises}' **Reject** toxicity	**(1)**

Question Number		Indicative content	Mark
QWC	***6(d)**	A description including some of the following • solar / heat / light • photosynthesis • chemical / fossil fuel • burning • thermal • in steam • kinetic • in turbine • electrical • in generator	**(6)**
Level	**0**	no rewardable material	
1	**1-2**	• a limited description which identifies an energy in an appropriate place e.g. thermal energy in the boiler OR e.g. the (same) energy flows from the boiler to the turbine • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3-4**	• a simple description which includes details of a relevant energy transfer e.g. (steam causing) the turbine to rotate turns the coil in the generator transferring kinetic energy into electrical energy • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description to includes details of a sequence of transfers e.g. chemical energy stored in the coal is transferred in the boiler to thermal energy producing steam. The steam turns the turbine which turns the coil. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

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