Write your name here

| Surname | Other names |
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**Pearson Edexcel GCSE**

Centre Number | | | | | |

Candidate Number | | | | |

# Physics/Science

## Unit P1: Universal Physics

**Higher Tier**

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

*Turn over* ▶

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P 4 6 5 1 1 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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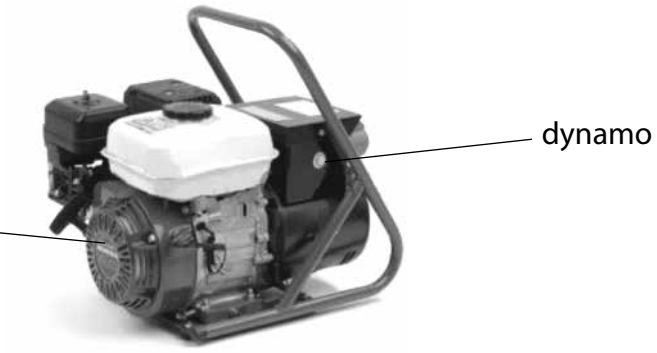
**Questions begin on next page.**

**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 ☒.**

## A petrol-driven generator

**1** The photograph shows a portable petrol-driven generator.




The small petrol engine drives the dynamo.
The dynamo generates electricity.
This arrangement is not efficient in generating electricity.

(a) Apart from efficiency, state one advantage and one disadvantage this petrol-driven generator has, when compared with a small wind-powered generator.

(i) Advantage

**(1)**

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(ii) Disadvantage

**(1)**

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(b) The table gives some data about the small petrol engine.

| | |
|---|---|
| energy transferred to surroundings in each second | 5200 J |
| energy supplied to dynamo in each second | 2800 J |

(i) Calculate the total energy supplied to the petrol engine in each second.

**(1)**

total energy supplied to the petrol engine in each second = ..... J

(ii) Use the data to calculate the efficiency of the petrol engine.

**(2)**

efficiency = ..... %

(c) The dynamo generates an electric current by induction.

Explain what is meant by induction of a current.

**(3)**

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**(Total for Question 1 = 8 marks)**

## The Universe

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

The Milky Way is part of

**(1)**

☒ **A** the Solar System but not the Universe

☒ **B** the Universe but not the Solar System

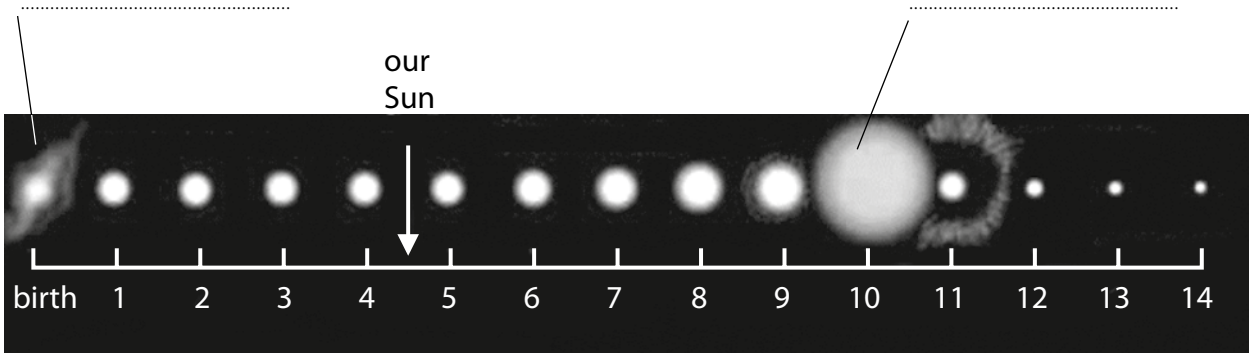
☒ **C** both the Solar System and the Universe

☒ **D** neither the Solar System nor the Universe

(b) The diagram shows the stages in the evolution of a star like our Sun.

The sizes of the star are not drawn to scale.

The position of our Sun now is shown.




birth age in billions of years (approx.)

(i) Label the two stages indicated.

**(2)**

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

The time it will take for our Sun to become a white dwarf from now is about

**(1)**

☒ **A** 7.5 billions of years

☒ **B** 11 billions of years

☒ **C** 14 billions of years

☒ **D** 16 billions of years

(c) Another main sequence star has a mass much greater than the mass of our Sun.

State the next stages in the evolution of this star, before it becomes a neutron star.

**(2)**

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(d) In a main sequence star, fusion in the core generates thermal energy. As a result, the hydrogen and helium ions are pushed outwards.

Explain why these ions do not just quickly move outwards.

**(2)**

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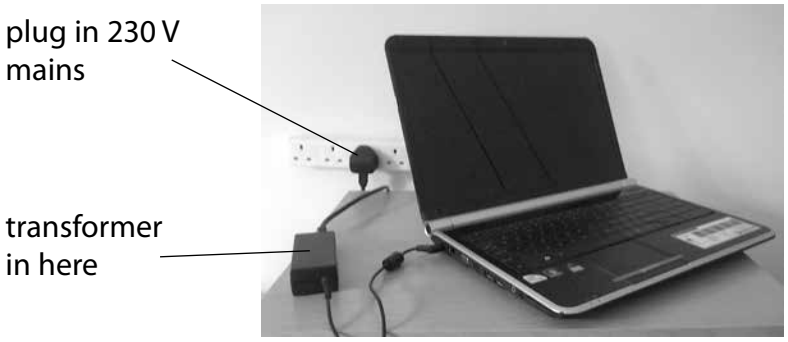
**(Total for Question 2 = 8 marks)**

**Power**

**3** The photograph shows a laptop computer plugged into the 230 V mains.




(a) The laptop is left on standby.

Its power consumption from the mains is 3.2 W.

The cost of 1 kWh of electrical energy is 14 p.

Calculate the cost of leaving the laptop on standby for 24 hours.

**(3)**

cost = ..... p

(b) When the laptop is in normal use, its power consumption from the mains is 97 W.

Calculate the current drawn from the mains.

**(3)**

current = ..... A

(c) The transformer shown in the photograph steps down the mains voltage of 230 V to 9.2 V.

The primary coil of the transformer has 4700 turns.

(i) Calculate the number of turns on the secondary coil.

**(3)**

number of turns = .....

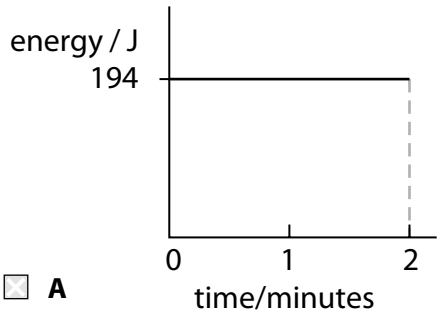
(ii) The laptop is switched on and works normally for 2 minutes.

Which graph shows the energy supplied by the mains in this time?

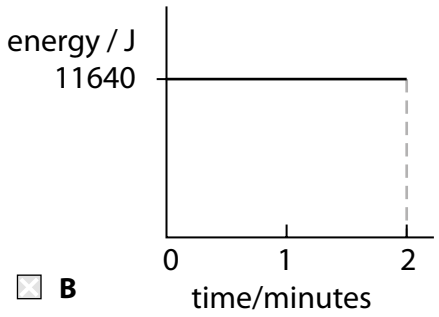
Put a cross (☒) in the box next to your answer.

**(1)**

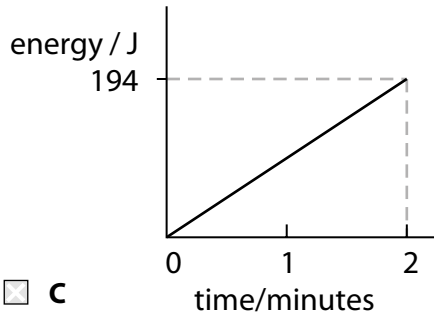
☒ **A**



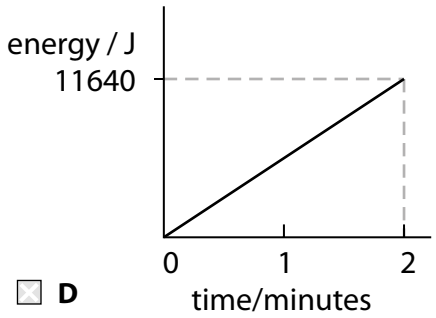

☒ **B**




☒ **C**




☒ **D**



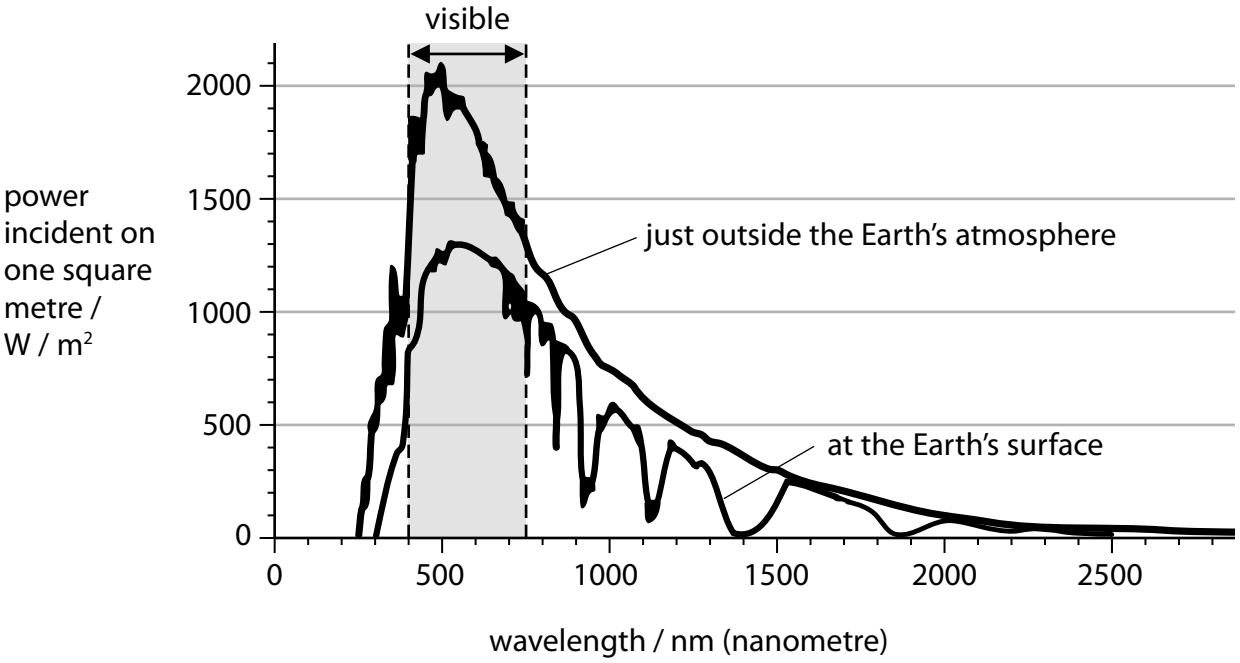

**(Total for Question 3 = 10 marks)**

**Radiation from our Sun and from other stars**

**4** (a) Our Sun emits different amounts of radiation at different wavelengths.

The graphs show how much radiation is measured for a given wavelength

- just outside the Earth's atmosphere
- at the Earth's surface.




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

The minimum wavelength of radiation received from our Sun at the Earth's surface is about

**(1)**

☒ **A** 0 nm

☒ **B** 250 nm

☒ **C** 310 nm

☒ **D** 520 nm

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

**(1)**

.....

(iii) Suggest why there is a difference in the two graphs at a wavelength of 1850 nm.

**(2)**

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(b) The velocity of light in a vacuum is 300 000 000 m/s ($3 \times 10^8$ m/s).

1 nm = $10^{-9}$ m (1 / 1 000 000 000 m)

Calculate the frequency of radiation that has a wavelength of 800 nm. Give the unit.

**(4)**

frequency = ..... unit .....

(c) Some light is emitted with a wavelength of 600.0 nm from our Sun.
When measured in the spectrum of another star, the light has a wavelength of 598.8 nm.

Explain what information this gives about the star.

**(2)**

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**(Total for Question 4 = 10 marks)**

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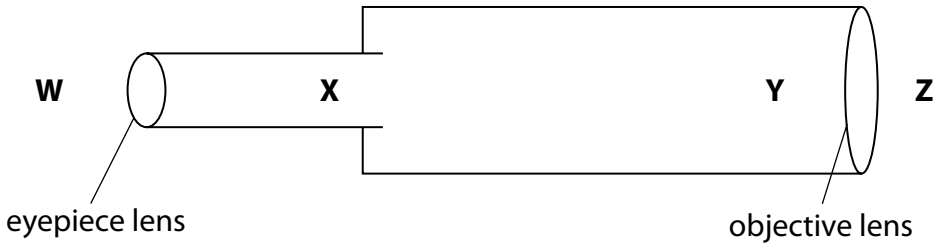
## Refraction

**5** (a) The diagram shows a telescope consisting of two converging lenses.




The telescope is used to look at the Moon.

The objective lens produces a real image of the Moon.

(i) Which position on the diagram shows where the real image of the Moon is formed?

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

**(1)**

☐ **A** position **W**

☐ **B** position **X**

☐ **C** position **Y**

☐ **D** position **Z**

(ii) Describe the function of the eyepiece lens.

**(2)**

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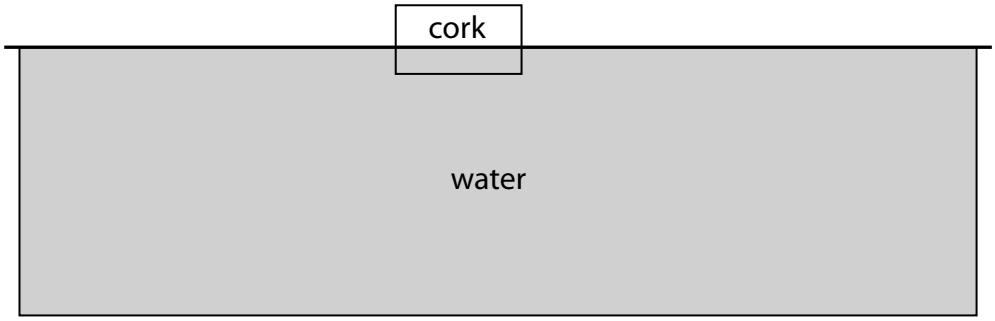
(b) (i) A cork floats on some water.




Describe how this arrangement can be used to show whether waves on the water surface are transverse or longitudinal.

You may add to the diagram to help your answer.

**(3)**

*(ii) The diagram shows water waves approaching a boundary between deep water and shallow water. The arrow shows the direction of travel of the water waves.

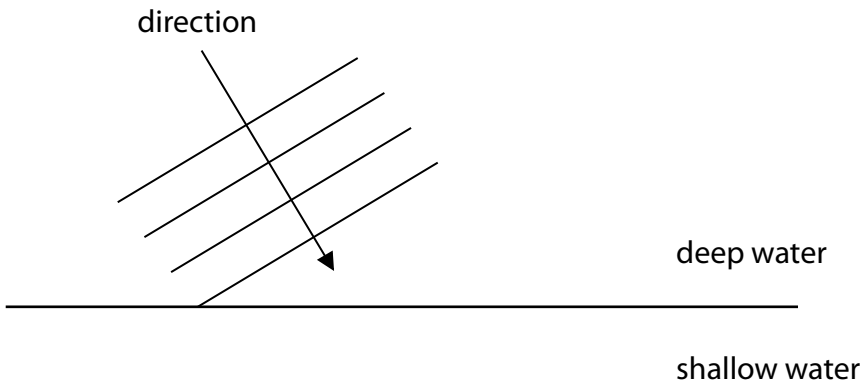
The wave speed in the shallow water is less than the wave speed in the deep water.

The frequency of the waves in the shallow water is the same as their frequency in the deep water.

Explain what happens to the direction and the wavelength of these waves when they pass from the deep water into the shallow water.

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

**(6)**




**(Total for Question 5 = 12 marks)**

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## Earthquakes and the interior of the Earth

**6** (a) Which row correctly lists the three parts of the Earth in order of their distance from its centre?

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

**(1)**

| | **nearest centre** | ⟶ | **furthest from centre** |
|---|---|---|---|
| ☒ **A** | crust | mantle | outer core |
| ☒ **B** | mantle | crust | outer core |
| ☒ **C** | outer core | crust | mantle |
| ☒ **D** | outer core | mantle | crust |

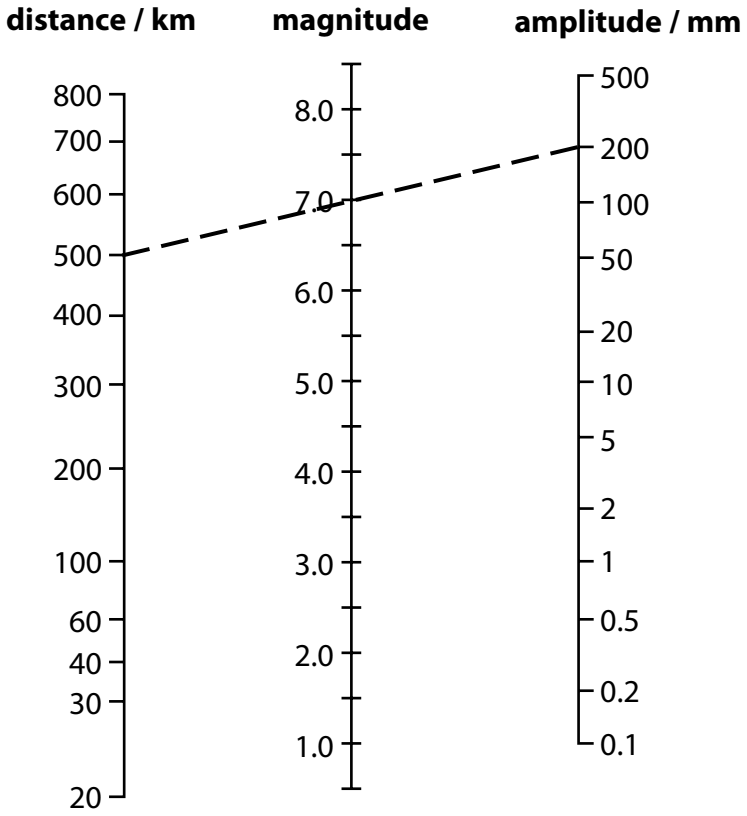
(b) Explain why it is difficult to predict when a tsunami will occur.

**(2)**

(c) The chart is based on the Richter scale.

To work out the magnitude of an earthquake on the Richter scale:

- mark the **distance** and **amplitude** of the earthquake on the scales
- join these with a straight line
- read off the **magnitude** on the central scale.




The seismic wave from an earthquake has an amplitude of 200 mm at a distance of 500 km from a seismic station.

This gives a magnitude of 7.0 on the Richter scale.

The table shows information about **one** other, different, earthquake.

Complete this table.

**(3)**

| distance from earthquake / km | amplitude / mm | magnitude |
|---|---|---|
| 100 | 1 | 3 |
| 300 | 0.1 | |
| | 2 | |

*(d) Scientists have used the properties of seismic waves to develop various models of the Earth's interior.

Explain how some of the properties of P-waves and S-waves lead to the present model of the Earth's interior.

**(6)**

**(Total for Question 6 = 12 marks)**

**TOTAL FOR PAPER = 60 MARKS**

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