Write your name here

| Surname | Other names |
|---|---|
| | |

**Edexcel GCSE**

| Centre Number | Candidate Number |
|---|---|
| | |

# Physics/Science

## Unit P1: Universal Physics

**Higher Tier**

| Wednesday 9 November 2011 – Morning<br>**Time: 1 hour** | Paper Reference<br>**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* ▶

P40179A



1/1/1/1/1/

P 4 0 1 7 9 A 0 1 2 0

edexcel
advancing learning, changing lives

## FORMULAE

You may find the following formulae useful

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

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

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

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

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

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

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

**BLANK PAGE**

**Question 1 Starts on Page 4**



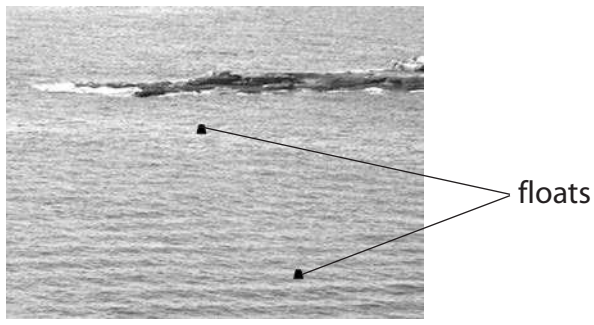
P 4 0 1 7 9 A 0 3 2 0

**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 ☒.**

## Waves carrying information

**1** The photograph shows a wave in a bay.
The wave was made by a passing boat.




(a) Which of these best describes what is transferred by the water wave?

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

**(1)**

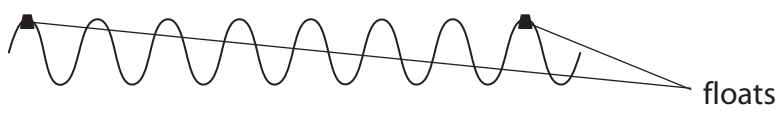
☒ **A** energy only

☒ **B** water only

☒ **C** both water and energy

☒ **D** neither water nor energy

(b) The diagram shows the wave as it passes by the two floats.




(i) The wavelength of the wave is 0.8 m.

Calculate the distance between the floats.

**(2)**

distance = ..... m

(ii) The frequency of the wave is 0.4 Hz.

How many complete wavelengths pass each float in 20 s?

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

**(1)**

☒ **A** 0.02

☒ **B** 0.8

☒ **C** 8

☒ **D** 50

(iii) A man on the shore observes the wave.

Suggest **one** piece of information the man could gain about the boat by observing the wave that made it.

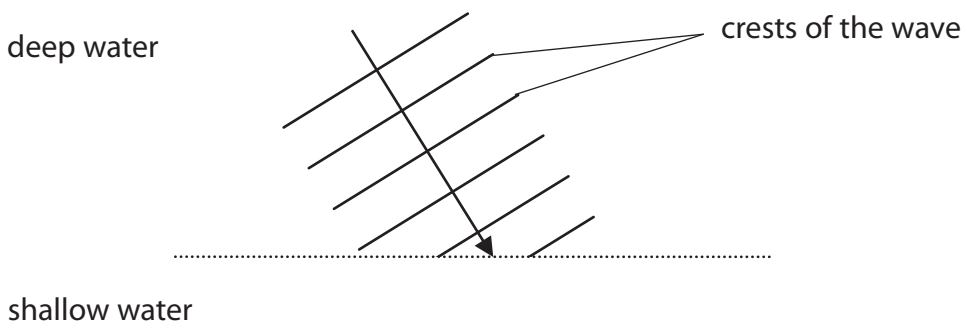
**(1)**

.....

.....

(c) The wave reaches shallow water before it reaches the shore.
Water waves travel more slowly in shallow water.

The diagram shows the wave as it reaches the shallow water.



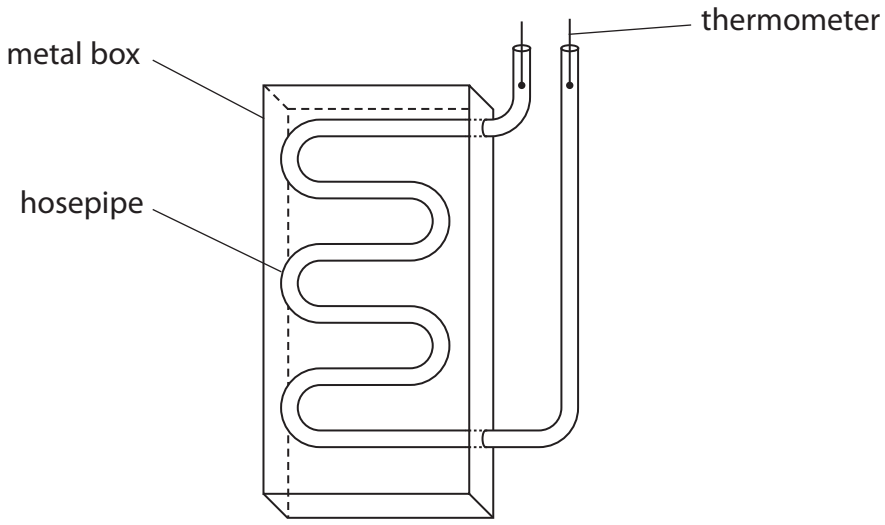

Complete the diagram to show how the wave travels in the shallow water.

**(3)**

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

**Solar heater**

**2** A student makes a solar water heater using a hosepipe.
He paints the hosepipe black and fills it with water.
He coils the hosepipe and fixes it into an open metal box as shown.




The student puts a thermometer in each end of the hosepipe.
The Sun shines on the hosepipe and heats the water.

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

The hosepipe is painted black because blackened surfaces are

**(1)**

☒ **A** good emitters of radiation

☒ **B** poor emitters of radiation

☒ **C** good absorbers of radiation

☒ **D** poor absorbers of radiation

(b) At first, the temperature of the water in the pipe increases.
After a while, the temperature becomes constant.

(i) Suggest **two** changes to the box which would increase the constant temperature reached.

**(2)**

1 .....

.....

2 .....

.....

(ii) Explain why the water reaches a constant temperature.

**(3)**

.....

.....

.....

.....

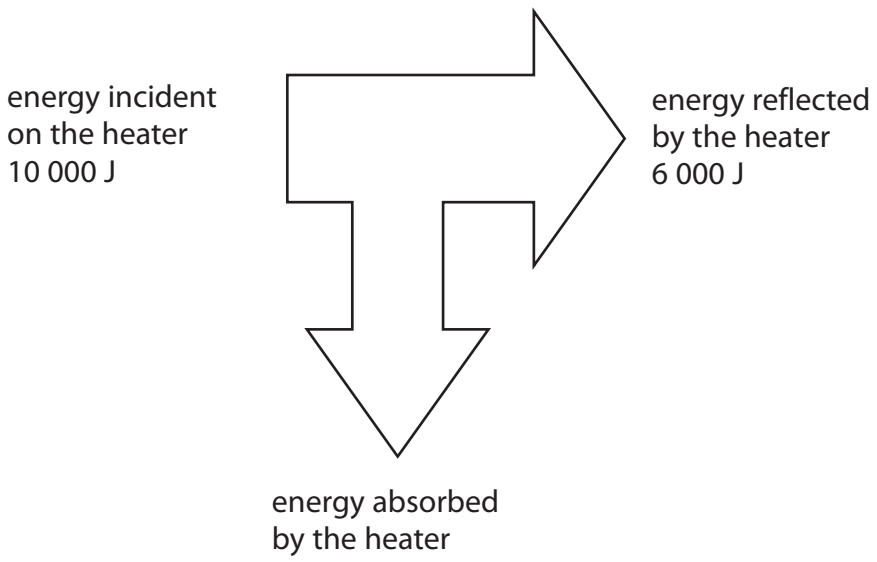
.....

.....

.....

(c) Some of the solar energy incident on the solar water heater is reflected.
The rest is absorbed.

The diagram gives some information about energy transfer during the first 200 s.




Calculate the power absorbed by the heater.

**(2)**

power = ..... W

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

## Electromagnetic waves

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

(i) All electromagnetic waves are

**(1)**

☒ **A** longitudinal and have the same amplitude in a vacuum

☒ **B** longitudinal and have the same speed in a vacuum

☒ **C** transverse and have the same amplitude in a vacuum

☒ **D** transverse and have the same speed in a vacuum

(ii) All electromagnetic waves have both uses and dangers.

Their potential danger increases when

**(1)**

☒ **A** frequency decreases and wavelength decreases

☒ **B** frequency increases and wavelength decreases

☒ **C** frequency decreases and wavelength increases

☒ **D** frequency increases and wavelength increases

(b) Some microwaves have a frequency of $1.5 \times 10^{10}$ Hz.
They travel at a speed of $3.0 \times 10^{8}$ m/s.

Calculate their wavelength.

**(3)**

wavelength = ..... m

(c) Infrared is used in an electric toaster.
Infrared is also used by a television remote control.

electric toaster

television remote control

Explain why using a television remote control does not burn anyone.

**(2)**

(d) Gamma rays can cause cancer.
Gamma rays can also be used to treat cancer.

Explain how gamma rays can do both.

**(3)**

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

**BLANK PAGE**

## Infrasound and earthquakes

**4** (a) Which row of the table is correct for both infrasound radiation and infrared radiation?

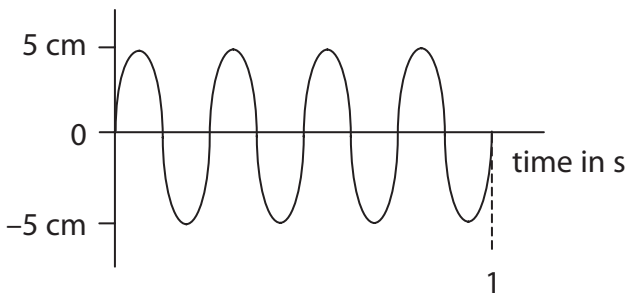
Put a cross (☒) in the box next to your answer.

**(1)**

| | infrasound | infrared |
|---|---|---|
| ☒ **A** | transverse | transverse |
| ☒ **B** | transverse | longitudinal |
| ☒ **C** | longitudinal | transverse |
| ☒ **D** | longitudinal | longitudinal |

(b) State the amplitude of this sound wave.

**(1)**




amplitude = .....

(c) Describe how infrasound differs from ultrasound.

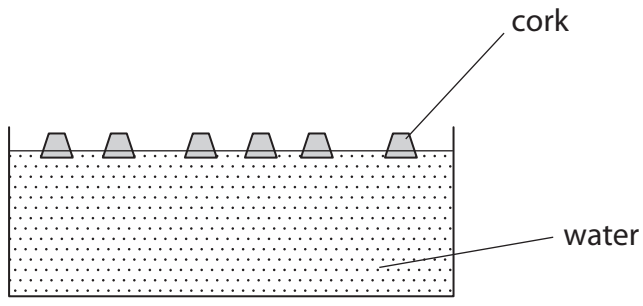
**(2)**

.....

.....

.....

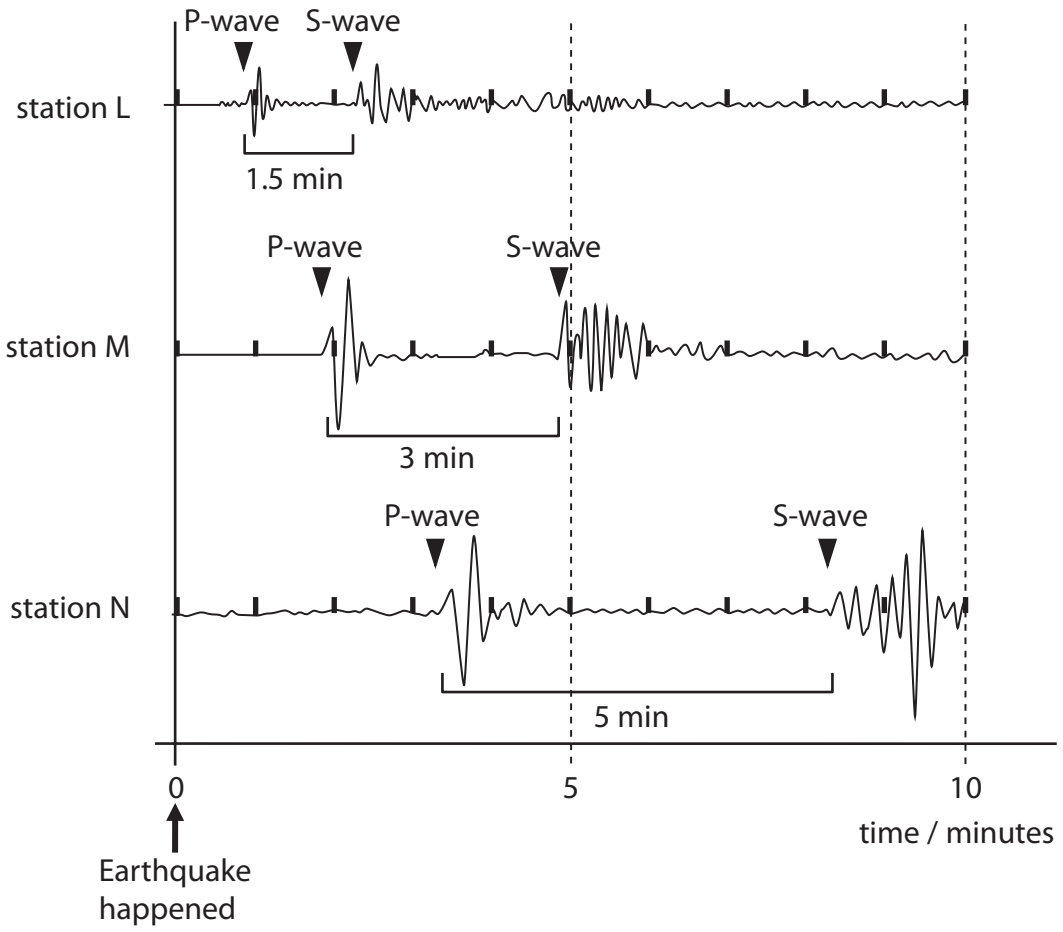
(d) Earthquakes are sometimes caused when plates in the Earth's crust move.
The diagram shows some corks floating on water.




Explain how this model of corks on water could be used to demonstrate what causes the Earth's plates to move.
You may add to the diagram to help with your answer.

**(3)**

(e) The movement of the Earth's plates can cause earthquakes.
The charts show the waves arriving at three research stations from the same earthquake.




A student suggested that the time between the arrival of the P-wave and the S-wave was proportional to the distance of the station from the earthquake.

Use the charts to evaluate whether this is correct or not.

**(3)**

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

**Stars and the Universe**

**5** (a) The photograph shows a nebula and many stars.

(i) A nebula is a cloud of gas and dust from which stars are formed.

Describe the energy changes involved when a main sequence star forms from gas and dust.

**(3)**

(ii) Describe how the mass of a main sequence star will affect what the star finally becomes.

**(3)**

*(b) While the origin of stars is well understood, there is still much debate about the origin of the Universe.
Two major theories about the origin of the Universe are the Big Bang and the Steady State theories.

Some evidence supports both theories.
Other evidence supports only one theory.

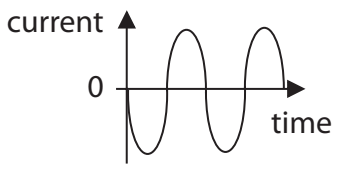
By considering the evidence, discuss why one of these theories is preferred by most scientists.

**(6)**

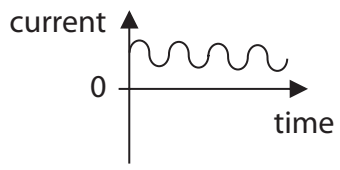
**(Total for Question 5 = 12 marks)**

## Distribution of electricity

**6** (a) Scientists say that graph 1 shows an alternating current while graph 2 shows a direct current.




graph 1




graph 2

The two graphs differ in several ways.

State the difference between the currents which makes one alternating and the other direct.

**(1)**

.....

.....

(b) A transformer is 100% efficient.

It has 200 turns on the primary coil and 3000 turns on the secondary coil.
The input voltage is 55 V.

(i) Show that the output voltage is about 800 V.

**(3)**

(ii) Calculate the current in the secondary coil when the current in the primary coil is 0.50 A.

**(2)**

current in secondary coil = ..... A

*(c) The diagram shows how electricity produced at a power station is transmitted to distant houses.


Transformers R and S are not 100% efficient.
By using transformers, energy losses in the transmission lines are reduced.

Explain how this reduction is achieved, even though some energy is wasted in the transformers themselves.

**(6)**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

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

**TOTAL FOR PAPER = 60 MARKS**

**BLANK PAGE**

**BLANK PAGE**

**BLANK PAGE**