Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016

Double Award Science: Physics

Unit P2

Higher Tier

[GSD62]

GSD62

MONDAY 20 JUNE, MORNING

TIME

1 hour 15 minutes.

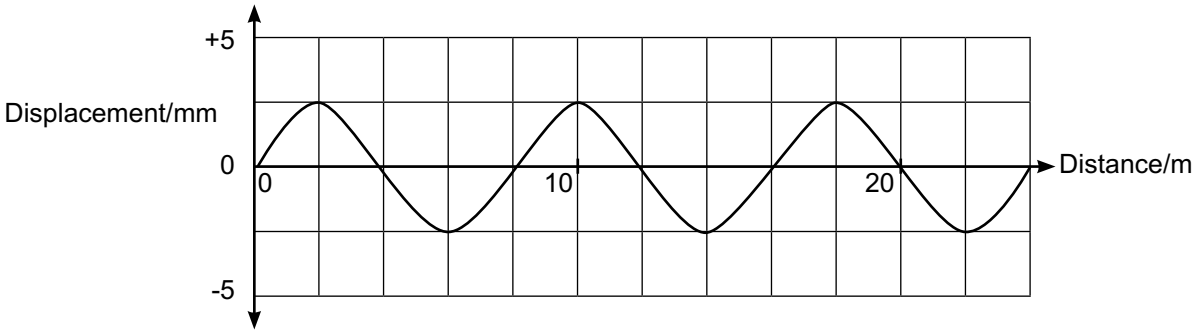
INSTRUCTIONS TO CANDIDATES

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 eight** 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 **3(b)** and **5(a)**.

1 **(a)** A graph of displacement against distance for a wave passing through air is given below.



(i) State the amplitude of the waves.

Amplitude = _____ mm [1]

(ii) State the wavelength of the waves.

Wavelength = _____ m [1]

(b) Radio waves are part of the electromagnetic spectrum. They travel through air at 3.0×10^8 m/s.

The frequency of a radio wave is 2×10^6 Hz.
Calculate its wavelength.

You are advised to show your working out.

Wavelength = _____ m [3]

(c) State **one** danger of infrared radiation and **one** danger of gamma rays.

Infrared: _____

Gamma: _____ [2]

(d) Describe fully how the particles move in a water wave as it passes a fixed point.

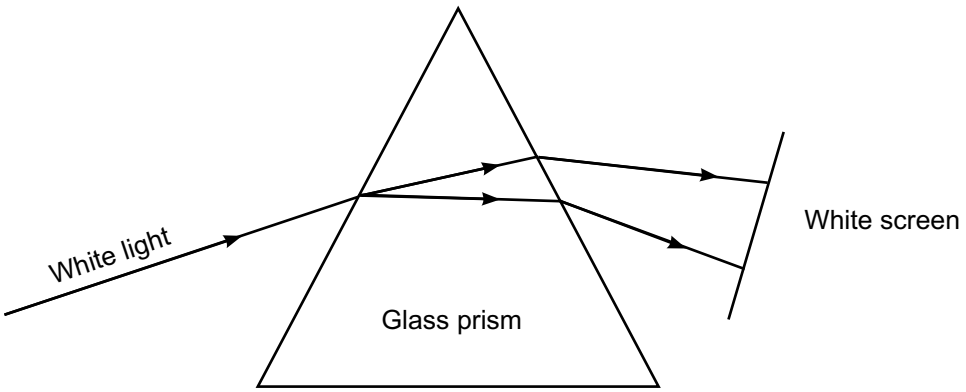
_____

_____

_____

_____ [3]

(e) When light enters a glass prism it is dispersed into its constituent colours.

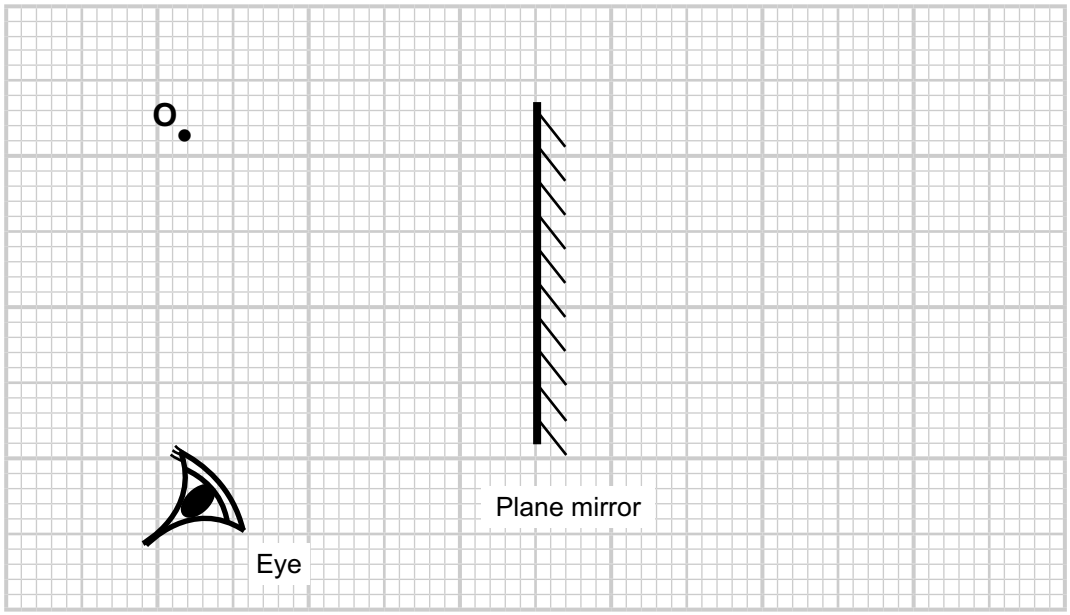


Which colour is refracted the most?

_____ [1]

[Turn over

2 Jamie looks at an image in a plane mirror.



(a) Draw an incident ray and a reflected ray to show how the image of point **O** is viewed by the eye in the mirror. Draw arrows on your rays. [4]

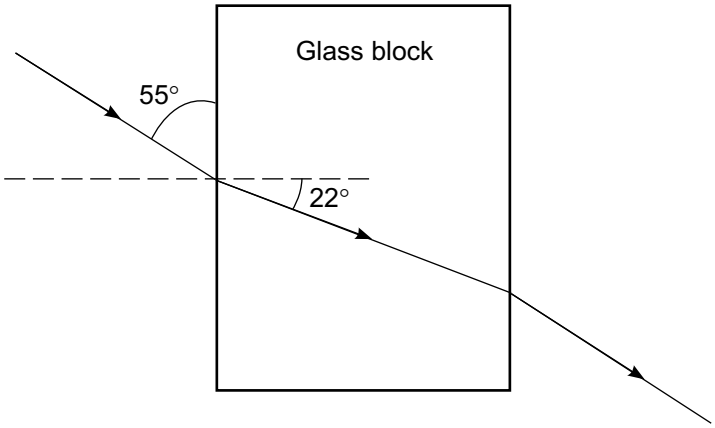
(b) State **three** properties of the image in a plane mirror.

1. _____

2. _____

3. _____ [3]

Jamie sends a ray of light through a glass block.



(c) (i) What is the angle of incidence?

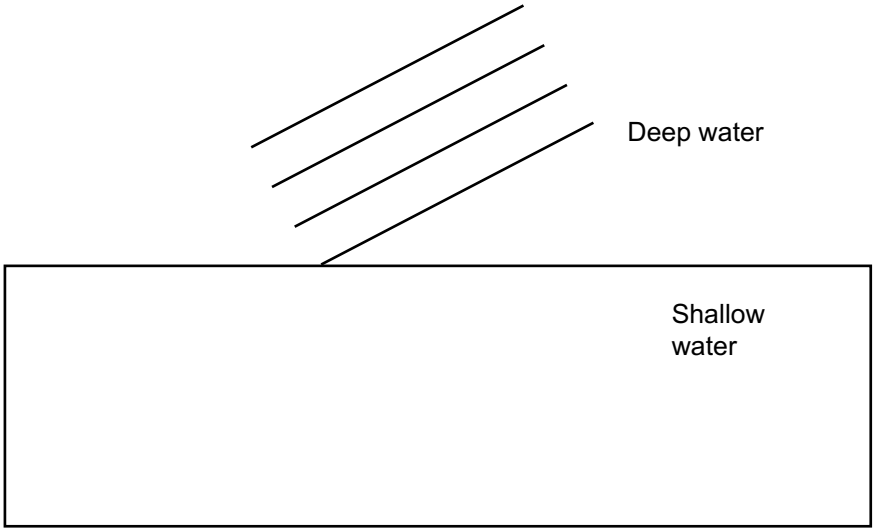
_____ ° [1]

(ii) What is the angle of refraction of the light ray in the glass block?

_____ ° [1]

[Turn over

(d) Water waves pass from deep water to shallow water in a ripple tank.



(i) Draw an arrow to indicate the direction of travel of the waves in the deep water.

Your arrow should end at the boundary between deep and shallow water. [1]

(ii) Draw an arrow to show the direction of travel of the water waves in the shallow water.

Your arrow should begin at the point where the arrow drawn in **(i)** ends. [1]

(iii) What happens, if anything, to the speed of the waves as they enter the shallow water?

_____ [1]

(iv) What, if anything, happens to the wavelength of the waves as they enter the shallow water?

_____ [1]

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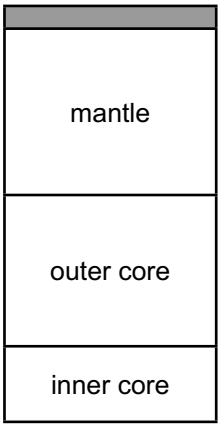
(Questions continue overleaf)

3 The diagram shows a cross section of the Earth.



(a) (i) Name a section which is completely liquid.

Answer _____ [1]

(ii) Name a section which is part solid and part liquid.

Answer _____ [1]

(iii) Name the layer shaded in the diagram above.

Answer _____ [1]

(b) Describe how a star is formed.

Your answer should include

- the main element involved at the start;
- the force involved;
- a full description of the process.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

[Turn over

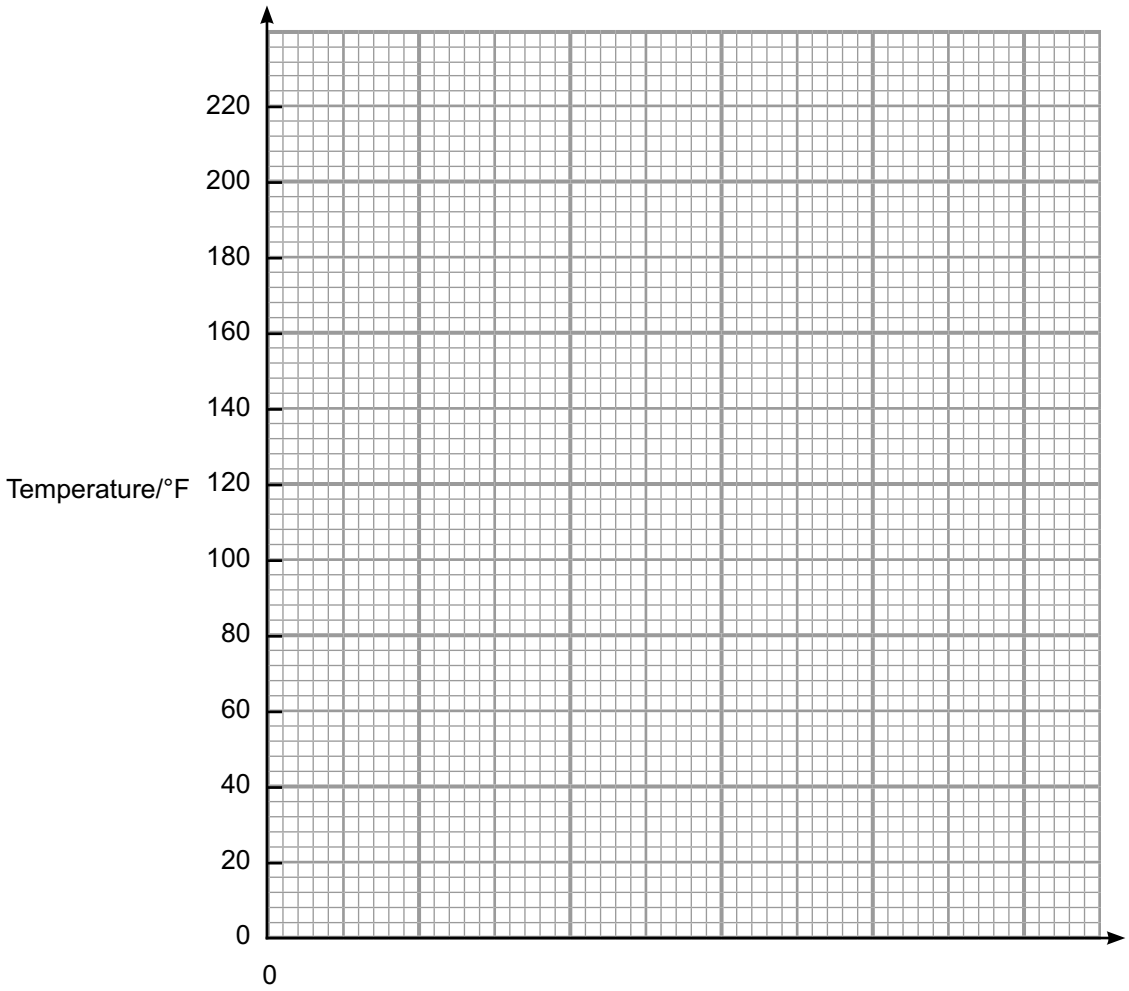
4 Temperature is measured in degrees Celsius (°C). An older temperature scale is called Fahrenheit (°F).

The table below gives temperatures in °C and the corresponding temperatures in °F.

Temp/°C	0	20	40	60	80	100
Temp/°F	32	68	104	140	176	212

The two temperature scales are related.

You are asked to plot a graph of temperature in Fahrenheit against temperature in Celsius.



(i) Choose a suitable scale for the horizontal axis and label it. [2]

(ii) Plot the points on the grid. [2]

(iii) Draw the best fit line. [1]

Use your graph to answer the following questions:

(iv) The intercept on the vertical axis gives the temperature of melting ice. What is this temperature in °C?

Temperature of melting ice _____ °C [1]

(v) A type of alcohol boils at 194 °F. What is this temperature in °C?

_____ °C [1]

(vi) Calculate the gradient of your graph.

Remember to include the unit.

You are advised to show your working out.

Gradient = _____ [3]

Unit = _____ [1]

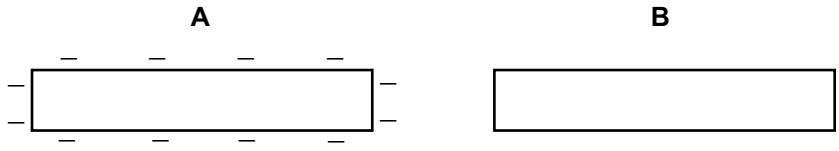
(vii) Does your graph show direct proportion? _____

Give a reason for your answer.

_____ [1]

[Turn over

5 A plastic rod **A** is negatively charged. It is brought close to, but not touching, a second uncharged plastic rod, **B**.



(a) Explain fully in terms of charges why the rods attract each other.

In your answer you must:

- describe how rod **A** may have become charged;
- describe, in terms of charges, why the rods attract each other.

In this part of the question you will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

Lightning is a sudden flow of electricity.

© Balazs Kovacs / iStock / Thinkstock

(b) A flash of lightning lasts 2×10^{-4} s during which 15 C of charge is transferred from a charged cloud to earth.

Calculate the average current.

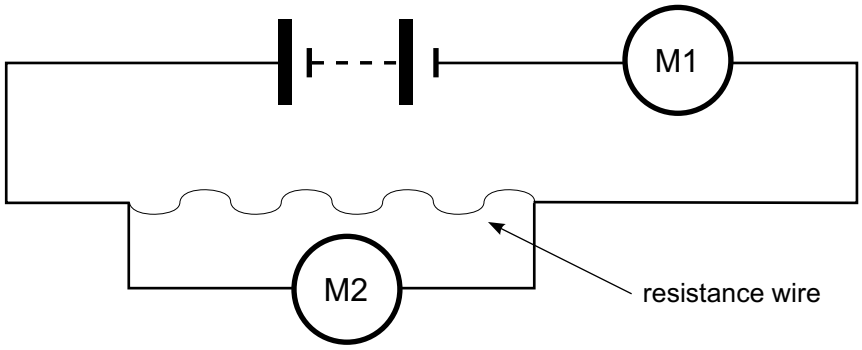
You are advised to show your working out.

Current = _____ A [3]

[Turn over

6 Julie wants to find out how the resistance of a piece of resistance wire depends on its length. She can vary the length of the wire.

She sets up the circuit shown to get enough readings to plot a graph.
M1 and M2 represent electrical meters.



(i) What does meter M1 measure? M1 measures _____

What does meter M2 measure? M2 measures _____ [2]

(ii) What additional component should Julie have included in the circuit?

_____ [1]

(iii) Why should she have included this component?

_____ [1]

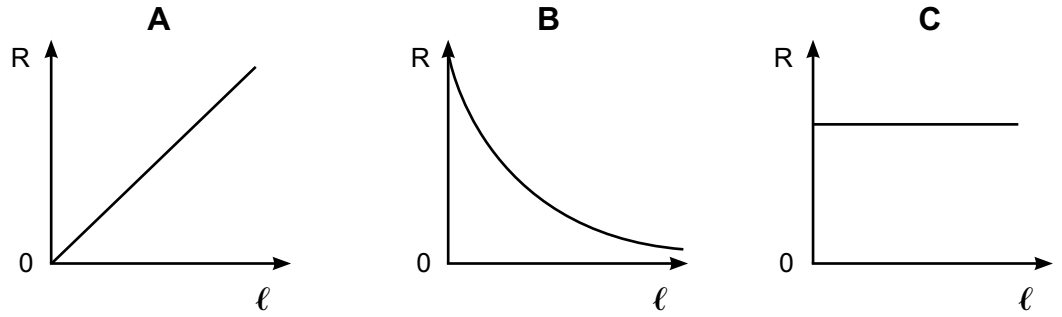
(iv) Name **two** factors that must be kept constant during the experiment to make the test fair.

1. _____

2. _____ [2]

(v) Which of the following graphs, **A**, **B** or **C**, correctly shows how the resistance R changes with the length ℓ?

Put a circle around the correct letter below.



[1]

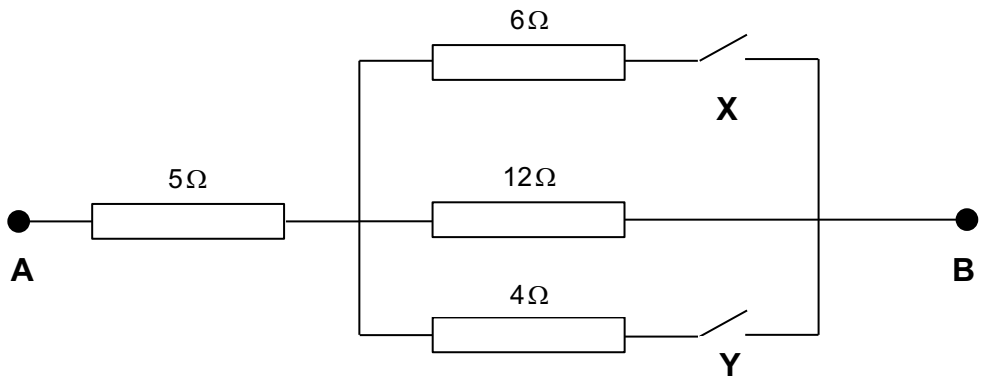
(vi) Julie has a piece of resistance wire. It is 90 cm long and has a resistance of 6 Ω. However she only needs a resistance of 5 Ω. What length of resistance wire will she use?

You are advised to show your working out.

Length = _____ cm [3]

[Turn over

7 Four resistors are arranged in the following pattern.



(a) (i) Complete the table to show the total resistance between **A** and **B** for the different switch settings.

Switch X	Switch Y	Resistance between A and B/Ω
Open	Open	
Closed	Open	

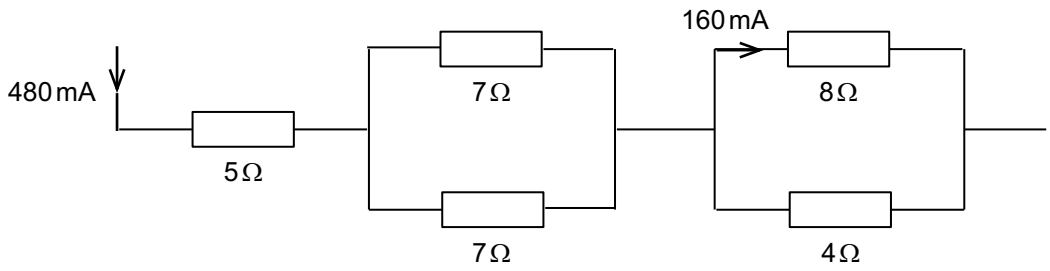
[2]

(ii) Calculate the total resistance between **A** and **B** when both switches are closed.

You are advised to show your working out.

Resistance = _____ Ω [4]

A current of 480 mA flows through the 5 Ω resistor in the circuit below.



(b) Complete the table to show the currents flowing through the different resistors.

Resistor	Current flowing/mA
5 Ω	480
7 Ω	
4 Ω	

[2]

(c) What is the voltage across the 5 Ω resistor when a current of 480 mA flows through it?

You are advised to show your working out.

Voltage = _____ V [4]

[Turn over

(d) What is the power developed in a different resistor if the current through it is 0.02 A when the voltage across it is 6.0 V?
Remember to include the unit.

You are advised to show your working out.

Power = _____ [4]

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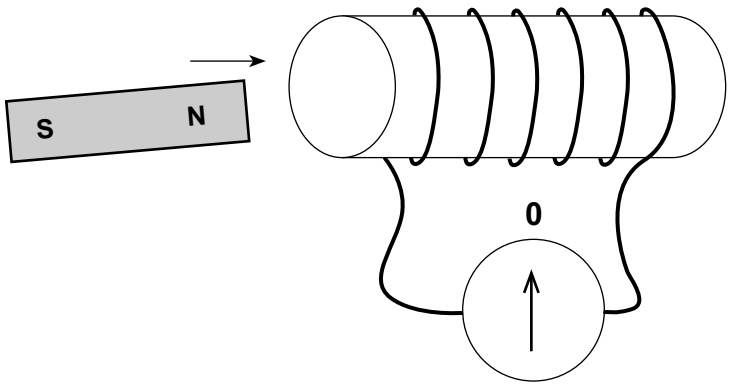
8 The diagram below shows a coil, a sensitive centre-zero ammeter and a bar magnet.



(a) When the North pole of the bar magnet is moved into the coil the ammeter gives a momentary deflection to the left.

(i) What, if anything, is observed on the centre-zero ammeter when the magnet is at rest inside the coil?

_____ [1]

(ii) The magnet is now withdrawn from the coil. What, if anything, is observed on the centre-zero ammeter as the magnet is moved away from the coil?

_____

_____ [2]

(b) The input voltage to a transformer is 240 V.
There are 2000 turns on the primary coil and 100 turns on the secondary coil.

Calculate the output voltage of the transformer.

You are advised to show your working out.

Output voltage = _____ V [3]

(c) Transformers play an important role in the distribution of electricity.

(i) Where is the step-up transformer used?

_____ [1]

(ii) Explain fully its use in the transmission system.

_____

_____

_____ [3]

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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
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7	
8	
Total Marks	

Examiner Number