Edexcel GCSE

Physics/Science
Unit P1: Universal Physics
Foundation Tier

Wednesday 5 June 2013 – Afternoon

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

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 $\qquad v = f \times \lambda$

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

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

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

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

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

(Turn over)

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? (1 mark)

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

☐ **A five**

☐ **B seven**

☐ **C nine**

☐ **D eleven**

(Question continues on next page)

(Turn over)

(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

☐ A green, red, yellow

☐ B blue, red, green

☐ C red, orange, yellow

☐ D violet, orange, green

(1 mark)

(Question continues on next page)

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

Draw ONE straight line from each part to its use.
(2 marks)

part   use

| ultraviolet | | detecting forged banknotes |

| gamma rays | | cooking |

| microwaves | | detecting cancer |

(Question continues on next page)

(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 marks)

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(Question continues on next page)

(Turn over)

(ii) **Explain why taking an X-ray image of a hand is more dangerous than taking an infrared image. (2 marks)**

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(TOTAL FOR QUESTION 1 = 8 MARKS)

(Questions continue on next page)

USING WAVES

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

    (a) **(i)** **Which of these is correct for ultrasound waves? (1 mark)**

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

☐ **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**

(Question continues on next page)

(ii) **Complete the sentence by putting a cross (☒) in the box next to your answer.**
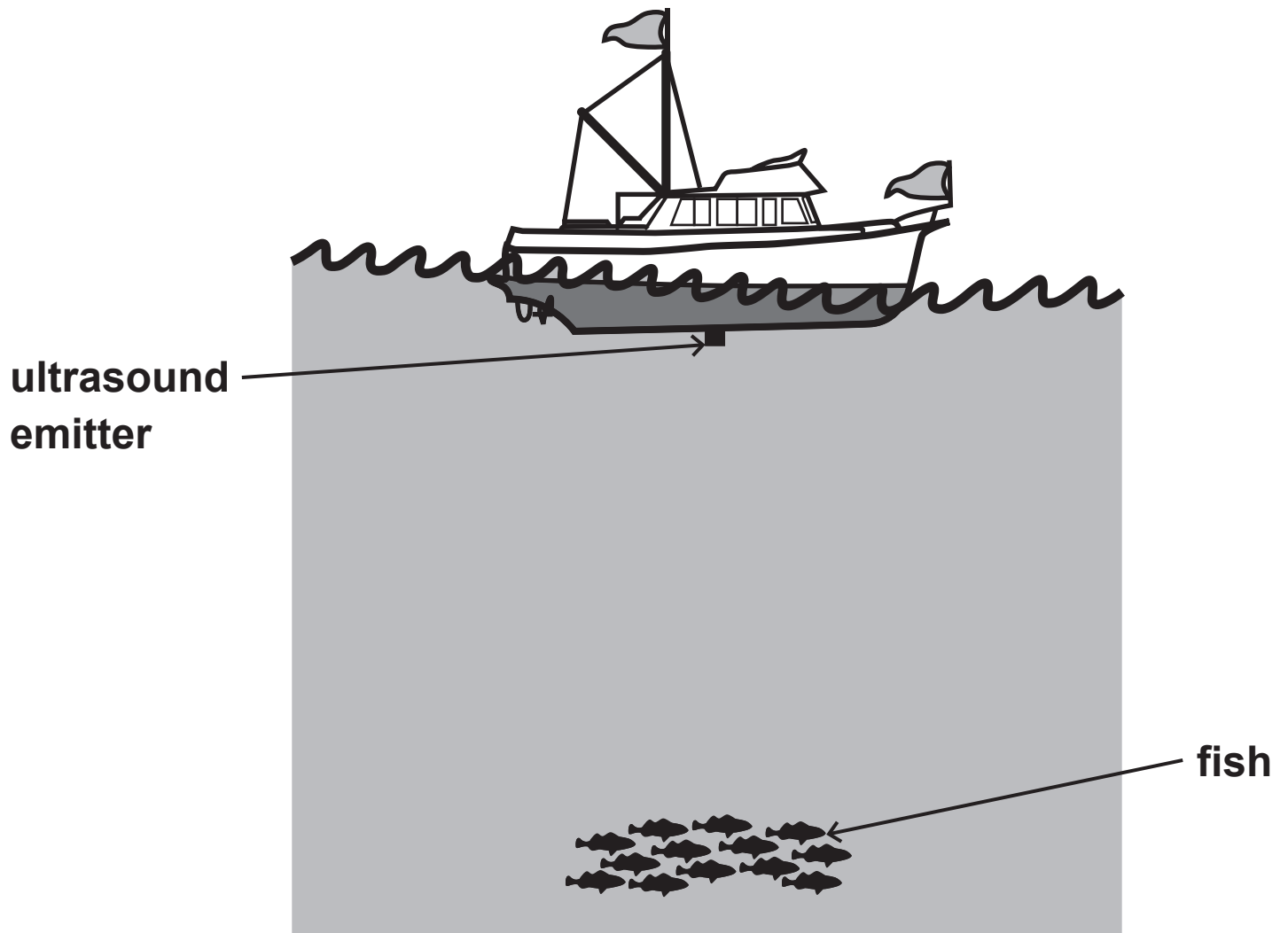
The system that uses ultrasound to find fish is called

☐ **A** **fibre optics**

☐ **B** **satellite transmission**

☐ **C** **sonar**

☐ **D** **thermal imaging**

(1 mark)

(Question continues on next page)

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

ultrasound emitter

fish

Describe how ultrasound waves are used to detect the fish.

You may add to the diagram to help with your answer.
(2 marks)

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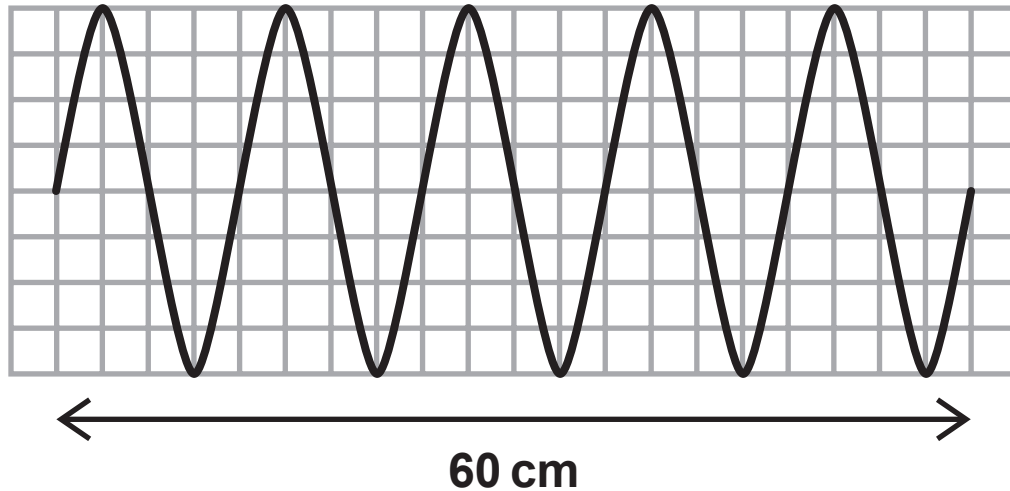**(Continue your answer on next page)**

(Turn over)

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(Question continues on next page)

(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.

60 cm

(i) State the number of wavelengths shown on the diagram. (1 mark)

number of wavelengths = _____

(Question continues on next page)

(Turn over)

(ii) **Calculate the wavelength of the waves.**
      (1 mark)

wavelength of waves = _____ cm

(Question continues on next page)

(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 marks)

speed of wave = _____ cm / s

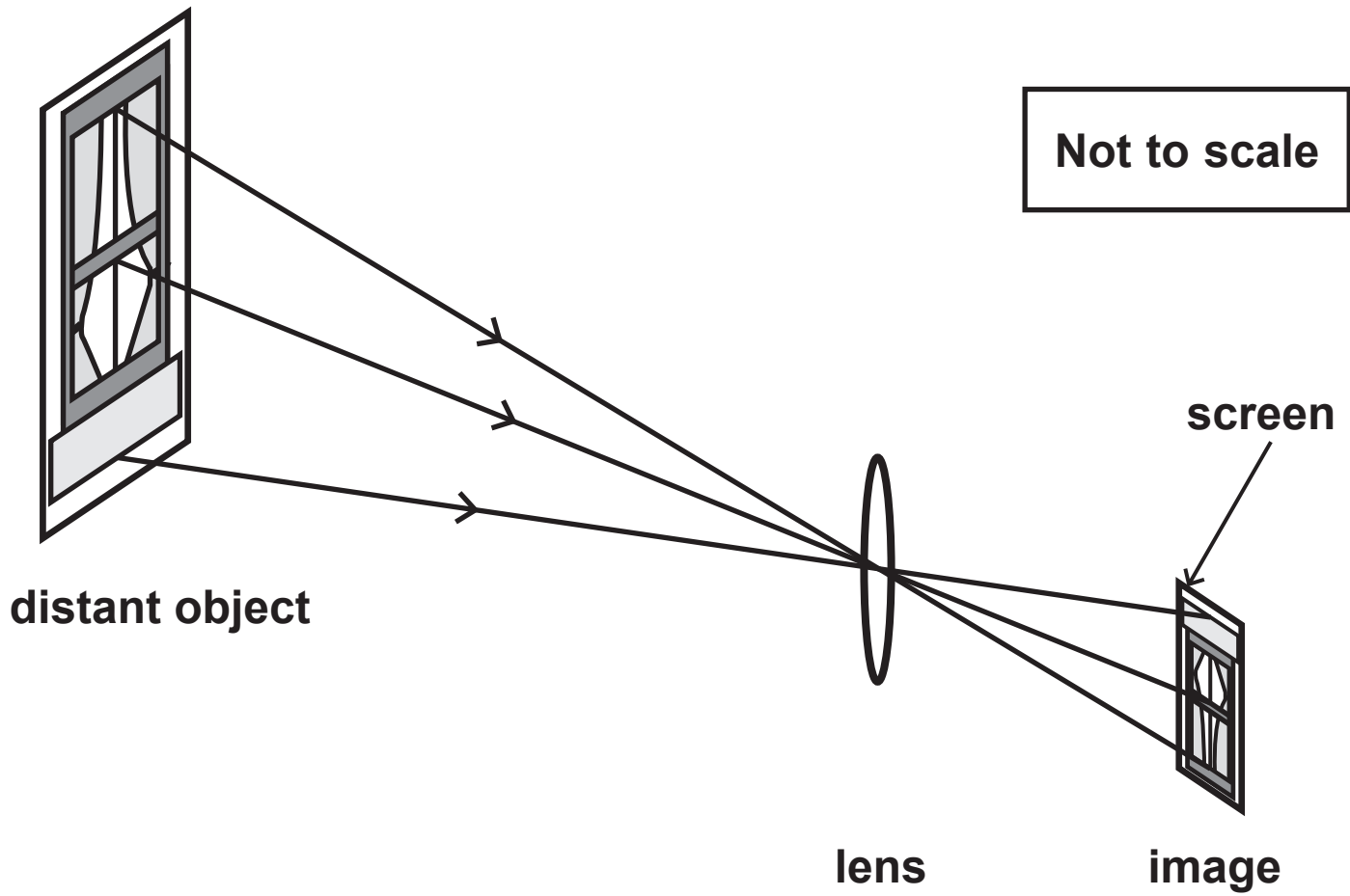**(TOTAL FOR QUESTION 2 = 8 MARKS)**

(Questions continue on next page)

(Turn over)

BEHAVIOUR OF LIGHT AND SOUND

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

Not to scale

screen

distant object

lens

image

(Question continues on next page)

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

The image produced is real because it is

☐ **A** in focus

☐ **B** magnified

☐ **C** on a screen

☐ **D** smaller

(1 mark)

(ii) Describe how to measure the focal length of the lens. **(2 marks)**

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(Question continues on next page)
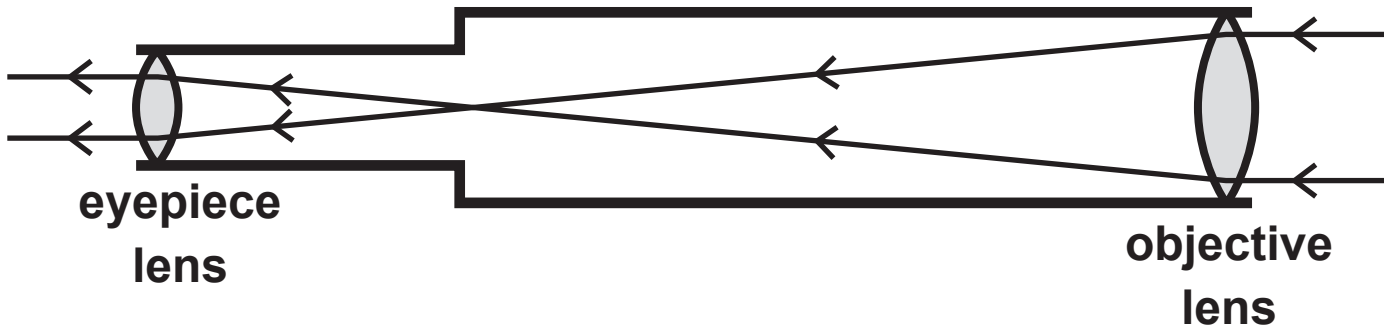
(b) The diagram shows a simple telescope which uses two lenses to look at stars.

    (i)   Explain what the eyepiece lens does. (2 marks)

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(Question continues on next page)

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

The light that travels from the stars transfers

☐ A charge

☐ B energy

☐ C mass

☐ D matter

(1 mark)

(Question continues on next page)

(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 marks)

speed of sound in air = _____ m / s

(Question continues on next page)

(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 marks)

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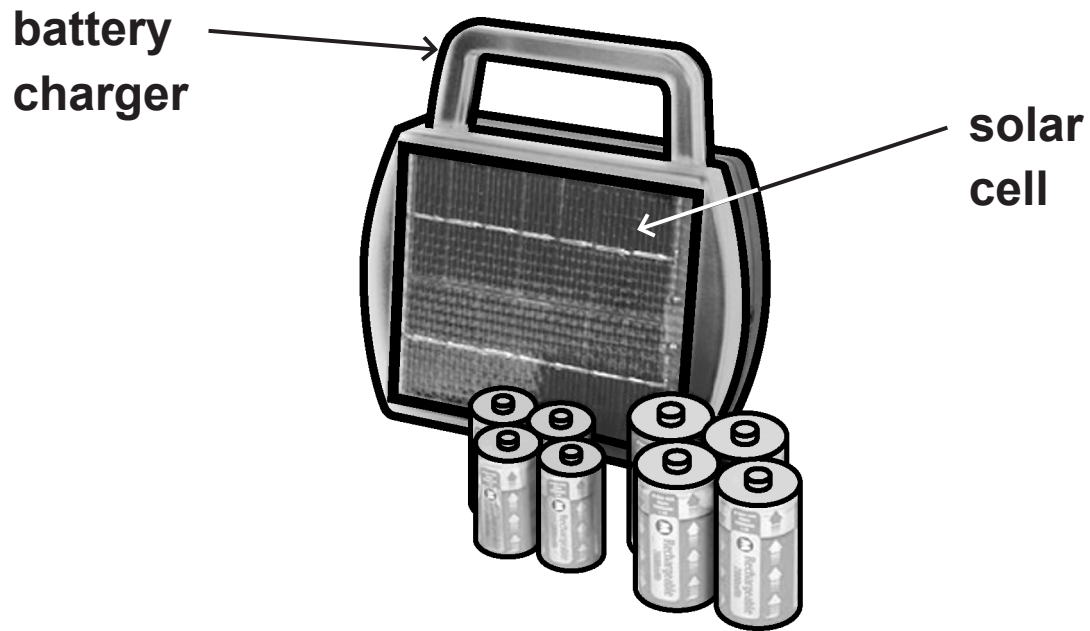**(TOTAL FOR QUESTION 3 = 10 MARKS)**

(Questions continue on next page)

(Turn over)

USING SOLAR ENERGY

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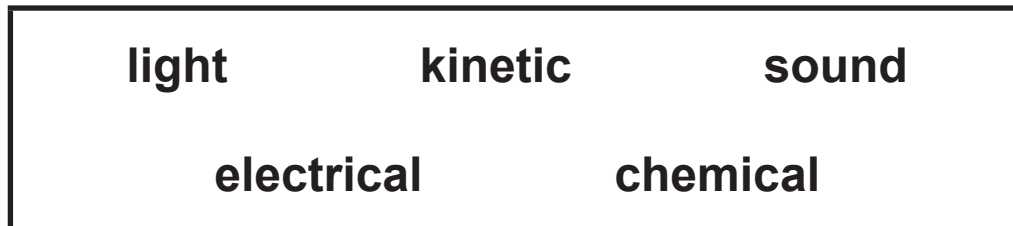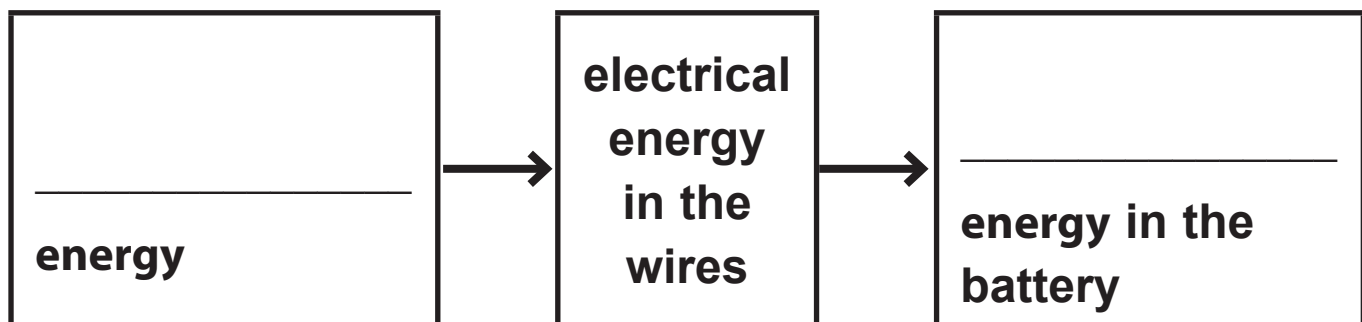
battery
charger

solar
cell

(Question continues on next page)

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

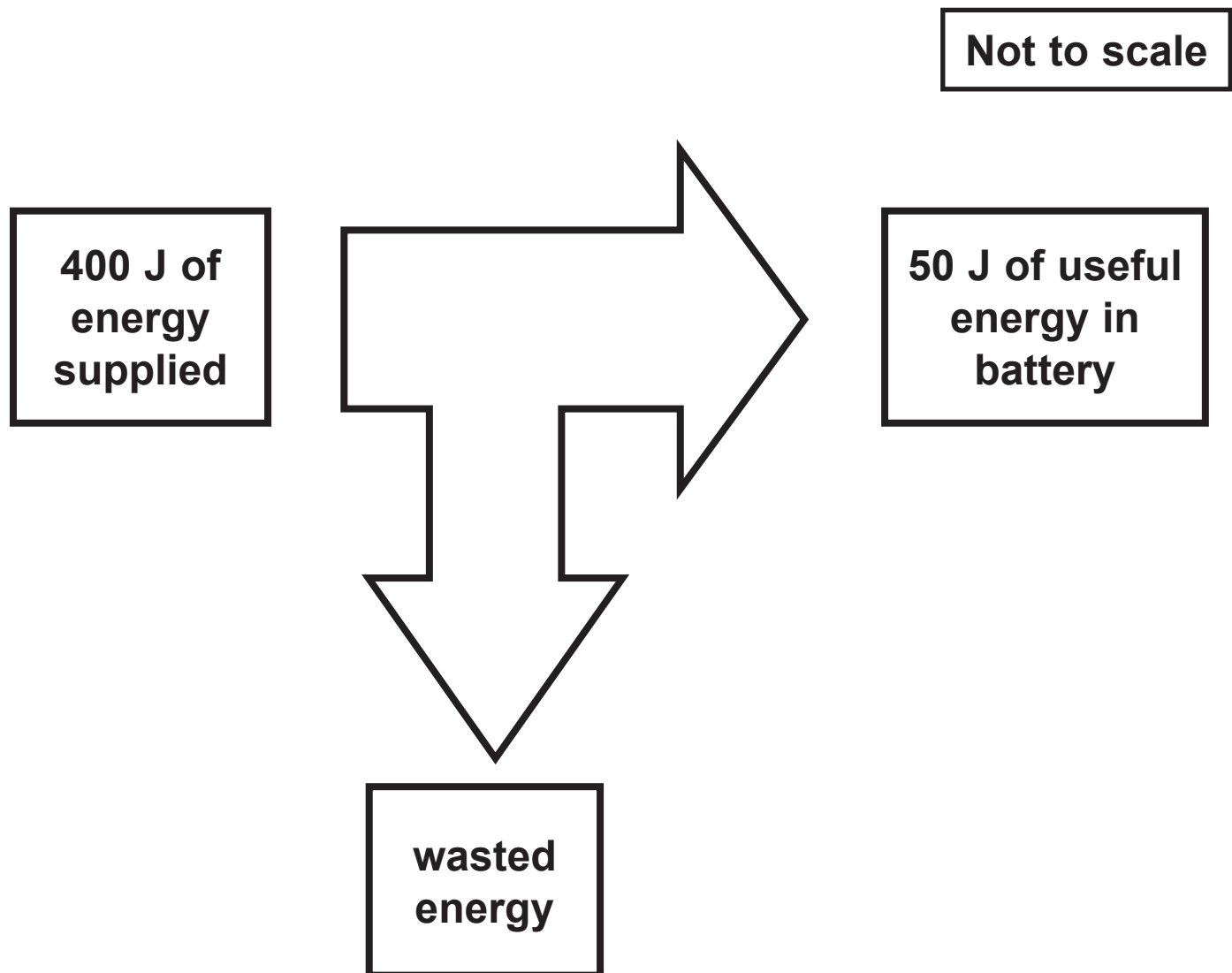Use words from the box to complete the energy transfer diagram. (2 marks)

light   kinetic   sound
electrical   chemical

Energy transfer diagram

| _____ energy | → | electrical energy in the wires | → | _____ energy in the battery |

(Question continues on next page)

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

Not to scale

| 400 J of energy supplied |

| 50 J of useful energy in battery |

| wasted energy |

(Question continues on next page)

(i) **Calculate the amount of wasted energy.**
(1 mark)

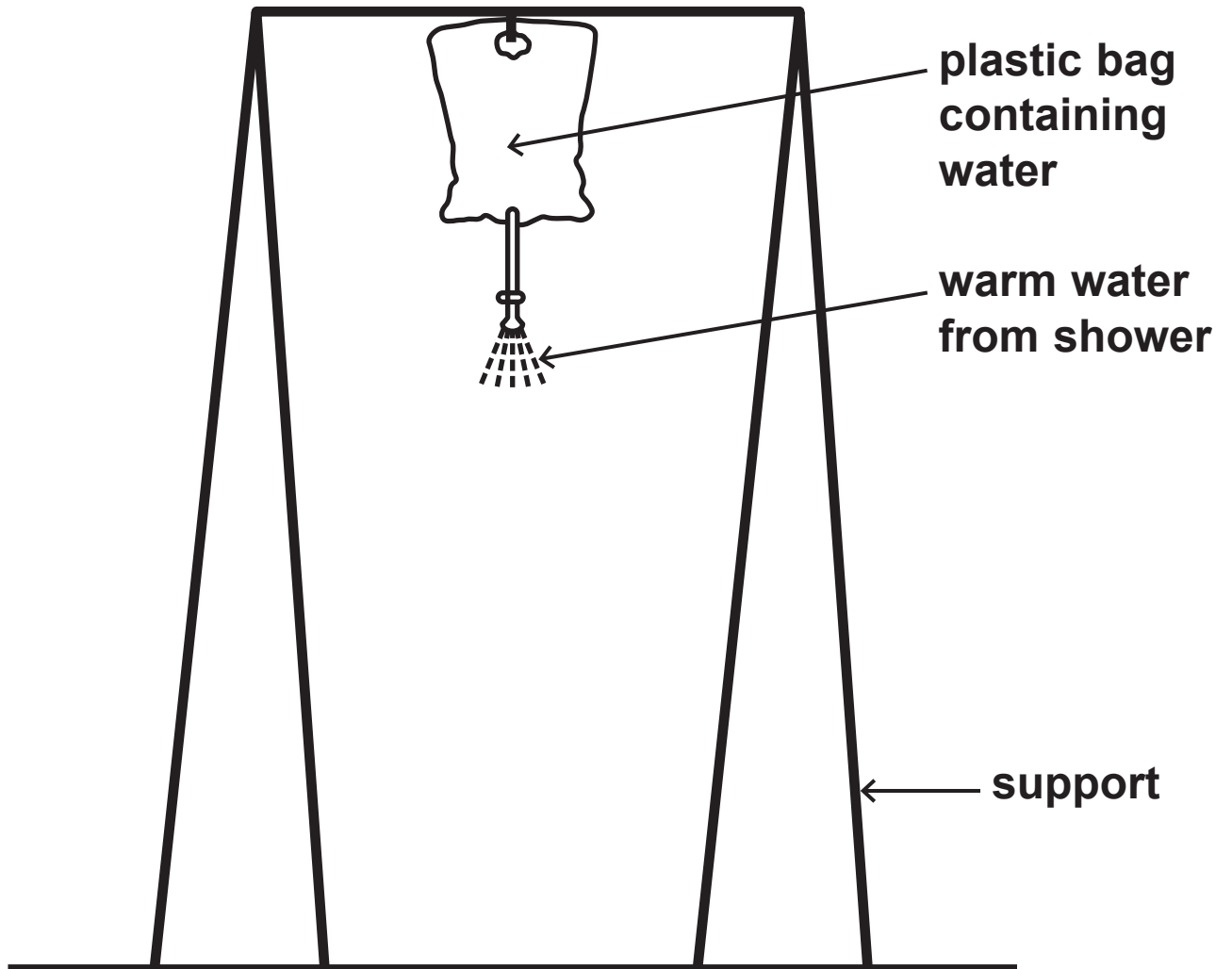**wasted energy = _____ J**

(Question continues on next page)

(ii) Calculate the efficiency of the battery charger.
(2 marks)

efficiency of the battery charger = _____ %

(Question continues on next page)

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

plastic bag containing water

warm water from shower

support

(Question continues on next page)

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 marks)

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(Question continues on next page)

(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 marks)

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(TOTAL FOR QUESTION 4 = 10 MARKS)

(Questions continue on next page)

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

☐ **A   atoms**

☐ **B   charge**

☐ **C   voltage**

☐ **D   watts**

(1 mark)

(Question continues on next page)

(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 marks)

power of the kettle = _____ W

(Question continues on next page)

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

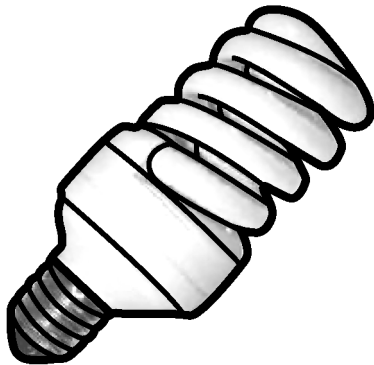Calculate the cost of using the television for
10 hours. (3 marks)

cost of using the television for 10 hours = _____ p

(Question continues on next page)

(Turn over)

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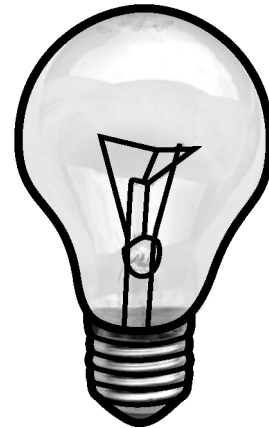
ENERGY SAVING LAMP

FILAMENT LAMP

power = 15 W

power = 60 W

cost = £1·50

cost = £0·30

lifetime = 10 000 hours

lifetime = 1 000 hours

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

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 marks)

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(Continue your answer on next page)

(Turn over)

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(TOTAL FOR QUESTION 5 = 12 MARKS)

SOLAR SYSTEM AND BEYOND

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

(i)   Complete the following sentence. (1 mark)

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

☐ **A   black hole**

☐ **B   neutron star**

☐ **C   supernova**

☐ **D   white dwarf**

(1 mark)

(Question continues on next page)

(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

(Question continues on next page)

(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 marks)
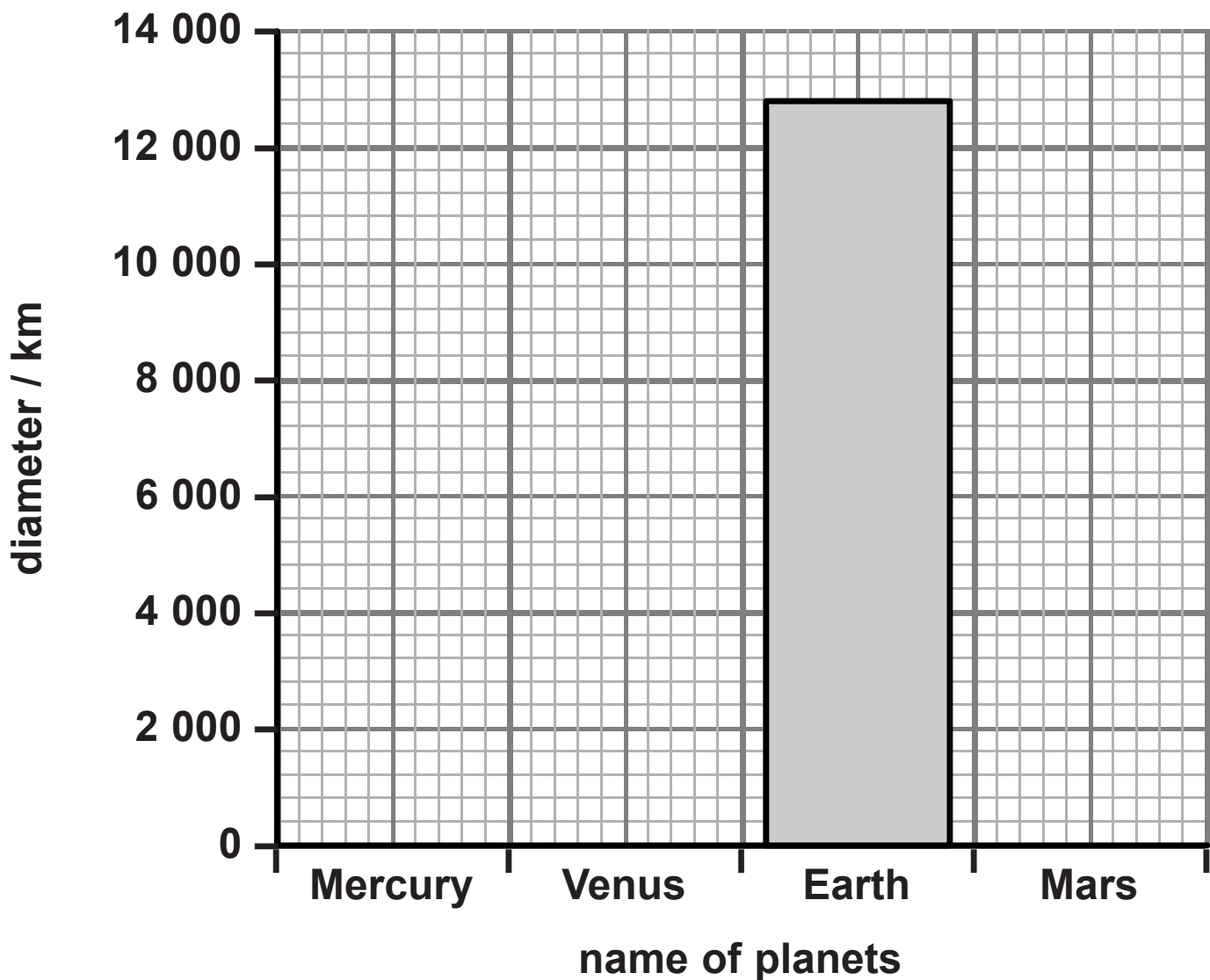
(Question continues on next page)

(Turn over)

(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 marks)

distance of Mars from the Sun = _____ km

(Question continues on next page)

*(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 marks)

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(Turn over)

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(TOTAL FOR QUESTION 6 = 12 MARKS)

TOTAL FOR PAPER = 60 MARKS

END