

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

Physics/Science

Unit P1: Universal Physics

Foundation Tier

Sample Assessment Material

Time: 1 hour

Paper Reference

5PH1F/01

You do not need any other materials.

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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Turn over ►

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FORMULAE

You may find the following formulae useful

wave speed = frequency \times wavelength

$$v = f \times \lambda$$

wave speed = $\frac{\text{distance}}{\text{time}}$

$$v = \frac{x}{t}$$

electrical power = current \times potential difference

$$P = I \times V$$

cost of electricity = power \times time \times cost of 1 kilowatt-hour

power = $\frac{\text{energy used}}{\text{time taken}}$

$$P = \frac{E}{t}$$

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

Answer ALL questions

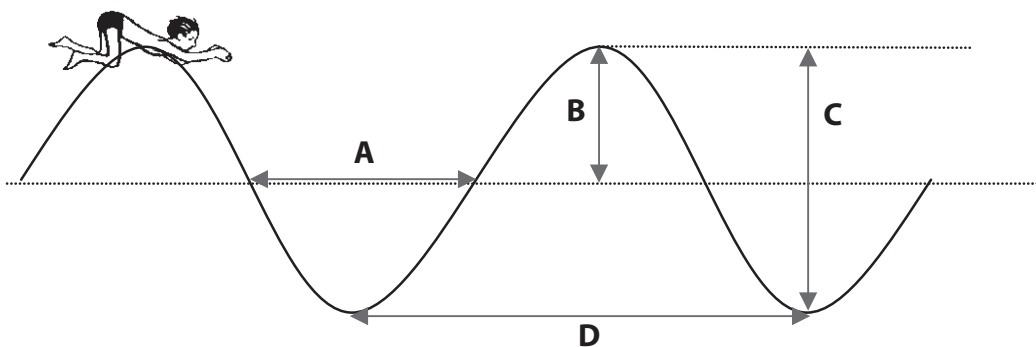
Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Water waves

- 1 The photograph shows waves made by a wave machine in a swimming pool.



- (a) The diagram shows Colin on top of one of these waves.



- (i) Which label on the diagram shows the wavelength of the wave?

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

(1)

- A
- B
- C
- D

- (ii) Which label on the diagram shows the amplitude of the wave?

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

(1)

- A
- B
- C
- D

- (b) The wavelength of the water wave is 3 m.
The frequency of the water wave is 0.5 Hz.

Calculate the wave speed.
State the unit.

(3)

wave speed = unit =

- (c) Colin does not try to swim. He lets himself float on the surface of the water.

Describe Colin's movement as the wave passes.

(2)

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- (d) The shallow end of this pool is like a beach.



The wave's energy is absorbed and the wave finishes there.
Some other pools have a wall at the end instead of a beach.

What would happen to waves when they hit this wall?

(1)

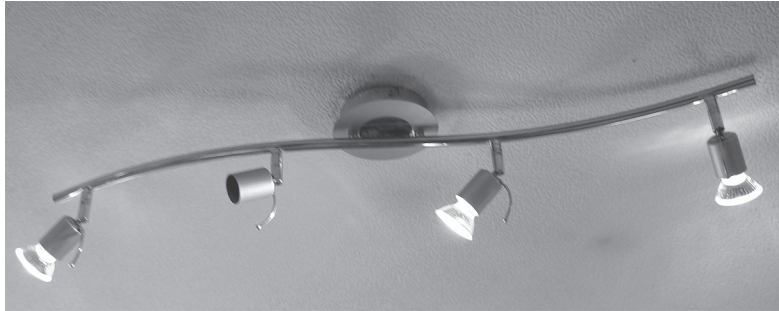
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(Total for Question 1 = 8 marks)

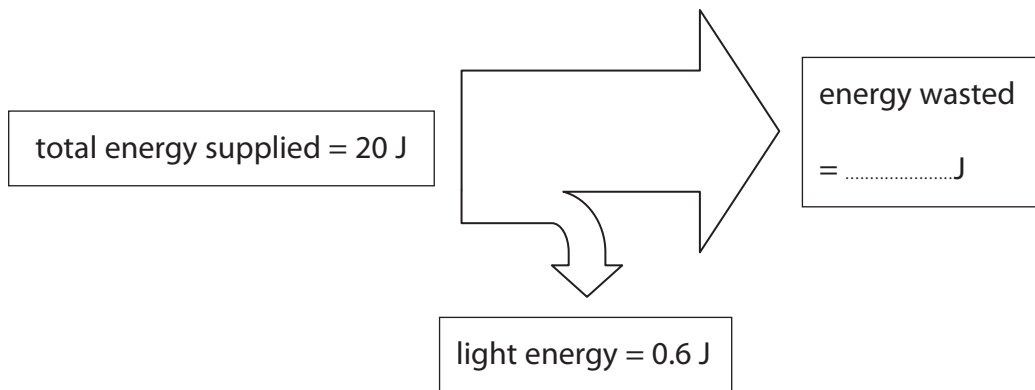
Lighting in the home

2 Geeta has a set of low-voltage spotlights in her kitchen.



(a) At the moment, Geeta uses halogen lamps.

The energy transfer in a halogen lamp can be shown by this diagram.



(i) Write the missing value in the right hand box.

(1)

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

Calculate the efficiency of the halogen lamp.

(2)

efficiency =

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

When a lamp is operating, the electrical power input is

(1)



- A** the same as the total heat and light power output from the lamp
- B** more than the total heat and light power output from the lamp
- C** less than the total heat and light power output from the lamp
- D** the power of the heat output minus the power of the light output.

(c) Geeta needs to insert a new lamp.

Her local store has halogen lamps and LED cluster lamps.

They would both fit and they give out the same amount of light.

The table shows how the two lamps compare.

	halogen lamp	LED cluster lamp
		
Light source	one hot filament	20 LEDs
Power consumption	20 W	4 W
Expected life	2 500 hours	50 000 hours
Price	£1.75	£6.20

Shutterstock

(i) Explain why Geeta should choose the LED cluster lamp.

(2)

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- (ii) The LED lamp is more expensive.
Geeta asks the salesperson if it would pay for itself in the first year of use.

What other information would the salesperson need to give an accurate answer?

(2)

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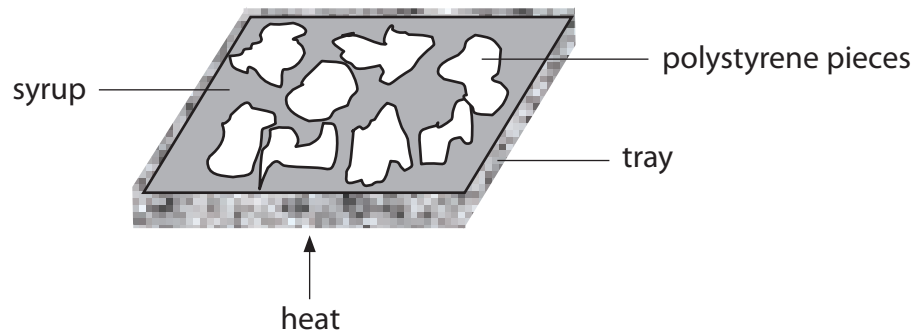
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(Total for Question 2 = 8 marks)

Inside the Earth

3 (a) Leroy made a model of the outermost layers of the Earth.



Leroy heated the syrup. The polystyrene pieces moved.

Look at the diagram below.

Draw a line from each part of the model to the part of Earth it represents.

(2)

part of the model

polystyrene ●

syrup ●

part of the Earth

● core

● mantle

● ocean

● plate

(b) Earthquakes can cause seismic waves in the Earth.

P-waves are one type of seismic wave. P-waves are longitudinal.

If a P-wave is moving from left to right, how do the particles in the wave move?

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

(1)

A

B

C

D

(c) Scientists can use seismometers to detect and record seismic waves from earthquakes.

(i)
$$\text{time} = \frac{\text{distance}}{\text{speed}}$$

P-waves travel at 5 km/s.

During a recent earthquake, a seismometer 120 km away detected the seismic waves.

Calculate the time, in seconds, it took before the P-wave reached the seismometer.

(2)

time = s

(ii) Earthquakes also produce S-waves.
S-waves travel more slowly than P-waves.

Describe how seismometer records of P-waves and S-waves can be used to work out where an earthquake happened.

(3)

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(d) Many lives might be saved if we could predict an earthquake happening.

Explain why, even with the use of seismometers, scientists still find it difficult to make accurate predictions.

(2)

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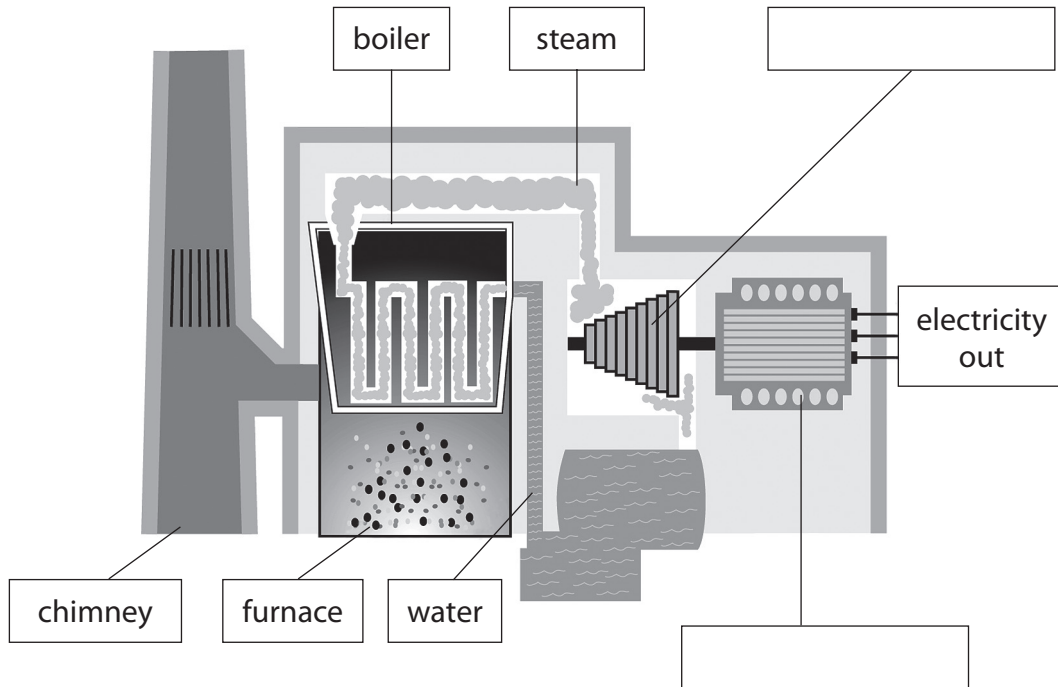
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(Total for Question 3 = 10 marks)

Making electricity

- 4 (a) Electricity is produced in power stations.

Here is a partly-labelled diagram of a coal-fired power station.



- (i) Complete the missing labels by choosing from these words.

(2)

generator motor reactor transformer turbine

- (ii) To transmit the electricity, the size of the voltage should be changed.

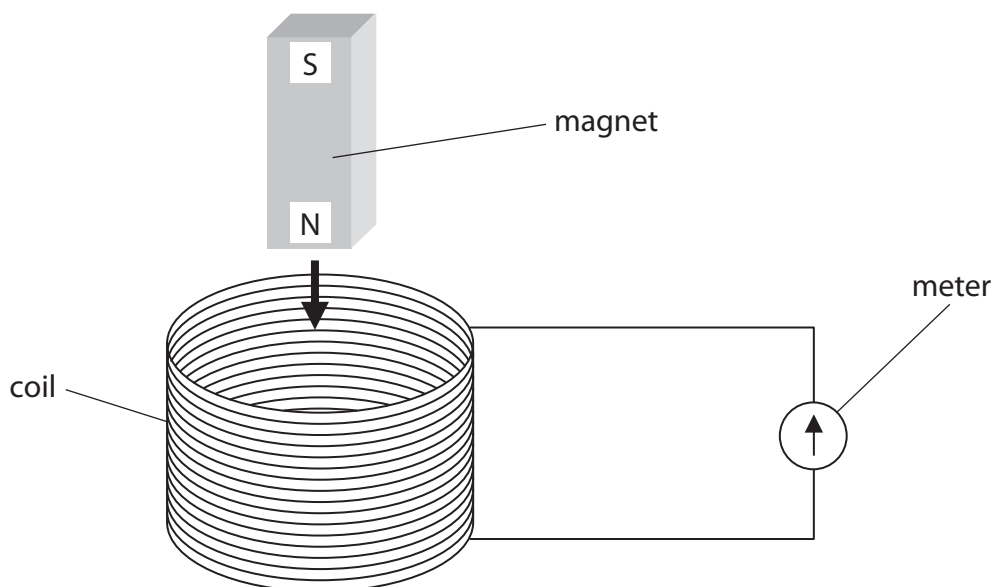
What device is used to do this?

(1)

- (iii) Describe the differences between a coal-fired power station and a nuclear power station.

(2)

(b) Electricity is produced when a magnet moves near a coil of wire.
Pedro set up an experiment like this.



Pedro let the magnet fall.
The meter pointer turned to the right.
Then it returned to the centre.

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

This showed that there was

(1)

- A** an electromagnetic wave in the meter
- B** an alternating current in the meter
- C** an alternating voltage across the coil
- D** an induced current in the coil

(ii) Pedro repeated the experiment with a stronger magnet.

Describe how the reading on the meter would have changed.

(2)

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(iii) Pedro did a similar experiment but the pointer turned to the **left**.

Explain why this may have happened.

(2)

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(Total for Question 4 = 10 marks)

The electromagnetic spectrum

5 (a) The chart shows the electromagnetic spectrum.

radio waves	microwaves	infrared	visible light	ultraviolet	X-rays	gamma rays
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(i) Complete this sentence using one of these types of electromagnetic radiation. (1)

Cooking is done using microwaves and

(ii) Which one of the following statements is correct?

Put a cross (☒) in the box next to your answer. (1)

- A gamma rays have the highest frequency
- B gamma rays have the longest wavelength
- C radio waves have the highest frequency
- D radio waves have the shortest wavelength

(iii) Cooking is an example of one application of microwave radiation.

State **one** other application of microwave radiation. (1)

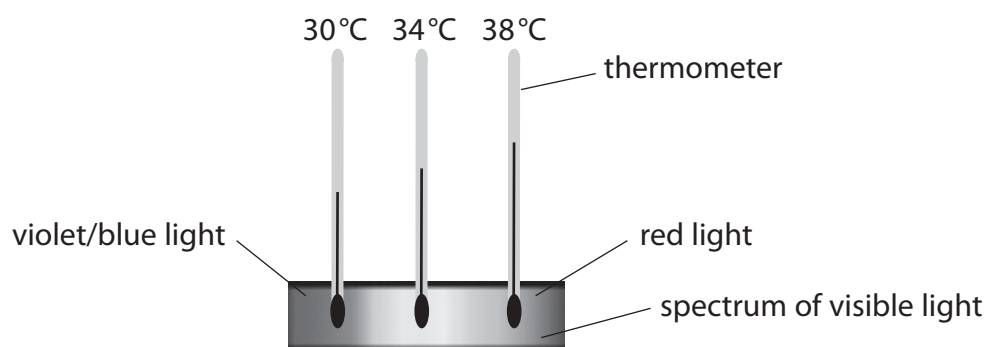
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(iv) Too much exposure to either infrared or X-rays can be harmful.

Compare the dangers to the human body of these two types of electromagnetic radiation. (3)

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*(b) The diagram shows three identical thermometers placed in a spectrum of visible light.



There is a pattern in the temperature readings shown in the diagram.

The scientist Herschel did a similar experiment and discovered the infrared part of the electromagnetic spectrum.

Describe how Herschel used the pattern to make his discovery.

(6)

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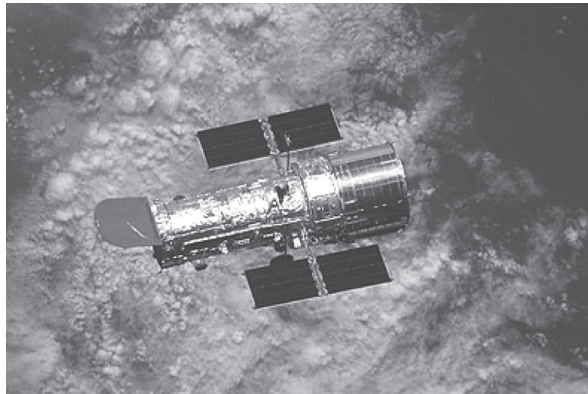
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(Total for Question 5 = 12 marks)

Exploring the Universe

- 6 (a) The Hubble Space Telescope orbits the Earth, outside its atmosphere, about 600 km above the Earth's surface.



NASA/Science Photo Library

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

The Hubble Space Telescope has enabled us to

(1)

- A** gain evidence to support the Steady State theory
 - B** observe very distant galaxies
 - C** search for extra-terrestrial intelligence
 - D** relay television and mobile phone signals
- (ii) Suggest advantages of the Hubble Space Telescope over a telescope of a similar size on the Earth's surface.

(2)

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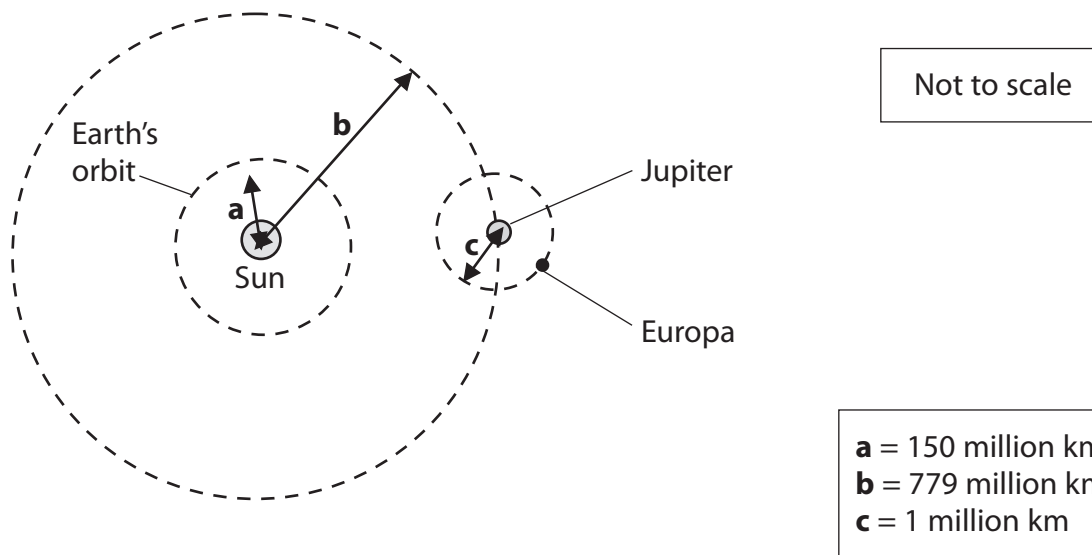
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- (b) The diagram shows how the Earth and Jupiter orbit the Sun. Europa, one of the moons of Jupiter, is also shown.

The radii of the orbits are shown by letters **a**, **b** and **c** and have the values given below.



The smallest distance between the **Earth** and **Jupiter** = **b - a**.

- (i) Use this equation to calculate the smallest distance between the Earth and Jupiter. (1)

smallest distance = million km

- (ii) Complete the equation below for the smallest distance between the **Earth** and **Europa**.

Use the letters **a**, **b** and **c** shown on the diagram. (2)

the smallest distance between **Earth** and **Europa** =

*(c) Some scientists think that there could be simple life on Europa.

We have already sent successful manned expeditions to our Moon.
There is now a proposal to send a manned expedition to Europa.

Using evidence and opinions, discuss why this is unlikely to happen in the near future.

(6)

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(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

Sample Mark Scheme

Unit P1: Universal Physics (Foundation Tier)

Question Number	Answer	Mark
1(a)(i)	D	(1)

Question Number	Answer	Mark
1(a)(ii)	B	(1)

Question Number	Answer	Acceptable answers	Mark
1(b)	0.5 × 3 (1) 1.5 (1) m/s (1)	accept Hz.m	(3)

Question Number	Answer	Mark
1(c)	a description including the following: idea of oscillation/with the wave (1) vertical direction only/moves up and down (1)	(2)

Question Number	Answer	Acceptable answers	Mark
1(d)	reflected	bounce	(1)

TOTAL: 8 MARKS

Question Number	Answer	Mark
2(a)(i)	19.4	(1)

Question Number	Answer	Mark
2(a)(ii)	0.6 ÷ 20 × 100 (1) 3 (%) (1)	(2)

Question Number	Answer	Mark
2(b)	A	(1)

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	<p>an explanation linking any pair of statements:</p> <p>LED has lower power consumption (1) (so) would cost less to run (1)</p> <p>LED does not use a filament (1) (so) would not get as hot (1)</p> <p>LED has longer expected life (1) (so) would need replacing less often (1)</p> <p>numerical comparison of life and cost of lamp (2)</p>	<p>uses less electricity (1)</p> <p>wastes less energy (1)</p> <p>lasts for more hours (1)</p> <p>lasts 20 times longer but does not cost 20 times as much (1)</p>	(2)

Question Number	Answer	Acceptable answers	Mark
2 (c)(ii)	<p>an answer including the following:</p> <p>number of hours (she expects the lamp to be used during the year) (1)</p> <p>cost of 1 kW h (1)</p>	<p>how often she uses the light</p> <p>cost of electricity</p> <p>answers may be in either order</p>	(2)

TOTAL: 8 MARKS

Question Number	Answer	Mark
3(a)	lines linking: polystyrene to plate syrup to mantle	(2)

Question Number	Answer	Mark
3(b)	B	(1)

Question Number	Answer	Mark
3(c)(i)	120 ÷ 5 (1) 24 (s) (1)	(2)

Question Number	Answer	Acceptable answers	Mark
3(c)(ii)	a description including the following in a logical order: find out the difference between arrival times (of S and P waves) (1) use tables/charts to find distance from seismometer (to epicentre)(1) find places which fit in with distances from (at least three) seismometers (1)	examine record to find time(s) when wave(s) arrived(1) use records from seismometers located at different places (1)	(3)

Question Number	Answer	Acceptable answers	Mark
3(d)	an explanation to include the following: seismic waves only generated as/after the earthquake happens(1) (so) can only record/measure after earthquake has happened (1)	answers may combine two ideas in one sentence; for example: only record the waves from the earthquake once it has happened and then it is too late would be worth 2 marks	(2)

TOTAL: 10 MARKS

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	turbine (in top box) (1) generator (in bottom box) (1)	alternator, coil	(2)

Question Number	Answer	Mark
4(a)(ii)	(step up) transformer	(1)

Question Number	Answer	Acceptable answers	Mark
4(a)(iii)	a description including any two of the following differences, such as a nuclear power station: has a reactor (1) does not have a furnace (1) chimney does not emit smoke (1) will have shielding (around reactor) (1) will heat the water indirectly (1)	any reasonable alternatives	(2)

Question Number	Answer	Mark
4(b)(i)	D	(1)

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	a description linking the following: (the pointer) moves further/a bigger distance (1) to the right (1)		(2)

Question Number	Answer	Mark
4(b)(iii)	<p>an explanation linking a pair of the following:</p> <p>he reversed the magnet/pulled the magnet out of the coil/the coil away from the magnet (1)</p> <p>(so) the (change in the) field was in the other direction (1)</p> <p>he reversed the connections to the meter (1)</p> <p>(so) the current flowed the other way (through the meter mechanism) (1)</p> <p>he wound the coil the other way round (1)</p> <p>(so) the (induced) current was reversed (in the circuit) (1)</p>	(2)

TOTAL: 10 MARKS

Question Number	Answer	Mark
5(a)(i)	infrared	(1)

Question Number	Answer	Mark
5(a)(ii)	A	(1)

Question Number	Answer	Acceptable answers	Mark
5(a)(iii)	any one of the following: communication/satellite/mobile phones (1) weather forecasting/to pin-point rain clouds (1)	any sensible application	(1)

Question Number	Answer	Acceptable answers	Mark
5(a)(iv)	a comparison that covers the following: infrared damages external parts of the body/burns the skin (immediately) (1) and (unlike) X-rays can penetrate the body and cause mutations/cancer(1) (so) harmful effects of X-rays are harder to monitor/treat(1)	(so) damage from infrared is quicker and so more dangerous than something that might kill you in the future(1)	(3)

Question Number		Indicative content	Mark
*5(b) QWC		<p>Description of pattern</p> <ul style="list-style-type: none"> temperature shown is different at different parts of the spectrum pattern (trend) shows temperature rises towards the red end (long wavelength part) of spectrum <p>Extension outside spectrum</p> <ul style="list-style-type: none"> decided to see if the trend continued investigated by placing thermometer beyond the red end where there is no visible light found temperature rise was (even) higher here <p>Conclusion</p> <ul style="list-style-type: none"> there must be some light which was invisible 	(6)
Level	0	no rewardable material	
1	1-2	<ul style="list-style-type: none"> a limited description of the pattern there is a limited description of what Herschel found there is little or no attempt to relate his findings to the conclusion the answer communicates ideas using simple language and uses little scientific terminology. Spelling, punctuation and grammar are used with limited accuracy 	
2	3-4	<ul style="list-style-type: none"> a clear description is given of the pattern linking colour/wavelength to temperature a limited explanation of why Herschel extended this investigation and some attempt to describe what Herschel found some attempt to relate his findings to the conclusion the answer communicates ideas showing some evidence of clarity and organisation and uses some scientific terminology appropriately. Spelling, punctuation and grammar are used with some accuracy 	
3	5-6	<ul style="list-style-type: none"> a clear description of the pattern, linking colour/wavelengths to temperature there is a clear explanation of why Herschel extended this investigation and a clear description of what he found clearly shows how evidence supported his conclusion the answer communicates ideas clearly and uses scientific terminology appropriately. Spelling, punctuation and grammar are used with few errors 	

TOTAL: 12 MARKS

Question Number	Answer	Mark
6(a)(i)	B	(1)

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	<p>an answer including two of the following:</p> <p>atmosphere distorts images (1) atmosphere absorbs some visible light (1) atmosphere absorbs other parts of the electromagnetic spectrum (1) light pollution on Earth (1) Earth based operation can be limited by bad weather/clouds (1)</p>	any named part of the electromagnetic spectrum e.g. X-rays	(2)

Question Number	Answer	Acceptable answers	Mark
6(b)(i)	629 millions of km ($\times 10^6$ km)	any correct alternatives of powers of ten e.g. $628\,000 \times 10^3$ km 628 000 000 km	(1)

Question Number	Answer	Acceptable answers	Mark
6(b)(ii)	<p>$b - (a + c)$ or $b - (c + a)$</p> <p>1st mark for b at front</p> <p>2nd mark for a and c subtracted</p>	ignore brackets	(2)

Question Number		Indicative content	Mark
*6(c) QWC		<p>Description of problems</p> <p>Problems to consider could be:</p> <ul style="list-style-type: none"> • very large distance from the Earth to Jupiter/Europa • much larger than the distance to our Moon • time involved is very large/much longer than lunar mission • problems of external help/control at large distance/time-delay of signals • need to secure sufficient funding • possibility of cross-contamination if life is indeed present on Europa • need for all life-support facilities on spacecraft itself • alternatives (such as robot probes) could be available • too difficult/technology not yet available • inadvisable/too much risk • could not guarantee (long term) commitment to mission • alternatives could provide more information than humans (for the same payload). <p>Advantages and disadvantages of problems</p> <p>Discussion of whether each problem mentioned are insurmountable or can be overcome.</p> <p>Conclusion/judgement</p> <p>Discussion of how, overall, the problems may prevent travel to Europa.</p>	(6)
Level	0	no rewardable material	
1	1-2	<ul style="list-style-type: none"> • there is a limited attempt to identify one or two of the factors that would impact on a manned journey to Jupiter/Europa in the near future • a limited attempt to explain the severity of the problems • limited, if any, conclusion • the answer communicates ideas using simple language and uses limited scientific terminology. Spelling, punctuation and grammar are used with limited accuracy 	
2	3-4	<ul style="list-style-type: none"> • there is an identification of at least several problems • some discussion of the severity of each problem • some discussion of how, overall, the problems will affect the likelihood of future travel • there is an attempt to draw a conclusion based on at least one of these factors • the answer communicates ideas showing some evidence of clarity and organisation and uses some scientific terminology appropriately. Spelling, punctuation and grammar are used with some accuracy 	
3	5-6	<ul style="list-style-type: none"> • there is a clear description of at least three main problems • clear discussion of the severity of these problems • clearly shows why the conclusion has been reached • the answer communicates ideas clearly and uses scientific terminology appropriately. Spelling, punctuation and grammar are used with few errors 	

TOTAL: 12 MARKS