Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2024

Physics

Unit 2

Foundation Tier

GPY21

[GPY21]
TUESDAY 18 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** 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 **1(d)**.

14068

1 **(a)** Waves can be classified as either transverse or longitudinal.

(i) Describe the difference between these two types of wave in terms of the motion of the particles of the medium through which the waves are moving.

_____

_____

_____

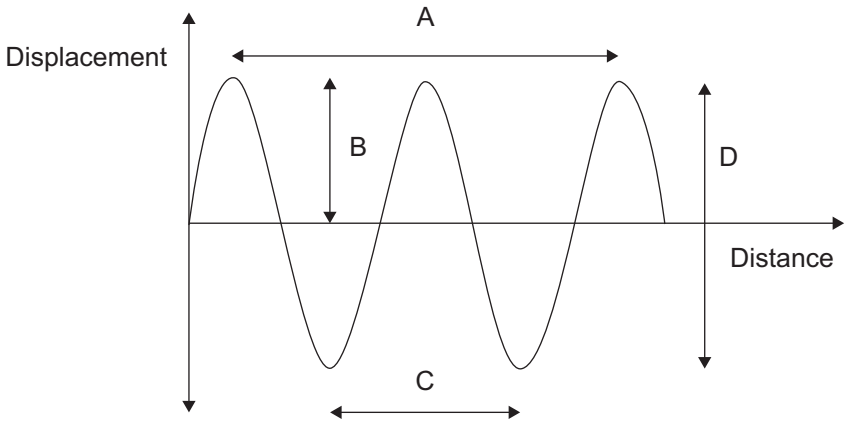
_____ [3]

(ii) State an example of each type of wave.

Transverse _____

Longitudinal _____ [2]

(b) A wave can be represented by the graph shown below.



(i) Which letter represents the wavelength of the wave?

_____ [1]

(ii) Which letter represents the amplitude of the wave?

_____ [1]

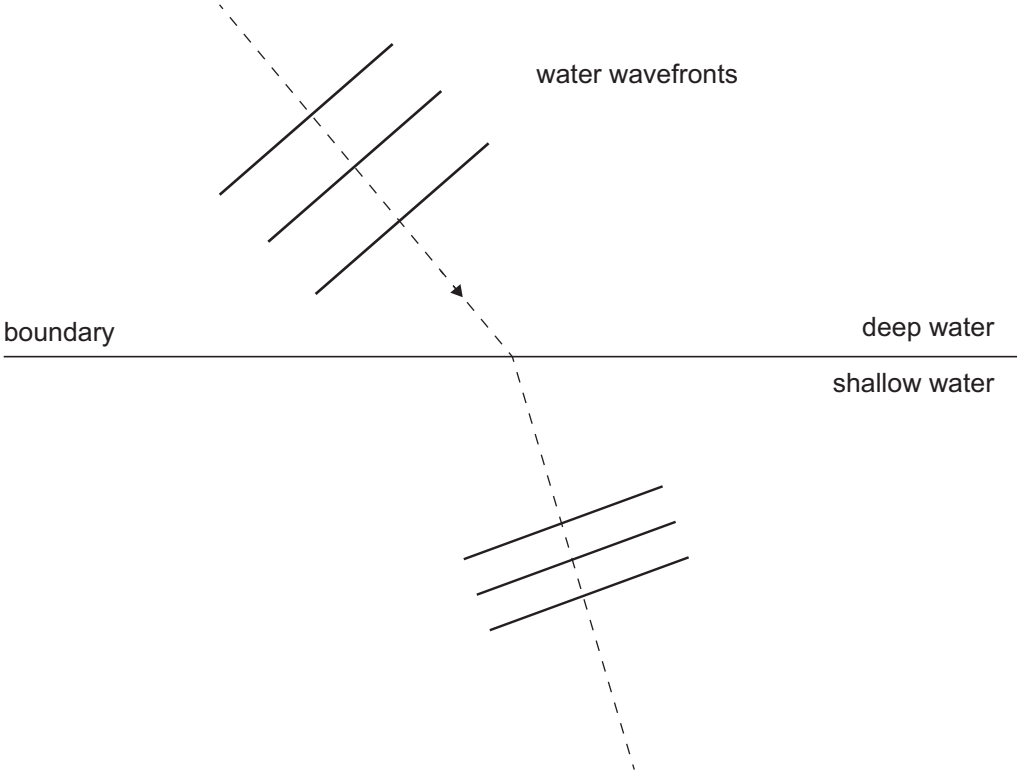
(iii) The frequency of the wave is 12 Hz. What does this mean?

_____

_____ [2]

[Turn over

(c) The diagram below shows what happens to water waves when they move from deep water to shallow water.



(i) This effect is called refraction.
Explain what causes this effect.

_____

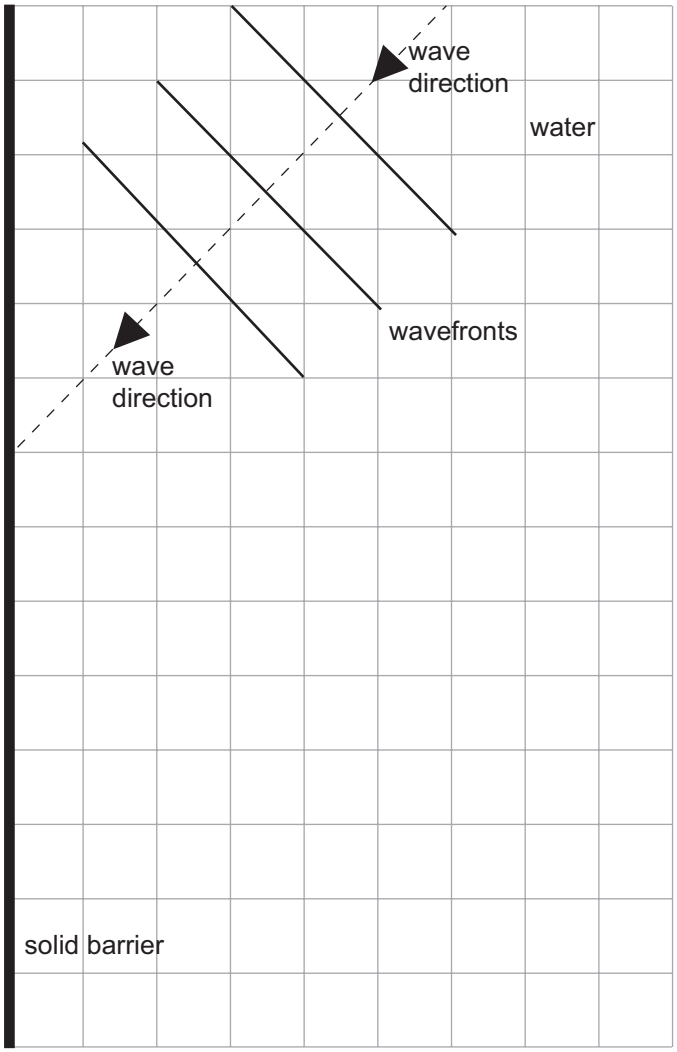
_____ [1]

(ii) What observation from the diagram supports your answer?

_____

_____ [1]

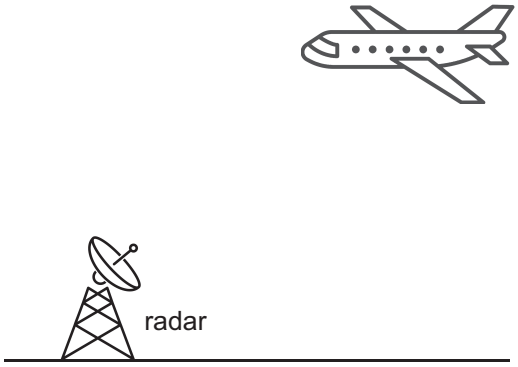
(iii) The diagram below shows water waves approaching a solid barrier.
The water waves are reflected by this solid barrier.
Carefully complete the diagram, by drawing three wavefronts, showing what happens after the waves strike the barrier.



[3]

[Turn over

(d) Radar uses pulses of electromagnetic waves in the form of microwaves to calculate the distance to an aircraft.
Describe, in detail, how this process is carried out.



Source: © Getty Images

In your answer you should explain the following points:

- why microwaves are used rather than sound waves;
- what happens to the microwaves when they reach the aircraft;
- why the microwaves are emitted as a short pulse rather than continuously;
- what measurement is made;
- what property of the microwaves is needed for the calculation of the distance to the aircraft;
- what calculation is carried out to determine the distance to the aircraft.

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

Write your answers in the spaces below and on the opposite page.

Microwaves, not sound waves, are used _____

_____

_____

_____

What happens at the aircraft? _____

_____

_____

_____

What is the reason for short pulses? _____

_____

_____

_____

_____

Measurement made _____

_____

_____

_____

Property of microwaves needed _____

_____

_____

Calculation to determine distance _____

_____

_____

_____ [6]

[Turn over

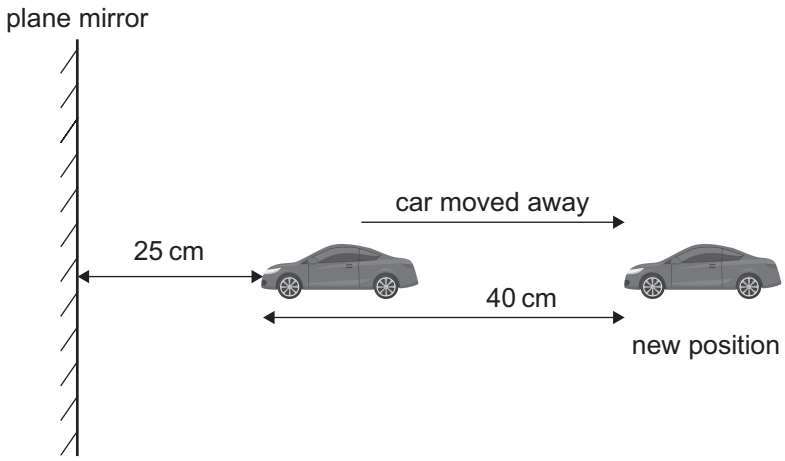
2 **(a)** A student observes an image in a plane mirror.

(i) Which of the following properties describe this image?
Tick (✓) the appropriate boxes to indicate your answers.

Diminished	☐
Enlarged	☐
Erect	☐
Upside down	☐
Real	☐
Same size as object	☐
Virtual	☐

[3]

A child's toy car is placed 25 cm in front of a plane mirror.
The child moves the car a **further 40 cm away** from the mirror.

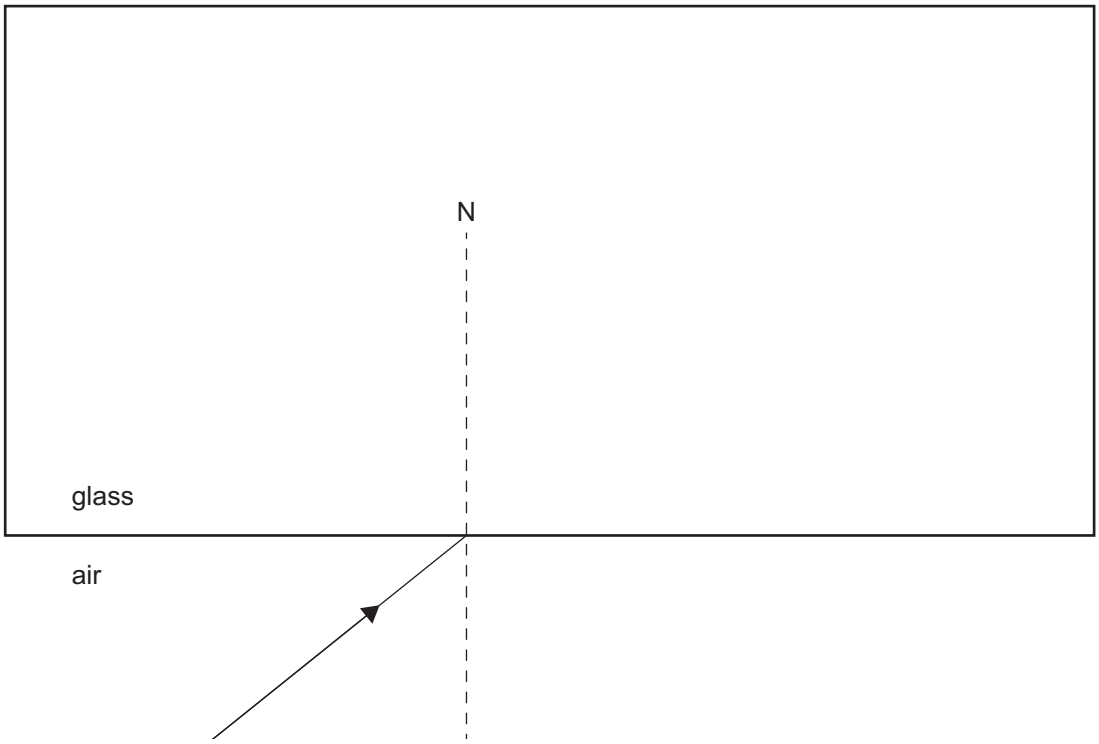


Source: © Getty Images

(ii) Calculate the distance between the toy car and its image in the plane mirror after the toy car has been moved to its new position.

Distance between toy car and its image = _____ cm [2]

(b) The diagram shows a ray of light incident on a glass block.



(i) What name is given to the dotted line marked N?

_____ [1]

(ii) Show clearly on the diagram the angle of incidence, labelling it with a letter **i**.

[1]

(iii) Draw the refracted ray in the glass. [2]

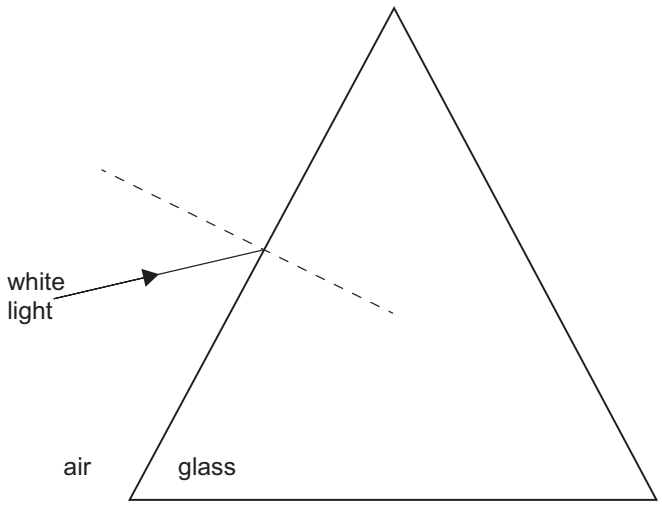
(iv) In what way, if at all, does the angle of refraction in the glass change when the angle of incidence in the air increases?
Indicate your answer by drawing a circle around one of the phrases below.

Decreases Does not change Increases

[1]

[Turn over

(c) When white light travels from the air into a triangular glass prism it splits up into different coloured rays.



(i) What name is given to this effect?

_____ [1]

(ii) Complete the diagram above to show the path of the red and violet rays through the prism and as they leave it. Label each ray. [3]

(iii) What causes the splitting of white light into different colours of light?

_____

_____ [1]

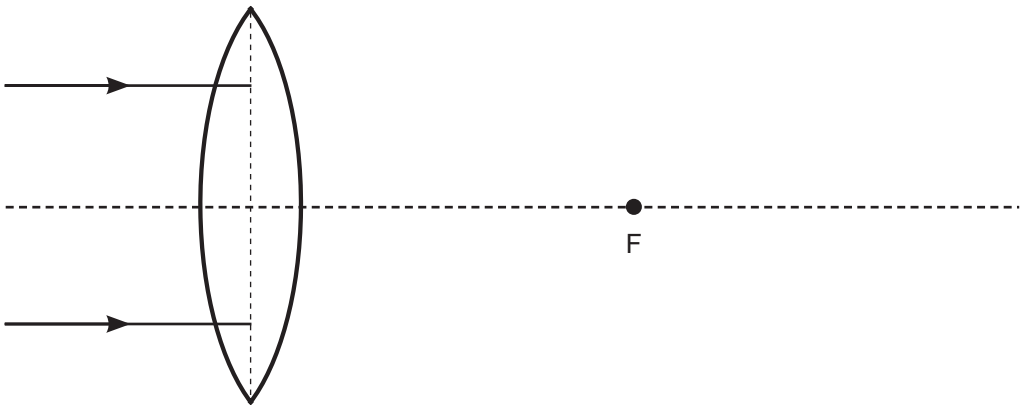
(d) (i) State what is meant by the focal length of a converging lens.

_____

_____ [1]

The diagram below shows two parallel light rays entering a lens.

(ii) Complete the diagram to show what happens to the two light rays as they pass through the lens. F is the principal focus.



[2]

A student is asked to carry out an experiment to measure the focal length of a converging lens using a distant object.

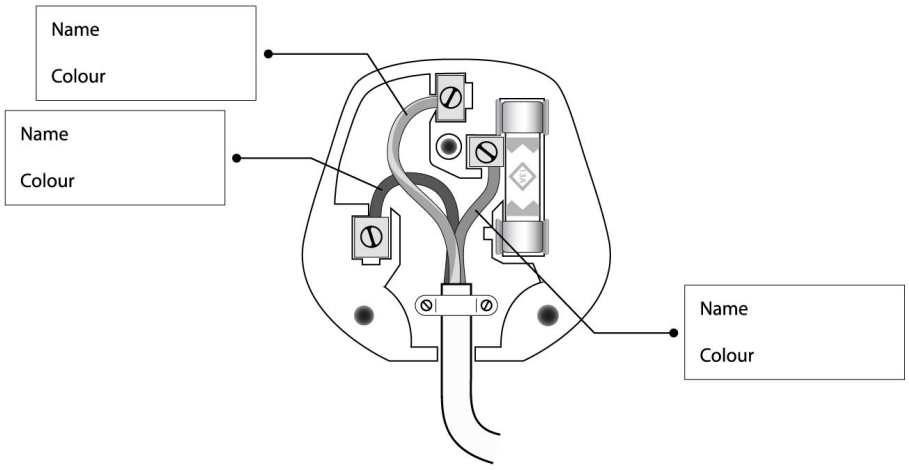
(iii) Other than the lens itself and the distant object, state **two** pieces of apparatus needed to find the focal length.

1. _____

2. _____ [2]

[Turn over

3 (a) (i) The diagram below shows a fused three pin plug.
In the boxes provided name the wires and their colour.

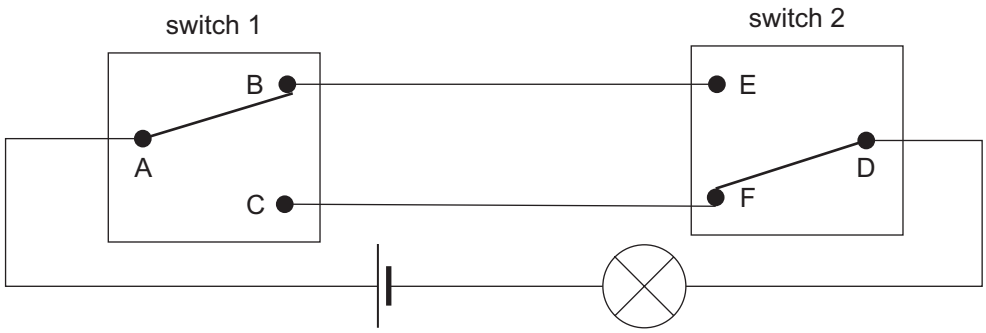


Source: © CCEA

[3]

(ii) On the diagram above mark with an arrow and label the fuse. [1]

Two way switches are common in homes so that a light can be switched on or off from different positions, for example at the top or bottom of a staircase.
The diagram below shows a circuit using a two way switch circuit.



(iii) Explain why the bulb is **not** lit when the switches are in the positions shown.

_____

_____ [1]

(iv) What should happen at switch 1 so that the bulb is lit?

_____ [1]

(v) As part of the safety associated with electrical appliances, the use of the correct fuse in the three-pin plug is essential.
The rating label for a toaster is shown below.

Toaster

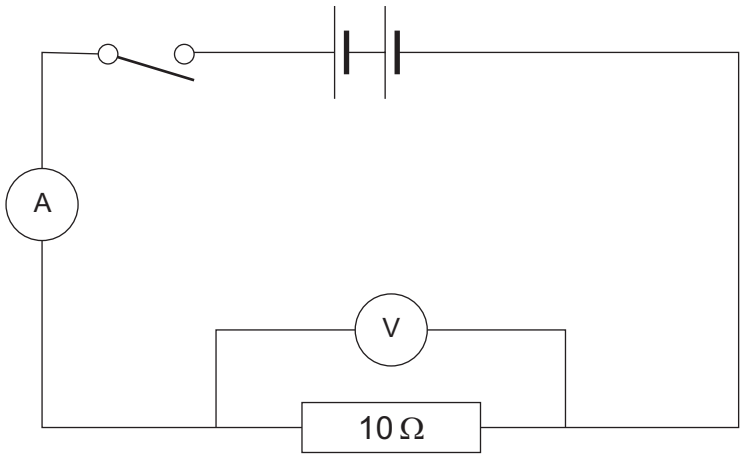
220 V
700 W

Using the information on the label, calculate the correct fuse to use.
The choice of fuses are 1A, 3A, 5A and 13A.
Show clearly how you get your answer, starting with the equation you plan to use.

Fuse = _____ A [4]

[Turn over

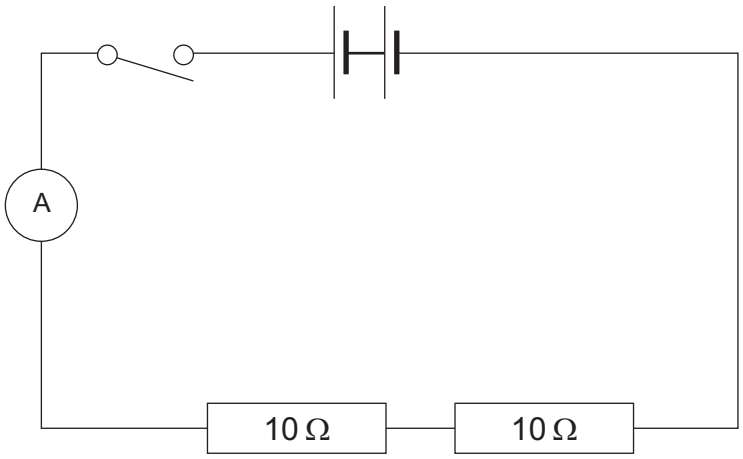
(b) The circuit shown below was set up.



(i) When the switch is closed, the reading on the ammeter is 0.3A.
What is the reading on the voltmeter?
Show clearly how you get your answer, starting with the equation you plan to use.

Reading on voltmeter = _____ V [3]

Another resistor is added to the circuit as shown below.

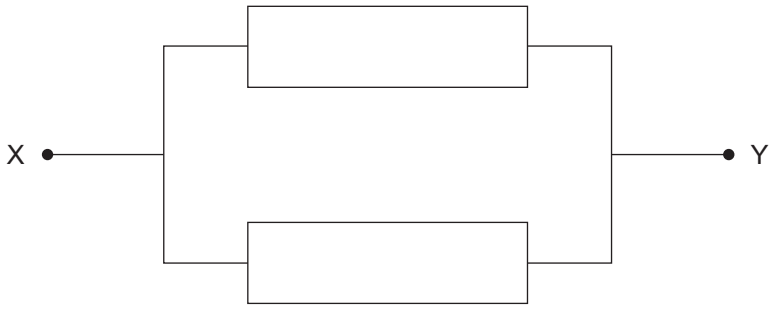


(ii) What effect does this have on the ammeter reading?
Explain your answer.

_____

_____ [2]

(c) (i) Two **identical** resistors are connected as shown below.

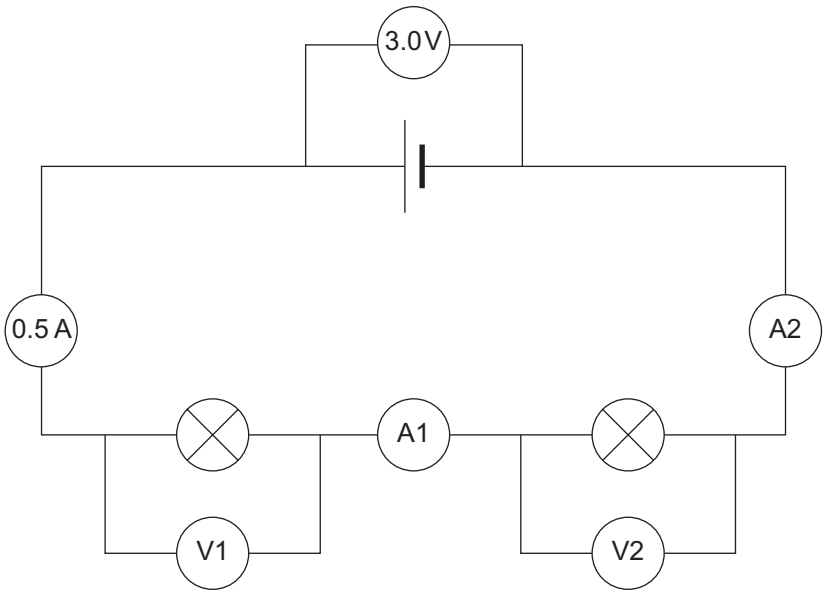


Name the type of circuit shown _____ [1]

(ii) The total resistance between X and Y is 20 Ω.
Write the value of each resistor inside each symbol. [1]

[Turn over

(d) The circuit shown below was built using two identical bulbs.



For each meter, state the reading.

Reading on A1 = _____

Reading on A2 = _____

Reading on V1 = _____

Reading on V2 = _____ [2]

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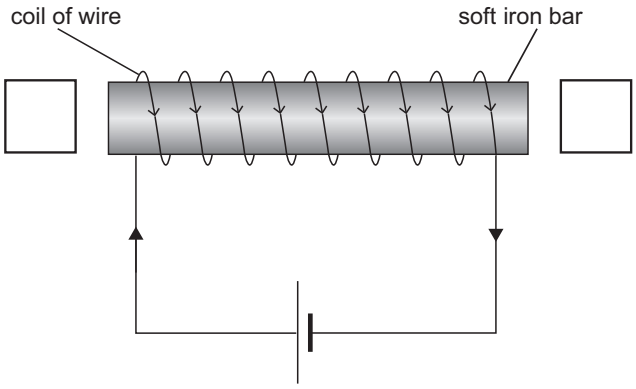
(Questions continue overleaf)

[Turn over

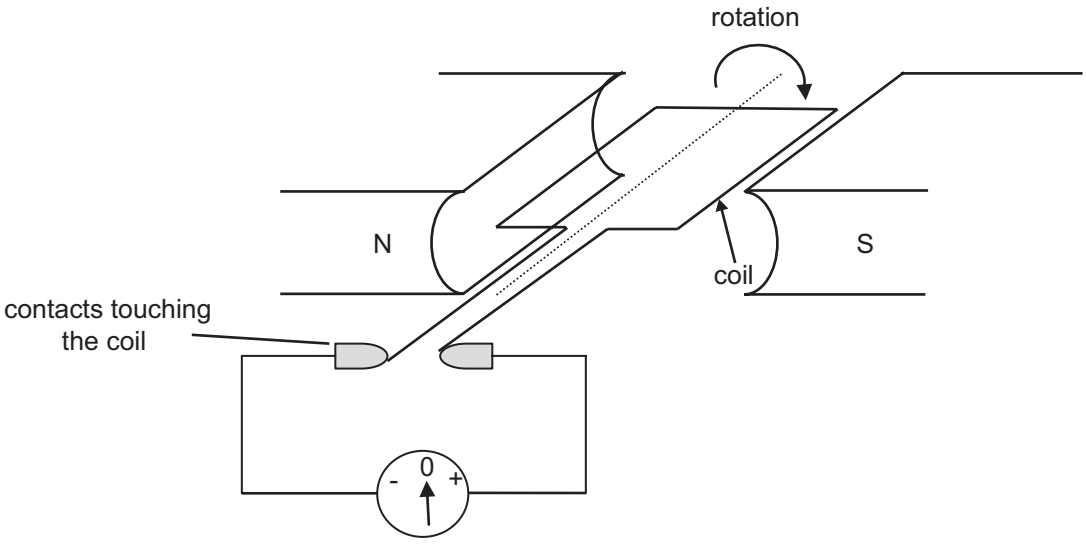
4 **(a)** The diagram shows a coil of wire wrapped around a soft iron bar.
When a current is passed through the coil a magnetic field is created around the coil.
Label the north and south poles, using the boxes shown.
On the diagram, draw **one** magnetic field line and mark its direction.



Source:© CCEA

[3]

(b) The diagram below shows an a.c. generator.



centre-zero meter

(i) State what happens in the coil of wire when it rotates between the poles of the magnet.

_____ [1]

(ii) Describe carefully the motion of the pointer in the centre-zero meter when the coil is rotated continuously.

_____

_____ [2]

(c) (i) Complete the sentences below about transformers.
Choose your answers from the words and phrases in the box.
Each word or phrase may be used once, more than once or not at all.

isolating	step-up	increase	decrease	step-down
	alternating	direct	battery	

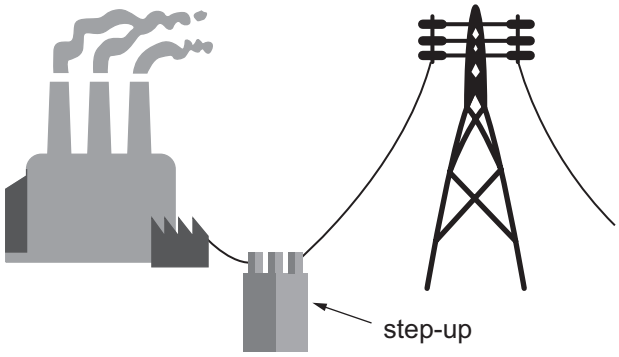
1. A _____ transformer gives a higher voltage at the secondary coil than at the primary coil.

2. The purpose of the core is to _____ the magnetic field strength between the primary and secondary coils.

3. The output voltage of a transformer is _____ .
[3]

[Turn over

The output from a power station is connected to a step-up transformer, which in turn is connected to the transmission lines.



Source: Adapted from National Energy Education Development Project (Public Domain)
https://www.eia.gov/energyexplained/electricity/delivery-to-consumers.php

(ii) Explain the advantage of using a step-up transformer to distribute electricity.

_____

_____

_____ [2]

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(Questions continue overleaf)

5 **(a)** There are many different types of objects in our Solar System which can be observed from the Earth.
Among them are the rocky planets and the gas planets.

(i) In the table below, place a tick (✓) in the correct box to identify which are rocky planets and which are gas planets.

Planet	Rocky	Gas
Neptune		
Saturn		
Earth		
Jupiter		

[2]

(ii) Write down the name of a gas planet whose name does not appear in the list above.

_____ [1]

(iii) All planets orbit the Sun.
What force enables this to happen?

_____ [1]

(iv) Other than the Sun, planets, moons and comets, what other objects are part of our Solar System?

_____ [1]

Spacecraft which orbit planets are called artificial satellites.

(v) State one use of artificial satellites which orbit the Earth.

_____

_____ [1]

(b) There are over 4000 known planets outside our Solar System. In the search for life on these planets, scientists are trying to find out the composition of the atmospheres around these planets.

(i) What gas in particular are they searching for in these planetary atmospheres?
Give a reason for your answer.

Gas: _____

Reason: _____

_____ [2]

(ii) State briefly how scientists are trying to identify the gases in these planetary atmospheres.

_____

_____ [2]

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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
Total Marks	

Examiner Number