Paper Reference(s) 5PH1F/01

Edexcel GCSE

Physics/Science
Unit P1: Universal Physics
Foundation Tier

Thursday 24 May 2012 – Morning
Time: 1 hour plus your additional time allowance

INSTRUCTIONS TO CANDIDATES
Write your centre number, candidate number, surname, initials and your signature in the boxes below. Check that you have the correct question paper.

Centre No.							
Candidate No.							
Surname							
Initial(s)							
Signature							
Paper Reference	5	P	H	1	F	/	0	1

X40241A

PEARSON

Use BLACK ink or ball-point pen.
Answer ALL questions.
Answer the questions in the spaces provided – there may be more space than you need.

MATERIALS REQUIRED FOR EXAMINATION

Calculator, ruler

ITEMS INCLUDED WITH QUESTION PAPERS

Nil

INFORMATION FOR CANDIDATES

- **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 TO CANDIDATES

- **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.**

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 ☒.

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 mark)

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

(Question continues on next page)

(b) State another use for ultrasound waves. (1 mark)

(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 marks)

(Question continues on next page)

(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. (2 marks)

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

(distance = _____ m

(Question continues on next page)

(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 marks)

Q1

(Total 8 marks)

(Questions continue on next page)

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 marks)

☐ **A** all the time

☐ **B** at regular intervals

☐ **C** every few minutes

☐ **D** only when they are heated

(Question continues on next page)

(b) Use words from the box to complete the table. (3 marks)

atom	energy	molecule
particle	source	wave

RADIATION	TYPE	TRANSFER
alpha	particle	energy
beta	_____	energy
gamma	_____	_____

(Question continues on next page)

(c) State two uses of gamma radiation. (2 marks)

(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 marks)

Q2

(Total 8 marks)

(Questions continue on next page)

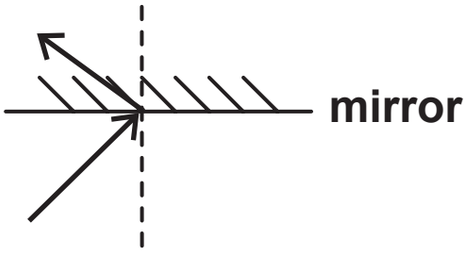
VISIBLE LIGHT

3 Mirrors and lenses can be used in telescopes.

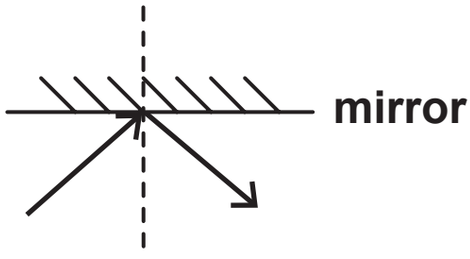
(a) Which diagram best shows what happens to a ray of light when it hits a plane mirror?

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

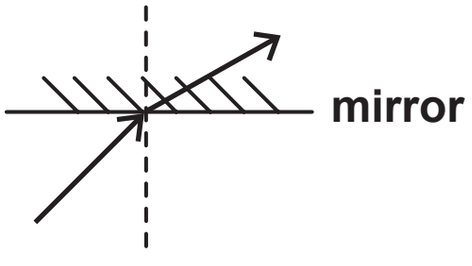
☐ **A**



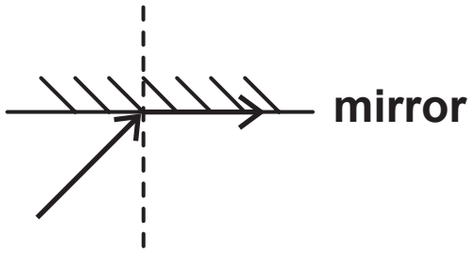
☐ **B**



☐ **C**



☐ **D**



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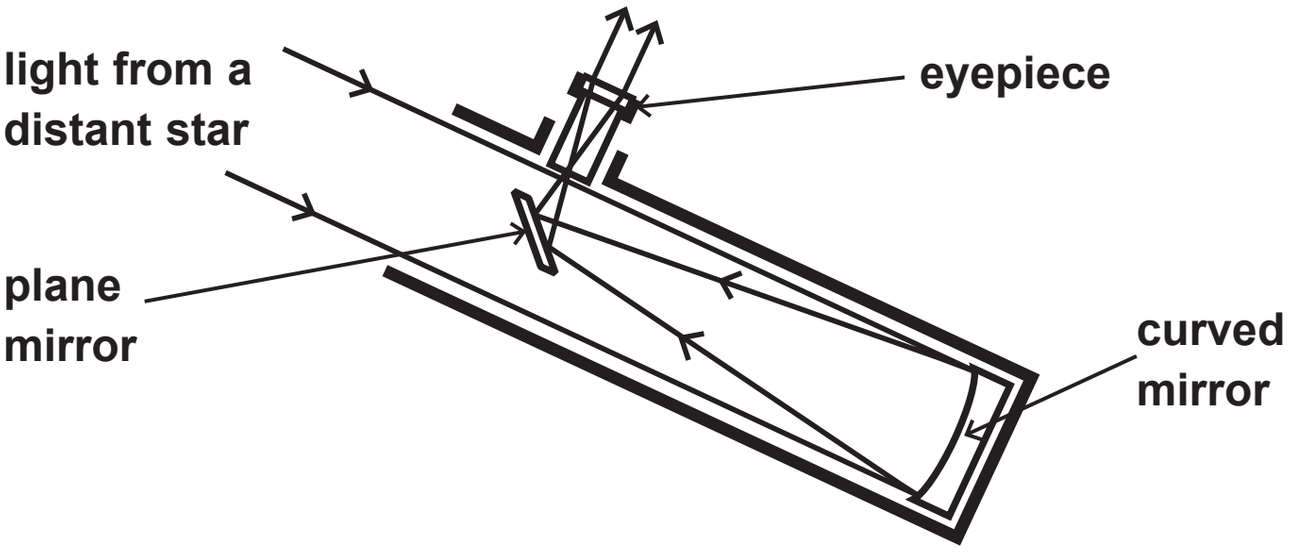
(b) The diagram shows light rays in a reflecting telescope.

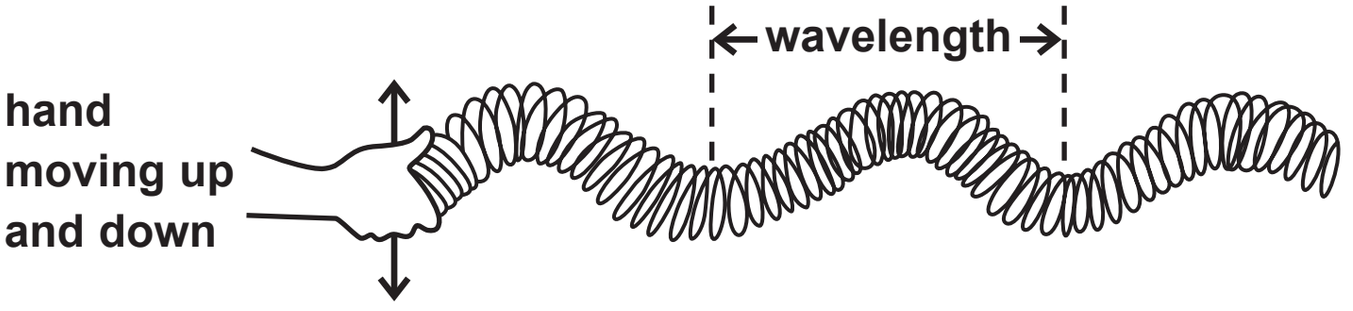


(i) Describe what the mirrors and the eyepiece do to the light rays to form an image of a distant star. (3 marks)

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

(Question continues on next page)

(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 mark)

(Question continues on next page)

(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 mark)

☐ 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 marks)

speed of wave = _____ m/s

Q3

(Total 10 marks)

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 mark)

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

(Question continues on next page)

(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 marks)

power consumption = _____ W

(Question continues on next page)

(ii) Describe what is meant by CURRENT.
(2 marks)

(Question continues on next page)

(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 mark)

_____

_____

(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 marks)

(Question continues on next page)

(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 mark)

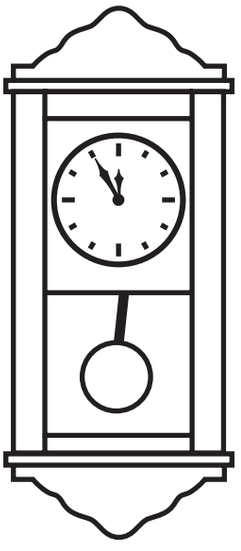
Q4

(Total 10 marks)

(Questions continue on next page)

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?

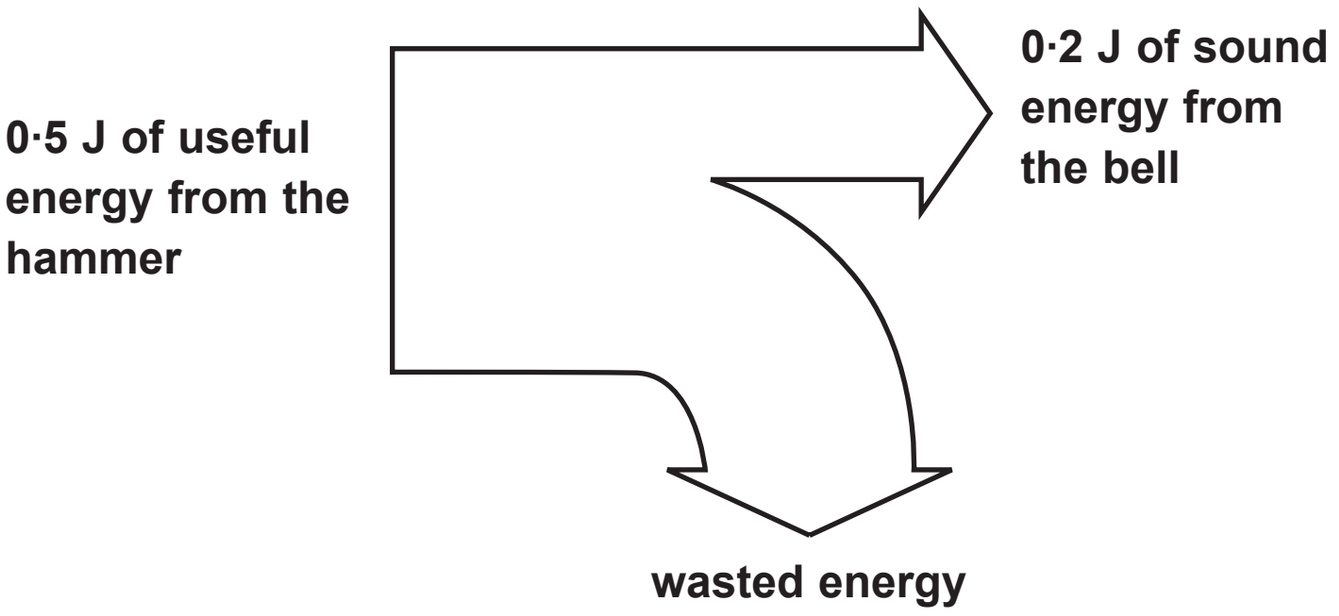
Put a cross (☒) in the box next to your answer.
(1 mark)

- ☐ **A** chemical energy
- ☐ **B** elastic potential energy
- ☐ **C** gravitational potential energy
- ☐ **D** thermal energy

(Question continues on next page)

(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.



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(i) Calculate the energy wasted. (1 mark)

wasted energy = _____ J

(ii) Calculate the efficiency of this process. (2 marks)

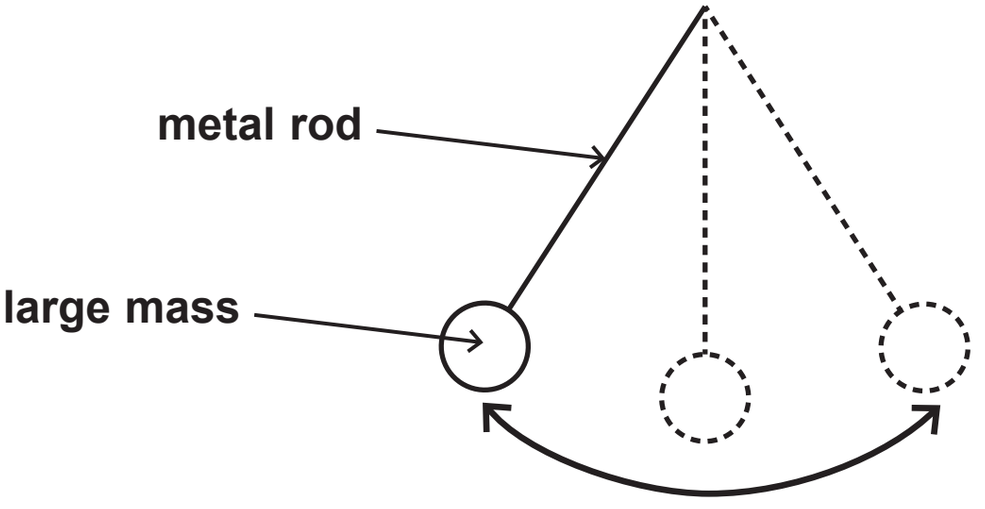
efficiency = _____

(Question continues on next page)

(iii) Suggest what happens to the wasted energy. (2 marks)

(Question continues on next page)

*(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.



(b) 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 marks)

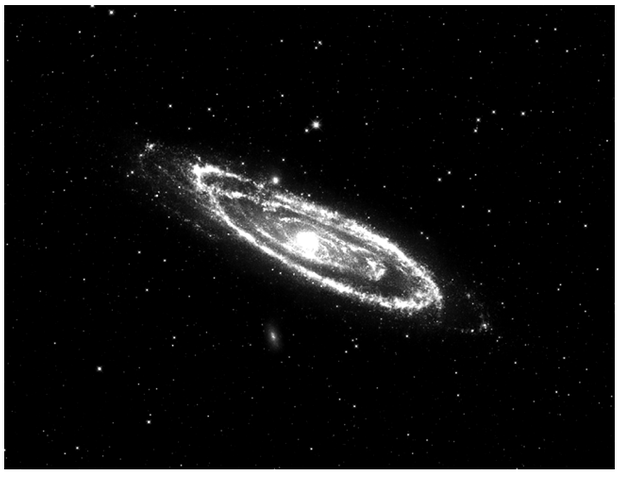
Q5

(Total 12 marks)

(Questions continue on next page)

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 mark)

☐ **A** constellations

☐ **B** planets

☐ **C** stars

☐ **D** Universe

(Question continues on next page)

(ii) State the name of the galaxy that contains our Solar System. (1 mark)

_____

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

(i) Describe the changes to the waves they observe. (2 marks)

_____

_____

_____

_____

_____

_____

(Question continues on next page)

(ii) State the evidence that astronomers have observed to support the Big Bang theory for the origin of the Universe. (2 marks)

(Question continues on next page)

*(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 marks)

(Continue your answer on next page)

Q6

(Total 12 marks)

TOTAL FOR PAPER = 60 MARKS

END