Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Physics/Science

Unit P1: Universal Physics

Higher Tier

Monday 19 May 2014 – Afternoon
Time: 1 hour

Paper Reference
5PH1H/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 3 4 2 0 A 0 1 2 0

PEARSON

FORMULAE

You may find the following formulae useful.

wave speed = frequency × wavelength $v = f \times \lambda$

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

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

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

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

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

$$\frac{\text{primary voltage}}{\text{secondary voltage}} = \frac{\text{number of turns on primary coil}}{\text{number of turns on secondary coil}} \qquad \frac{V_p}{V_s} = \frac{N_p}{N_s}$$

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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 waves

1 (a) Microwaves and X-rays are both electromagnetic waves.

(i) Which row of the table is correct for microwaves and X-rays in a vacuum?

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

(1)

	their speeds are	their frequencies are
☒ **A**	different	different
☒ **B**	different	the same
☒ **C**	the same	different
☒ **D**	the same	the same

(ii) State **one** harmful effect of X-rays on living matter.

(1)

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(b) X-rays are ionising radiation.

(i) State **one** other ionising radiation in the electromagnetic spectrum.

(1)

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(ii) State **one** use of an ionising radiation.

(1)

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(c) (i) State **one** way in which microwave radiation can be harmful to people.

(1)

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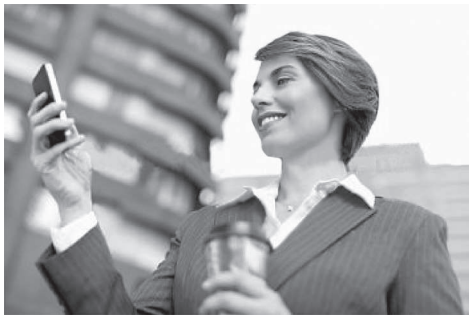
The microwaves used in ovens have a frequency of about 2450 MHz.
Mobile phones emit microwaves with a frequency of about 2000 MHz.



Microwave ovens have shielding to protect people from the microwave radiation.

(ii) Suggest why the same shielding is **not** necessary for mobile phones.

(3)

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(Total for Question 1 = 8 marks)

Transformers

2 The photograph shows a step-down transformer.

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

(2)

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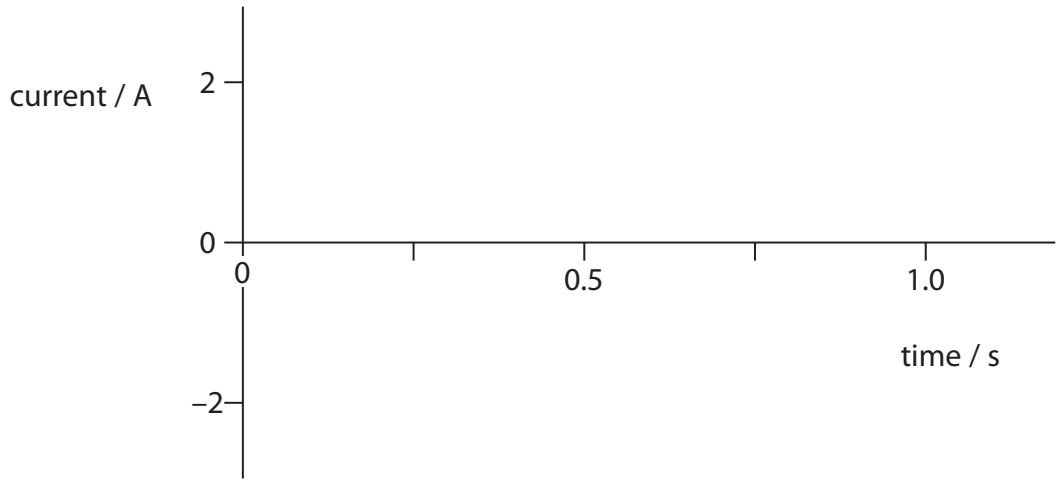
(b) Transformers need alternating current to work properly.
Sketch a graph of an alternating current with a frequency of 2 Hz.

(2)



(c) A transformer has 2400 turns on the primary coil and 100 turns on the secondary coil.

Calculate the secondary voltage if the primary voltage is 12 V.

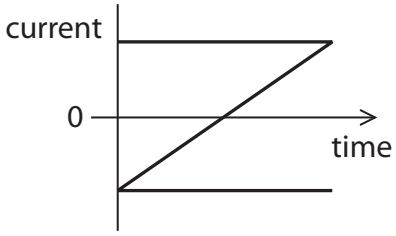
(3)

secondary voltage = ... V

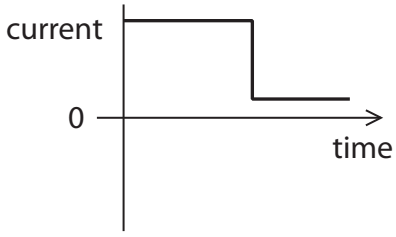
(d) Opening the switch in a circuit produces the opposite magnetic effect to closing the switch.
A scientist connected a switch, a fixed resistor and a battery to the primary coil of a step-up transformer. The scientist also connected a fixed resistor across the secondary coil.
The scientist switched the circuit on and then later switched it off.

Which of these best represents the current in the secondary coil?

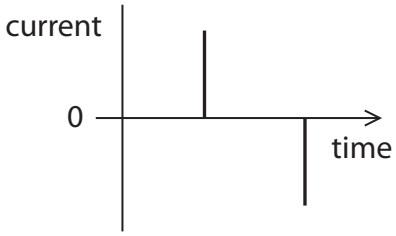
(1)



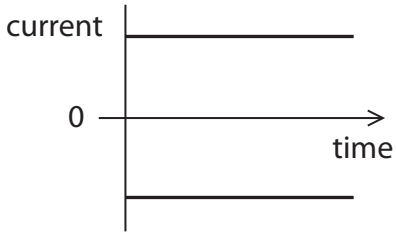
☒ **A**



☒ **B**



☒ **C**



☒ **D**

(Total for Question 2 = 8 marks)

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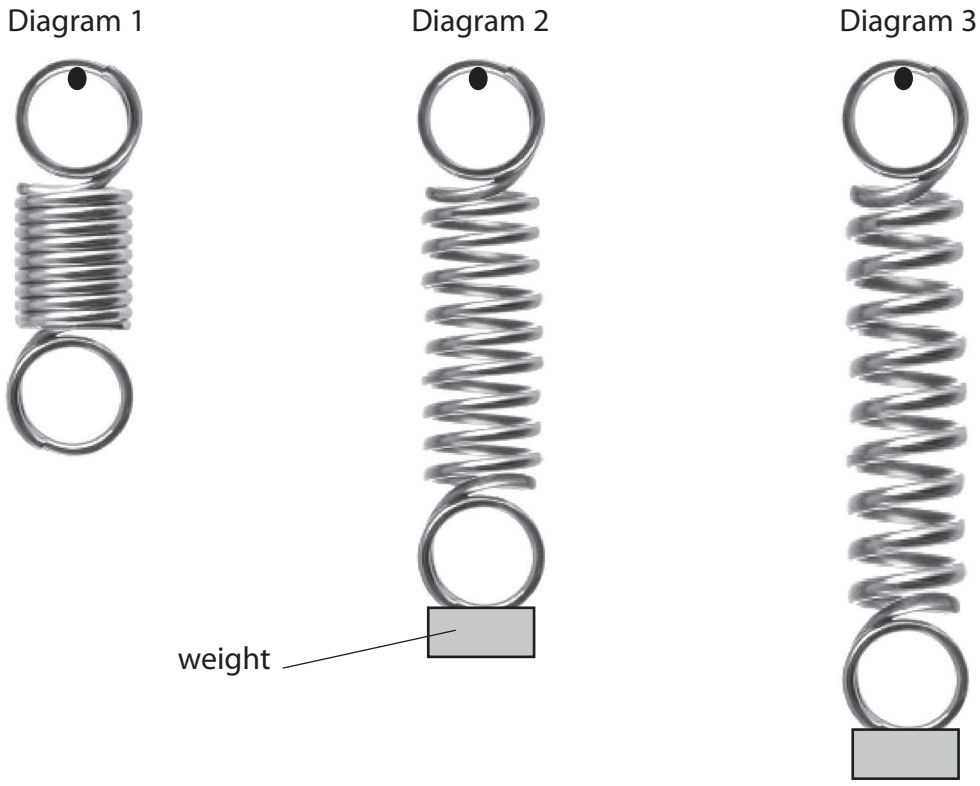
Springs and shock absorbers

3 (a) The diagrams show a spring hanging from a nail.

- In Diagram 1 there is no weight on the spring.
- Diagram 2 shows the spring after a weight is added.
- Diagram 3 shows the spring after the weight has been pulled down slightly.



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

When held stationary as in Diagram 3,

(1)

☒ **A** the spring has zero elastic potential energy

☒ **B** the weight has equal amounts of elastic potential and kinetic energy

☒ **C** the weight has more kinetic energy than gravitational potential energy

☒ **D** the spring has more elastic potential energy than the weight has kinetic energy

(ii) The spring is stretched from the position shown in Diagram 2 to the position shown in Diagram 3.
The spring is then released.
Describe the energy changes that take place until the spring stops vibrating.

(3)

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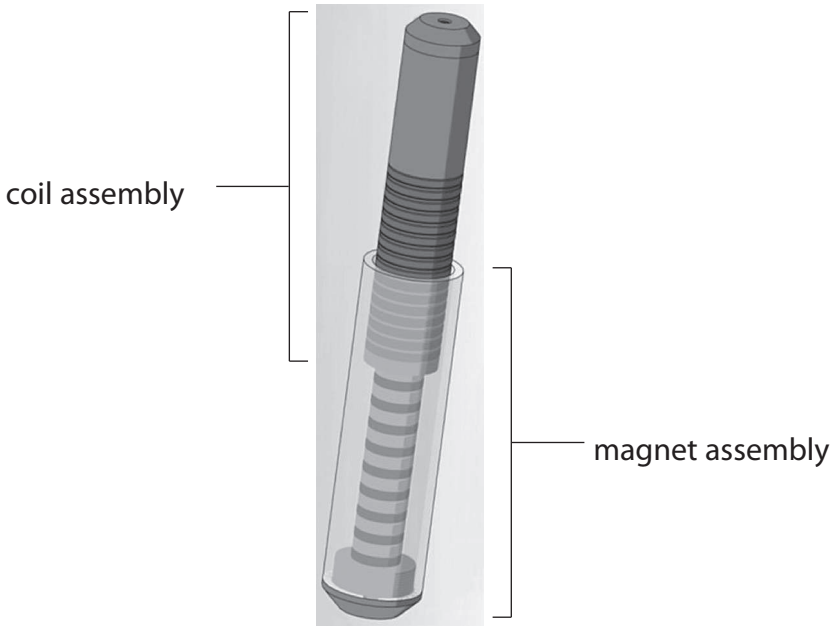
(b) Shock absorbers with springs are used on some motorcycles.
These shock absorbers reduce the bounce on an uneven road.
A new shock absorber has been developed to convert some of the movement energy into another form.
It consists of magnets which slide inside a coil when the motorcycle goes over a bump.



Some of the energy which would otherwise be wasted can be recovered and so fuel is saved.

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

This device is designed to

(1)

☒ **A** increase the thermal energy obtained from the fuel

☒ **B** increase the efficiency of the motorcycle

☒ **C** decrease the speed of the motorcycle

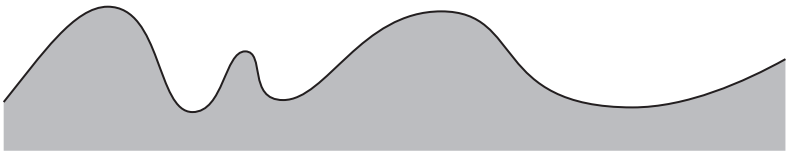
☒ **D** decrease the braking power of the motorcycle

(ii) Explain how this new type of shock absorber can provide electrical energy.

(2)

(iii) The diagram shows the bumps on the surface of two roads, L and M.
Explain why the device will transfer more energy on road L than on road M for a motorcycle travelling at the same speed.

(3)



road L

road M

(Total for Question 3 = 10 marks)

Meteors and earthquakes

4 The photograph shows a meteor exploding above Russia in 2013.

(a) The noise from the explosion was described as the loudest sound ever detected on Earth.
However, human beings could not hear this sound.
State the **two** sound frequency ranges that human beings cannot hear.

(2)

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(b) Meteors sometimes collide with the Earth's surface.
These collisions produce both P-waves and S-waves.

(i) Which of the following is correct for a P-wave?

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

(1)

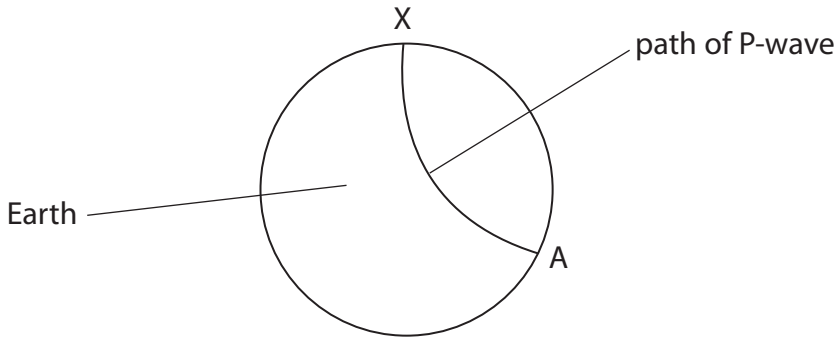
☒ **A** It is a transverse wave travelling faster than an S-wave.

☒ **B** It is a transverse wave travelling slower than an S-wave.

☒ **C** It is a longitudinal wave travelling faster than an S-wave.

☒ **D** It is a longitudinal wave travelling slower than an S-wave.

The diagram shows the path of a P-wave.
The P-wave travels from the collision at X, through the Earth, to another point, A.



(ii) Explain why the path of the P-wave is not a straight line.

(2)

(iii) Explain why there are regions on the Earth's surface where S-waves from the collision at X cannot be detected. You can add to the diagram to help your answer.

(3)

(iv) Describe how a meteor colliding with the Earth could set off an earthquake.

(2)

(Total for Question 4 = 10 marks)

Galileo and Jupiter

5 This picture shows Galileo holding a telescope.

(a) Explain the purpose of the eyepiece in a telescope.

(2)

(b) Galileo drew pictures of his observations of Jupiter.
Nowadays we can take photographs.
Suggest how photographs would have helped Galileo.

(1)

(c) The telescope collects light reflected from Jupiter.
The light has a frequency of 4.30×10^{14} Hz and a speed of 3.00×10^{8} m/s.
Calculate the wavelength of the light.

(3)

wavelength = ... m

*(d) Galileo's observations of the moons of Jupiter disproved the geocentric model. However, these observations were not enough to prove the heliocentric model of the Solar System.
Explain why Galileo's observations disproved one model but were not enough to prove the other model.

(6)

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(Total for Question 5 = 12 marks)

Changing Universe

6 A long time ago scientists thought that the Universe never changed.

Now there is evidence to show that stars progress through various stages and that the Universe is expanding.

(a) Our Sun is in its main sequence stage.

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

A star of much greater mass than the Sun will eventually become

(1)

☒ **A** a black hole

☒ **B** a protostar

☒ **C** a red dwarf

☒ **D** a white dwarf

(ii) Describe how the Sun reached its main sequence stage.

(3)

(iii) Scientists can estimate the age of a star. They want to find the age of the oldest star.

Suggest why knowing the age of the oldest star is not enough to tell scientists the age of the Universe.

(2)

*(b) Edwin Hubble discovered that the Universe was expanding.
He did this by using observations of red-shift.
Explain what red-shift is and how it provides evidence that the Universe is expanding.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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