## Science: Physics

## Unit P2

## Foundation Tier


[GPH21]
MONDAY 24 JUNE, MORNING

## TIME

1 hour 30 minutes.

## INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided. Do not write outside the box, around each page or on blank pages.
Complete in blue or black ink only. Do not write with a gel pen.
Answer all questions.

## INFORMATION FOR CANDIDATES

The total mark for this paper is 90 .
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in question 4(b).

1 (a) A stretched spring rests on a table.
$A$ wave travels from end $A$ to end $B$.


Describe carefully how point $\mathbf{X}$ will move when
(i) a transverse wave passes along the spring;
$\qquad$
$\qquad$
$\qquad$
(ii) a longitudinal wave passes along the spring.
$\qquad$
$\qquad$
$\qquad$
(iii) Give another example of a transverse wave and another example of a longitudinal wave.

Transverse: $\qquad$
Longitudinal: $\qquad$
(b) The outline of sea waves is shown below. The diagram is not to scale.

(i) What is the amplitude of the waves? $\qquad$ m [1]
(ii) What is the wavelength of the waves? $\qquad$ m [1]

In 60 seconds 15 waves pass the end of a pier.
(iii) Calculate the frequency of the waves.

You are advised to show clearly how you get your answer.
Remember to provide the unit with your answer.

Frequency $=$ $\qquad$
(iv) Calculate the speed of the waves. You are advised to show clearly how you get your answer.

Speed $=$ $\qquad$ $\mathrm{m} / \mathrm{s}$ [2]
(c) To study the reflection of sound from a solid object the apparatus below was used.


A pulse of sound was emitted by the device at A and the time taken for the sound pulse to travel to the object and back again (round trip time) was measured.
This was repeated for different distances d.
The results of the investigation are shown in the table below.

| Distance <br> $\mathbf{d} \mathbf{~ i n ~} \mathbf{m}$ | Time for the <br> round trip in $\mathbf{m s}$ | Time to travel <br> the distance $\mathbf{d}$ in $\mathbf{~ m s}$ |
| :---: | :---: | :---: |
| 0.2 | 1.2 |  |
| 0.4 | 2.6 |  |
| 0.6 | 3.4 |  |
| 0.8 | 4.8 |  |
| 1.0 | 6.0 |  |

(i) Complete the table above by calculating the time for the pulse of sound to travel the distance d.
(ii) Using the equation below and data from the table calculate the speed of sound.

$$
\text { Speed }=\frac{\text { Distance }}{\text { Time }}
$$

$$
(1 \mathrm{~ms}=1 \text { millisecond }=0.001 \mathrm{~s})
$$

$\qquad$ m/s [3]

$\square \square$
(iii) Using the grid below plot a graph of distance d ( $y$-axis) against time to travel the distance $d$ ( $x$-axis). Draw a line of best fit through the points.

Distance in metres

(iv) The sound emitter was placed at a distance from the object that gave a round trip time of 3.0 ms . Using the graph determine the distance d.

Distance d = $\qquad$ m [1]

|  |  |
| :--- | :--- |

2 (a) The diagram shows a ray of light incident on a glass block.
Some of the light is reflected at the top surface and some of the light passes through the glass and is reflected at the opposite side which has a mirrored surface.

(i) Complete the path of the ray of light through the glass block and back out into the air towards the person viewing it as shown in the diagram.
(ii) Explain, in terms of the speed of light, why the ray of light takes the path you have drawn in the glass.
$\qquad$
$\qquad$
(iii) What is the relationship between the angle of incidence and the angle of reflection?
$\qquad$

| Examiner Only |  |
| :---: | :---: |
| Marks | Remark |
|  |  |
|  |  |

(b) Catherine is given a converging lens. Describe how she could use a distant object to find the focal length of the lens. You may use the space below for a diagram.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
(c) In a camera, a lens is used to form an image on the film.

The diagram below, which is full scale, shows the lens of a camera and the film.
The lens is adjusted so that a sharp image is formed on the film.

(i) What type of lens is used in this camera?
(ii) The first ray from the top of the object has been drawn. Draw a second ray from the top of the object so that the position of the principal focus (focus) of the lens can be found. Mark the focus with an F.
(iii) What is the focal length of the lens?
$\qquad$ cm [1]
(iv) Which two of the words listed below describe the properties of the image formed on the film? Circle those that are correct.

Virtual Diminished
Real
Magnified
Upright
[2]


3 (a) The diagram below shows two 1.5 V cells connected to two lamps. The two lamps are lit.

(i) In the space below draw the circuit diagram, using the standard symbols, for the circuit shown above.
(ii) When the two lamps are lit the current flowing in the circuit is 0.2 A . Each cell provides a voltage of 1.5 V .
Calculate the total resistance of the circuit.
You are advised to show clearly how you get your answer.
Remember to give a unit with your answer.

> Resistance =
$\qquad$
Examiner Only
Marks $\quad$ Remark
(b) Zoe was given a sealed box containing a component that conducts electricity.
Two terminals attached to the box allowed her to connect it to a circuit. To find out what the component was she decided to investigate how the current passing through the component depended on the voltage across it.
(i) Complete the circuit diagram below by inserting a switch, an ammeter, a voltmeter and a variable resistor that would allow Zoe to obtain a series of values of the voltage and the current.

component
in a box

The results of her investigation are shown in the graph opposite.

(c) The photograph shows a girl touching an electrostatic generator.
(i) Describe how her hair acquires a positive charge.
$\qquad$
$\qquad$
$\qquad$
(ii) When she touches an object a small spark is seen.

What particles are moving in the spark and in what direction do they move?

1. The particles are $\qquad$
2. The direction in which they move is $\qquad$
8005.04R

4 (a) The diagram below shows a plotting compass which consists of a needle (small magnet) pivoted so that it can move freely. When a magnet is not present it points in the direction shown.

(i) When the plotting compass is placed close to a bar magnet the needle of the plotting compass points in the direction shown below.
Explain why this happens.

$\qquad$
$\qquad$
$\qquad$

In the diagram below, a plotting compass shows the direction of the magnetic field of the bar magnet at position $A$.

(ii) Draw arrows in the circles to show the directions of the magnetic field at points $B$ and $C$.
(iii) Mark with an S , on the diagram, the south pole of the magnet.
（b）The diagram below shows a bar magnet and a coil of wire．The coil of wire is connected to a sensitive ammeter which reads zero when the pointer is in the middle．


Describe，carefully，what is observed when the magnet is moved slowly into the coil from the right，held there stationary for a few seconds before being removed quickly again to the right．

In this question you will be assessed on your written communication skills including the use of specialist science terms．
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$\qquad$
(c) (i) Explain, fully, the difference between direct current (d.c.) and alternating current (a.c.).
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
(ii) Name one source of d.c. and one source of a.c.
d.c. source $\qquad$
a.c. source $\qquad$ [2]

5 (a) (i) Name the generally accepted scientific model which describes the formation of the Universe.
(ii) According to this model how old is the Universe?
(iii) The light from distant galaxies is red shifted. What is meant by red-shift?
$\qquad$
$\qquad$
(iv) What is the explanation of this red-shift?
$\qquad$
$\qquad$
$\qquad$
(b) Describe and explain, briefly, the nebular model for the formation of the solar system. In your answer you should give one piece of evidence that supports the model.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
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$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
(c) Give two uses for artificial satellites that orbit the Earth.

1. $\qquad$
$\qquad$
2. $\qquad$
$\qquad$

[Turn over

6 The Earth is made up of a number of layers. Diagram A below shows the topmost layer. This topmost layer is divided into two layers.
(i) On Diagram A, label the topmost layer and the two layers it is divided into. Write the names in the boxes provided.


Diagram A

Diagram B below is a map of the Earth. The dots show the location of Earthquakes and Volcanoes.

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| Examiner Only |  |
| :---: | :---: |
| Marks | Remark |
|  |  |

(ii) What does Diagram B suggest about the structure of the topmost layer of the Earth?
$\qquad$
$\qquad$
$\qquad$
(iii) How does the structure of the Earth suggested by Diagram B explain earthquakes?
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
(iv) How are volcanoes explained by this structure of the Earth?
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

## DO NOT WRITE ON THIS PAGE

| For Examiner's <br> use only |  |
| :---: | :---: |
| Question <br> Number | Marks |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |
| 6 |  |
| Total |  |
| Marks |  |
|  |  |

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