



General Certificate of Secondary Education
2022

Centre Number

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Candidate Number

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Physics

Unit 2

Foundation Tier



[GPY21]

GPY21

THURSDAY 23 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 boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Answer **all five** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 80.

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 **2(a)**.



- 1 (a) Complete the following sentences about waves.
Choose words from the list below.

perpendicular matter longitudinal
energy transverse parallel

All waves transfer _____ .

A sound wave is an example of a _____ wave.

In a sound wave the vibrations are _____ to the direction of the wave.

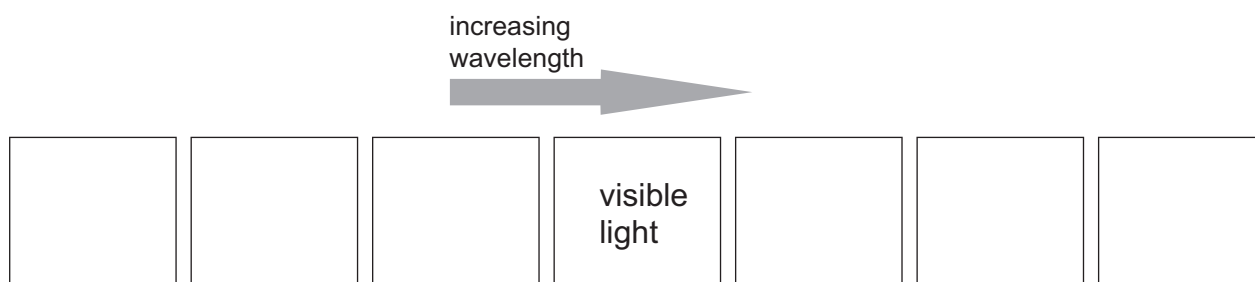
Which of the following can **sound** waves travel through?
Circle **all** the correct answers.

gases solids vacuum liquids

[4]

- (b) Complete the diagram below by inserting the names of the missing regions of the electromagnetic spectrum in the appropriate boxes.

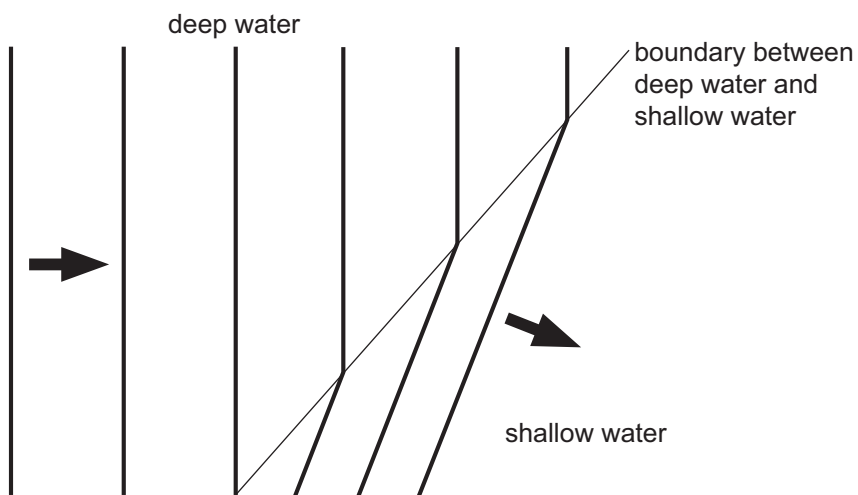
The position of visible light is shown.



[3]



(c) The diagram below shows water waves moving from deep water into shallow water. The boundary between the deep water and the shallow water is shown. Tick (✓) the appropriate boxes in the table below to show what happens to the wavelength, frequency and speed of the water waves as they pass from deep water to shallow water.



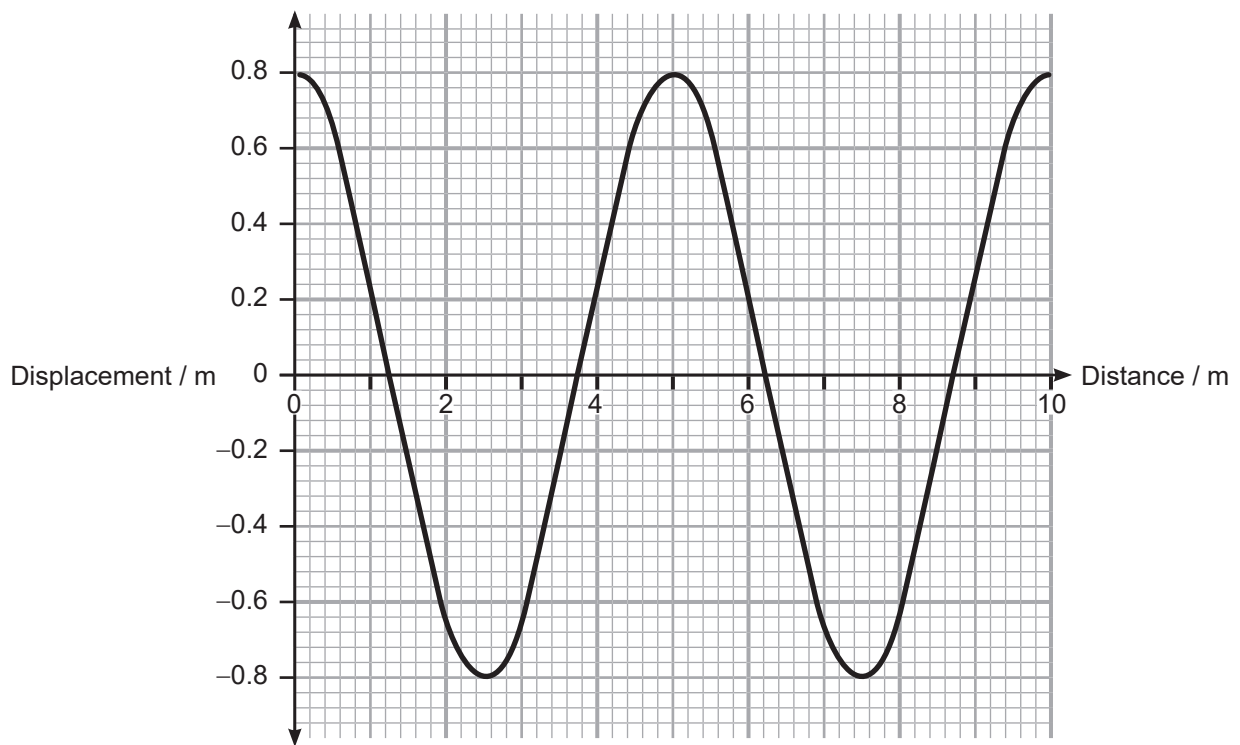
Source: Chief Examiner

	Decreases	Remains the same	Increases
Wavelength			
Frequency			
Speed			

[3]



(d) The graph below represents a water wave.



Source: Chief Examiner

(i) State the amplitude and wavelength of this wave.

Amplitude = _____ m

Wavelength = _____ m [2]



- (ii) The speed of this water wave is 6 m/s.
Calculate its frequency.
Include the unit with your answer.
Show clearly how you get your answer, starting with the equation you plan to use.

Frequency = _____ [3]

Unit = _____ [1]

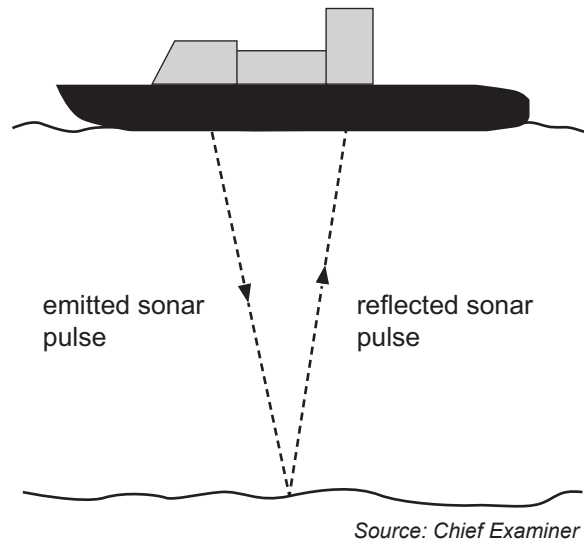
[Turn over

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24GPY2105

- (e) The depth of the sea can be measured using sonar as shown in the diagram below. A ship sent out a sonar pulse which was reflected from the sea floor. The sea floor was found to be 3840 m below the surface. The speed of sonar waves in sea-water is 1500 m/s.



Calculate the time that passed between the emission of the sonar pulse and detection of the echo by the ship on the surface.

Show clearly how you get your answer, starting with the equation you plan to use.

Time = _____ s [4]



2 (a) White light is composed of a mixture of colours. This can be demonstrated in a laboratory.

Describe how this may be done and explain why it occurs.

In your answer you should respond to the following points:

- what equipment is required;
- name the process that causes the colours to appear;
- what the spread of colours is called;
- list the colours as they appear, starting with the longest wavelength;
- why the colours appear in the order they do.

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

Equipment _____

Name of process _____

Spread of colours _____

List of colours in order _____

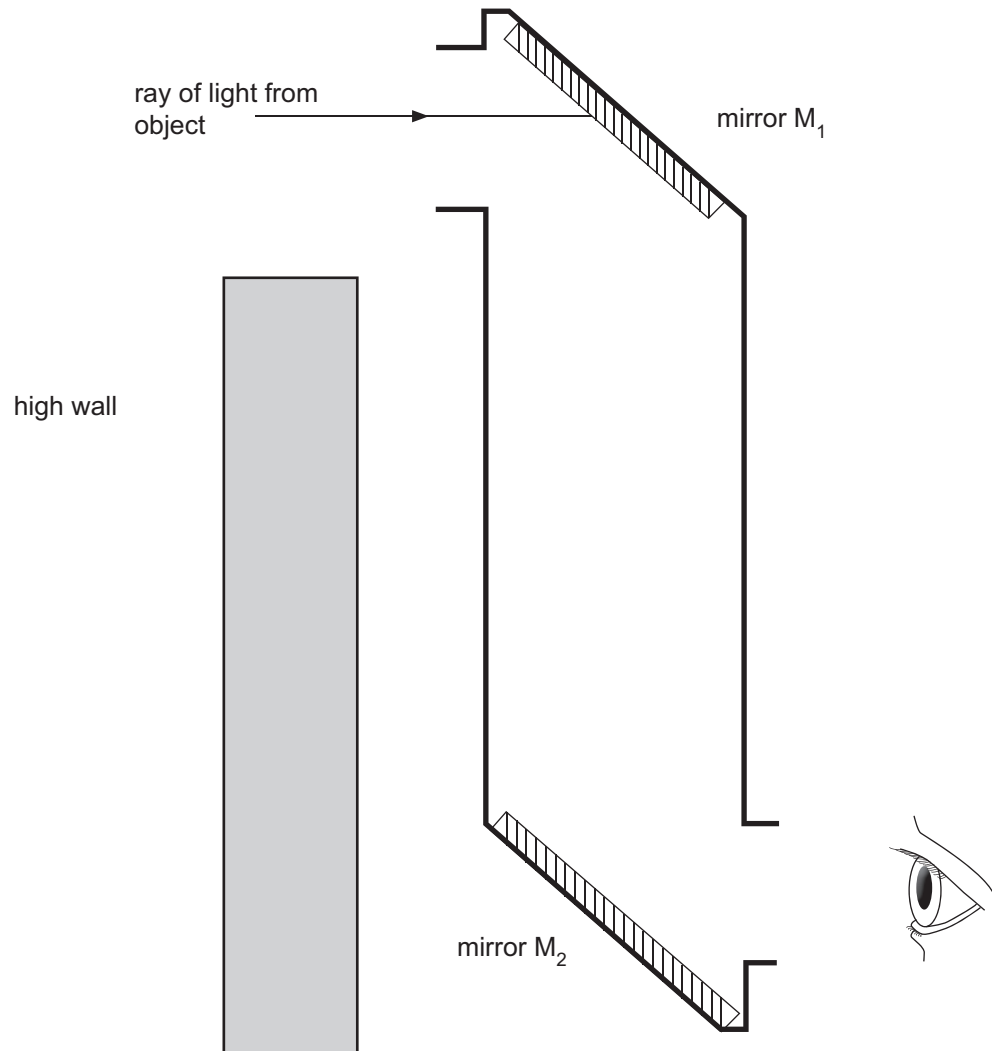
Why the colours appear in the order they do _____

_____ [6]

[Turn over



- (b) The diagram below shows an optical instrument known as a periscope, which uses two plane mirrors. The periscope can be used to see what is happening on the other side of a high wall.



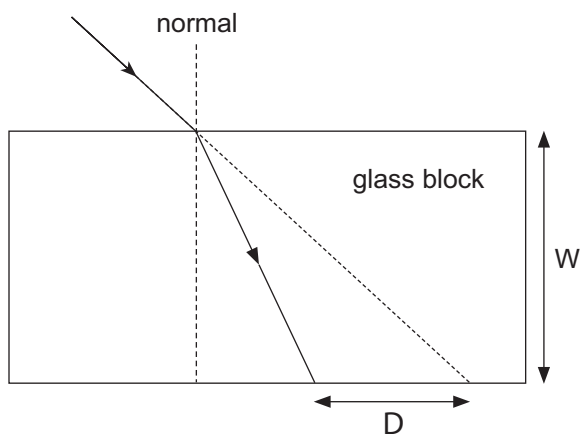
Source: Chief Examiner

Using a ruler, carefully complete the path of the ray to show how it reaches the user's eye.

[1]



- (c) When a ray of light passes from air into glass it is refracted. The ray of light is displaced from its original path. The diagram below shows this. The distance between the point where the refracted ray emerges from the glass block and the original path is the displacement D .



Source: Chief Examiner

- (i) On the diagram mark with an i the angle of incidence when the light enters the glass and with an r the angle of refraction in the glass. [1]

An experiment was carried out to investigate if the displacement, D , depended on the width, W , of the glass block.

- (ii) State one controlled variable in this investigation.

_____ [1]



The table below shows the results for glass blocks of different widths.

Width W of the glass block/cm	0	2	4	6	8	10
Displacement D/cm	0	1.0	1.9	2.8	3.7	4.7

- (iii) On the grid opposite plot a graph of the displacement D (y-axis) against the width of the glass block W (x-axis). Clearly indicate the points using \odot or X.
Draw a line of best fit through the points. [4]

The displacement D and the width of the glass block W are related by the equation:

$$\frac{D}{W} = k$$

- (iv) Using your **best fit** line find the value of k.

$$k = \underline{\hspace{2cm}} \quad [3]$$





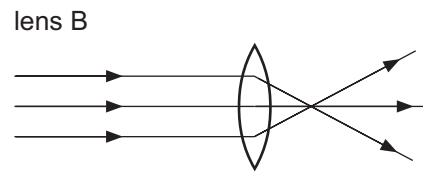
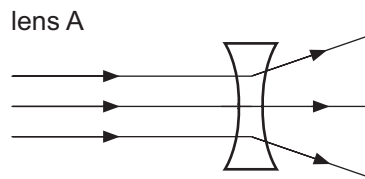
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[Turn over



24GPY2111

(d) The diagrams below show the passage of light through two types of lens.



Source: Chief Examiner

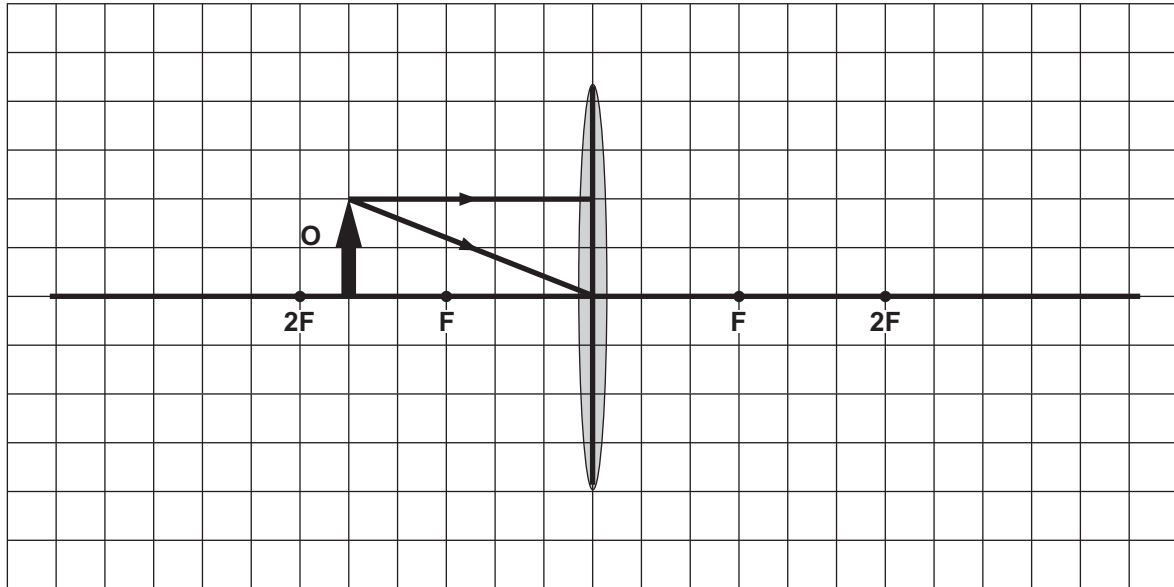
(i) Name the types of lens.

Lens A is _____

Lens B is _____ [1]



(ii) The diagram below shows the position of an object, labelled O, in front of a lens.



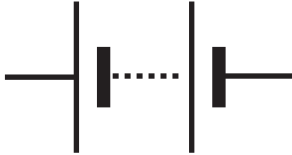
Source: Chief Examiner

Using a ruler, complete the diagram to show clearly the passage of the two rays after passing through the lens. Draw the image and label it I. [3]



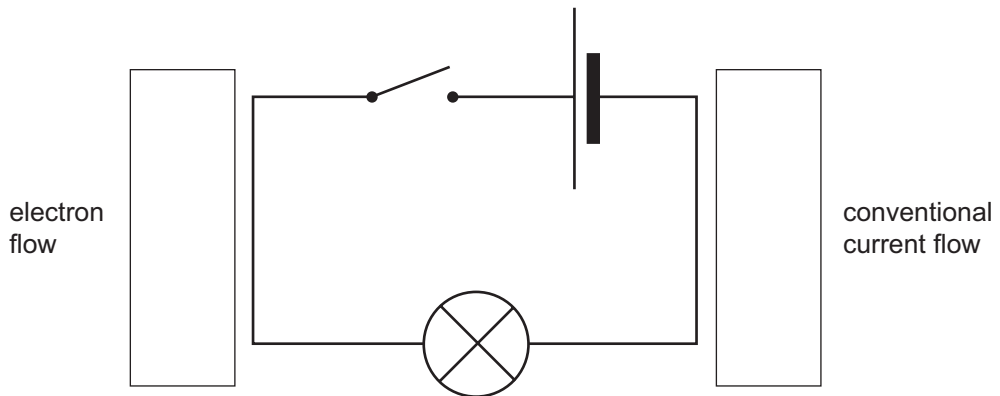
- 3 (a) Below are two symbols used in electrical circuits.
Name each symbol.
Write your answer in the space provided.





[2]

- (b) When the switch in the circuit below is closed, the lamp is lit.
Draw an arrow in each box to show the direction of conventional current flow and electron flow.



Source: Chief Examiner

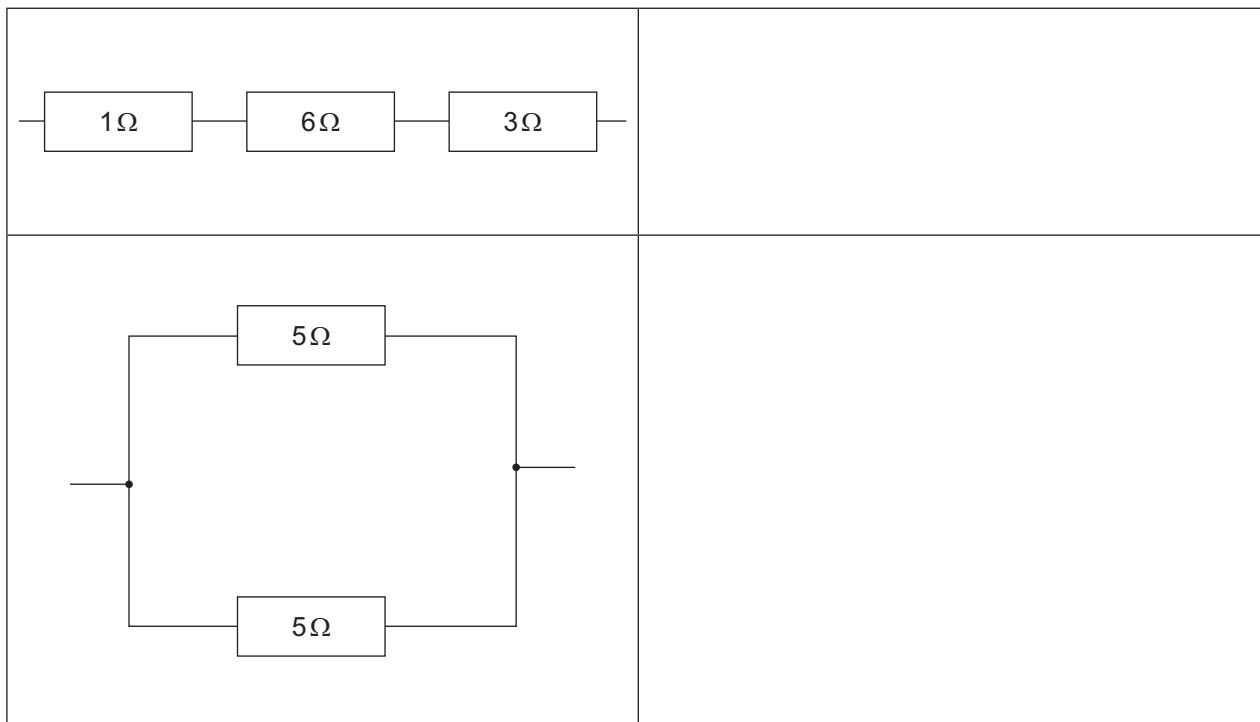
[2]

- (c) Explain why a conductor such as copper conducts electricity but an insulator such as rubber does not.

[1]



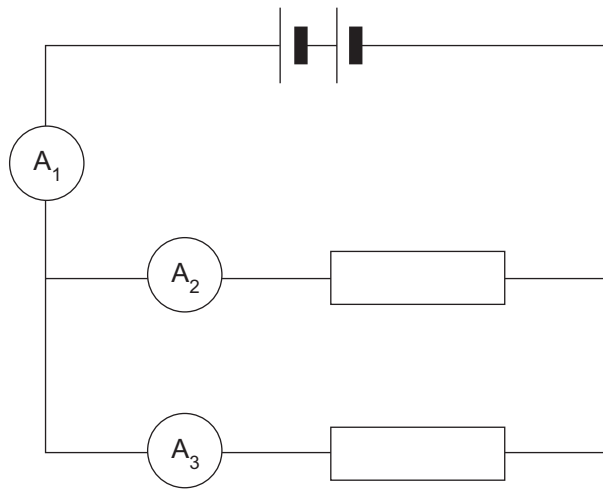
(d) (i) Calculate the total resistance of each arrangement of resistors shown below.



[4]



- (ii) In the circuit shown below the ammeter A_1 reads 1.5A and ammeter A_2 reads 0.4A.
What is the reading on ammeter A_3 ?

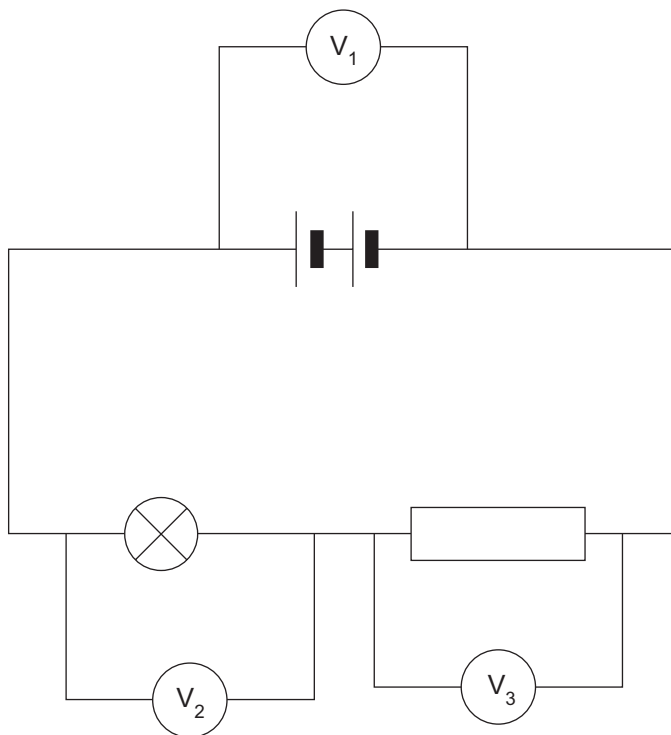


Source: Chief Examiner

Reading on A_3 = _____ A [1]



- (iii) In the circuit shown below, the voltmeter V_1 reads 3.0 V and voltmeter V_2 reads 1.8 V.
What is the reading on voltmeter V_3 ?

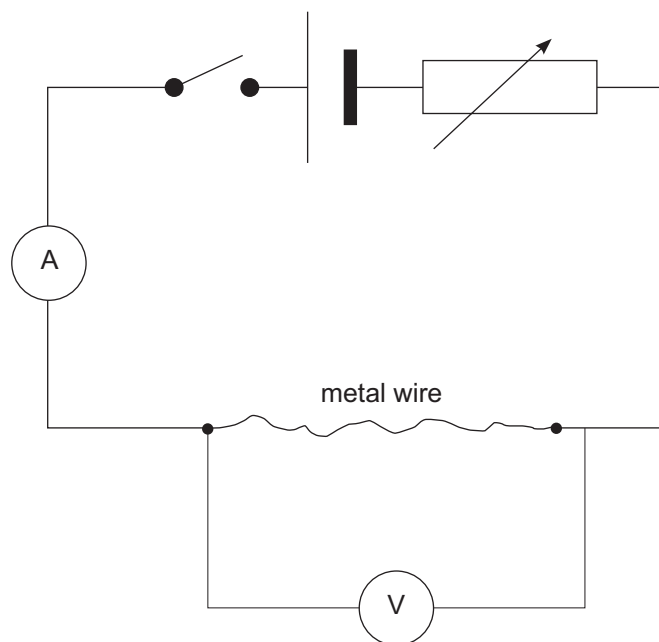


Source: Chief Examiner

Reading on V_3 = _____ V [1]



- (e) The circuit diagram below was set up to investigate the relationship between the voltage across a metal wire and the current passing through it.



Source: Chief Examiner

- (i) Name the component used to change the current.

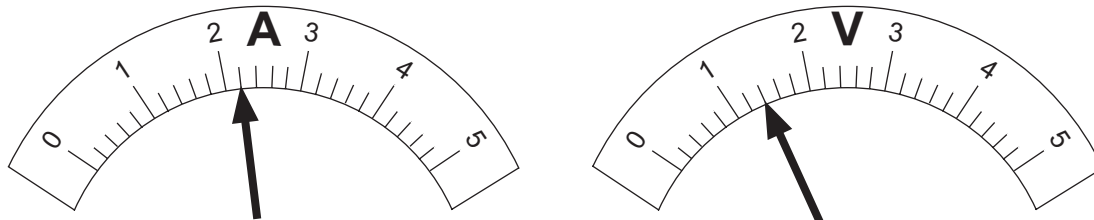
_____ [1]

- (ii) It is important that the temperature of the wire is kept constant. Describe how this is done using the circuit shown.

_____ [1]



- (iii) The diagram below shows the readings on the two meters. Calculate the resistance of the wire using these measurements. Show clearly how you get your answer, starting with the equation you plan to use.



Source: Chief Examiner

Resistance = _____ Ω [4]

- (iv) On the axes below, draw the graph that would be obtained when the voltage is plotted against the current. Label each axis with the quantity and the unit.



[2]

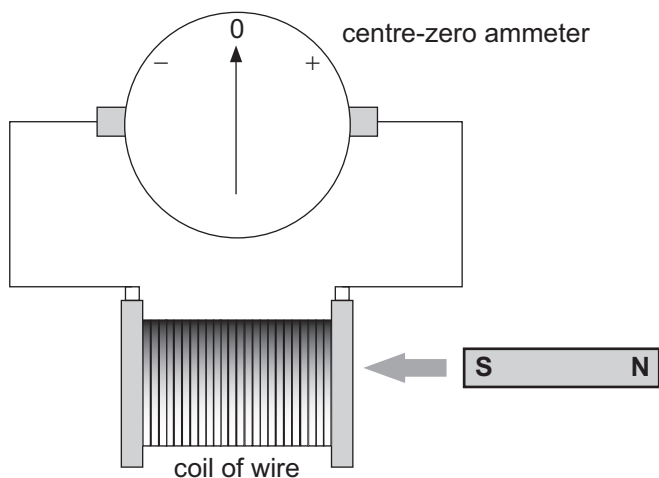
- (v) What is the relationship between the voltage and the current?

_____ [1]

[Turn over



- 4 (a) Electromagnetic induction can be demonstrated by moving a magnet in and out of a coil connected to a centre-zero ammeter, as shown below.



Source: Chief Examiner

1. **Momentary deflection and returns quickly to zero.**
2. **Steady deflection.**
3. **Pointer moves to one side then to the other side.**
4. **No deflection.**

For each of the actions described below write the number that corresponds to the observation in the boxes provided.

Action	Observation (1 to 4)
The magnet is moved quickly towards the coil and then held at rest outside the coil.	
The magnet is left at rest inside the coil.	
The magnet is moved slowly out of the coil.	
The magnet is moved towards and then away from the coil.	

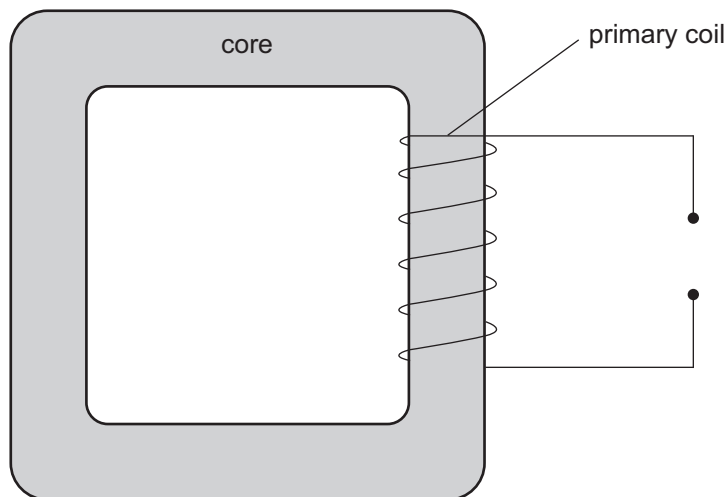
[4]



(b) The diagram below shows the structure of a transformer. The diagram is incomplete.

(i) From what material should the core be made? _____ [1]

(ii) Complete the diagram to show the coils in a **step-up** transformer. [1]



Source: Chief Examiner

(iii) How does the output voltage compare with the input voltage in a **step-up** transformer?

_____ [1]

(iv) What type of voltage is used in a transformer? _____ [1]

(v) Transformers are used at power stations to step up the voltage before it is connected to the overhead transmission cables. Explain fully why this is done.

_____ [2]

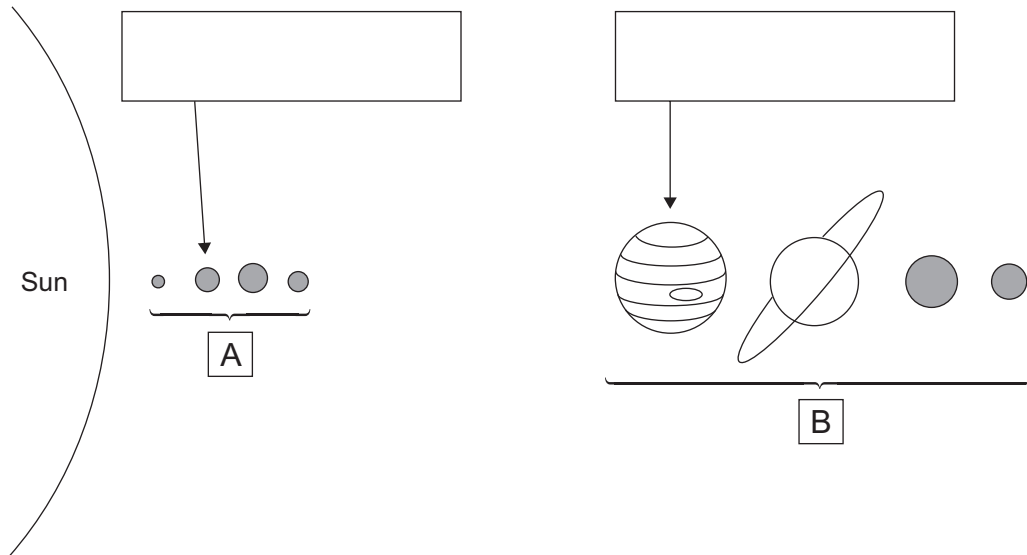
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5 (a) The diagram below shows the eight planets that make up our Solar System.

(i) Name the two planets marked with arrows.
Write their names in the boxes provided.

[2]



Source: Chief Examiner

(ii) The planets can be divided into two groups, A and B as shown above.
What do the planets in each group have in common?

Group A _____

Group B _____ [2]



(b) Stars are formed when enough gas from space is pulled together.

(i) Name the two gases that stars are mostly formed from.

_____ and _____ [2]

(ii) Name the force that pulls the gases together to form a star.

_____ [1]

(iii) Name the process that produces a star's energy.

_____ [1]

(c) Below is a list of statements about our Solar System and the Universe.

Tick (✓) those statements that are true.

The distance to stars is measured in light years.	
The Red Shift is evidence that the planets are moving away from Earth.	
The Big Bang is believed to have happened 14 thousand years ago.	
Asteroids are one of the features of our Solar System.	

[2]

THIS IS THE END OF THE QUESTION PAPER



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Question Number	Marks
1	
2	
3	
4	
5	

Total Marks	
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Examiner Number

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