Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2025

Physics

Unit 2

Higher Tier

GPY22

[GPY22]

MONDAY 16 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 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 100.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You may use a scientific calculator.
Quality of written communication will be assessed in question **3(c)**.

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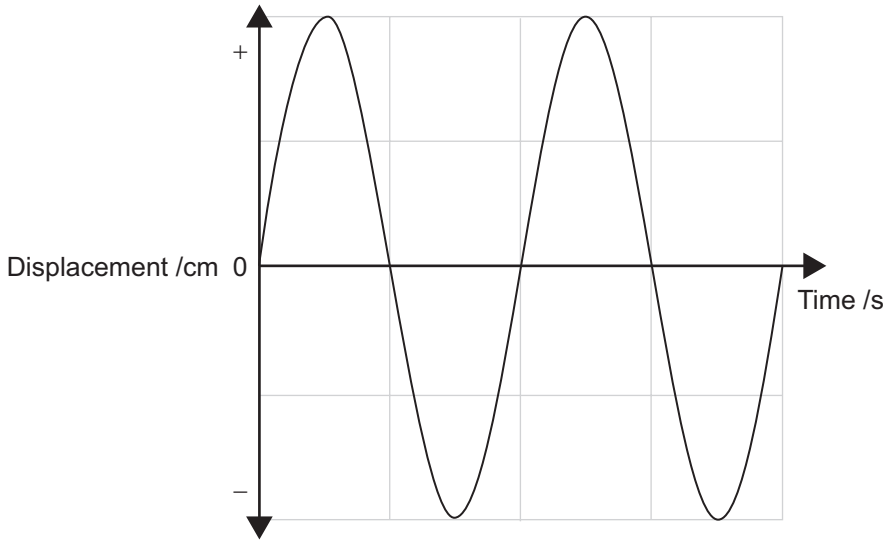
28GPY2201

1 **(a)** **(i)** The frequency of a wave is 5 kHz. Explain what this means.

_____

_____ [3]

(ii) The graph below shows how the displacement of a wave changes with time. On the axes, draw the wave that has **half the amplitude** and has **half the frequency** of the one shown.
Do not include any values in your diagram.



[2]

(iii) Describe the difference between a transverse wave and longitudinal wave.

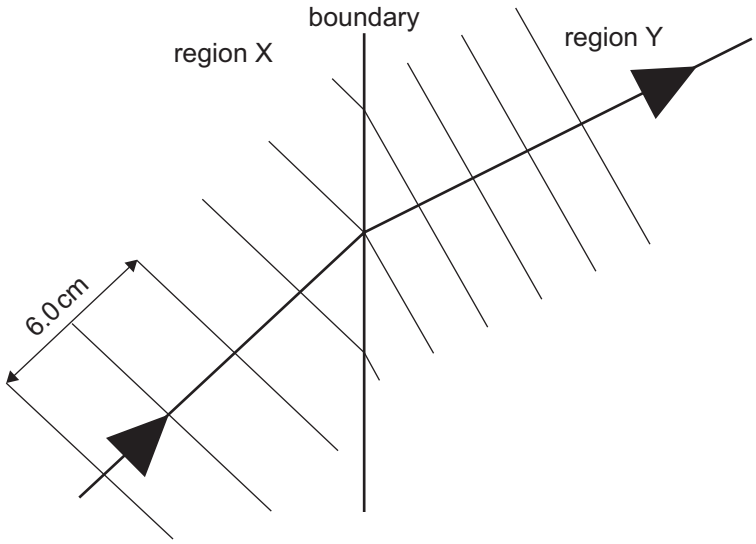
_____

_____

_____

_____ [2]

(b) The diagram below shows water waves travelling from region X to region Y.



In region X the horizontal distance between the first crest and the third crest is 6.0 cm. The waves travel at a speed of 21 cm/s.

(i) Calculate the wavelength of the water waves.

Wavelength = _____ cm [1]

(ii) Calculate the frequency of the water waves.
Show your working out.

Frequency = _____ Hz [3]

[Turn over

(iii) What happens to the speed, frequency and wavelength of the waves when they move from region X to region Y?
Record your answers by placing a tick (✓) in the appropriate box below.

	Increases	**Remains the same**	**Decreases**
Speed			
Frequency			
Wavelength			

[3]

(iv) Which region has the deeper water?
Explain your answer.

_____

_____ [1]

(c) **(i)** Four electromagnetic waves are listed below.

microwaves X-rays ultraviolet radio waves

Place them in the table below in order of increasing wavelength.

Increasing wavelength

[2]

(ii) Below are statements about the dangers of electromagnetic waves.
Using lines, match each danger with the correct electromagnetic wave.

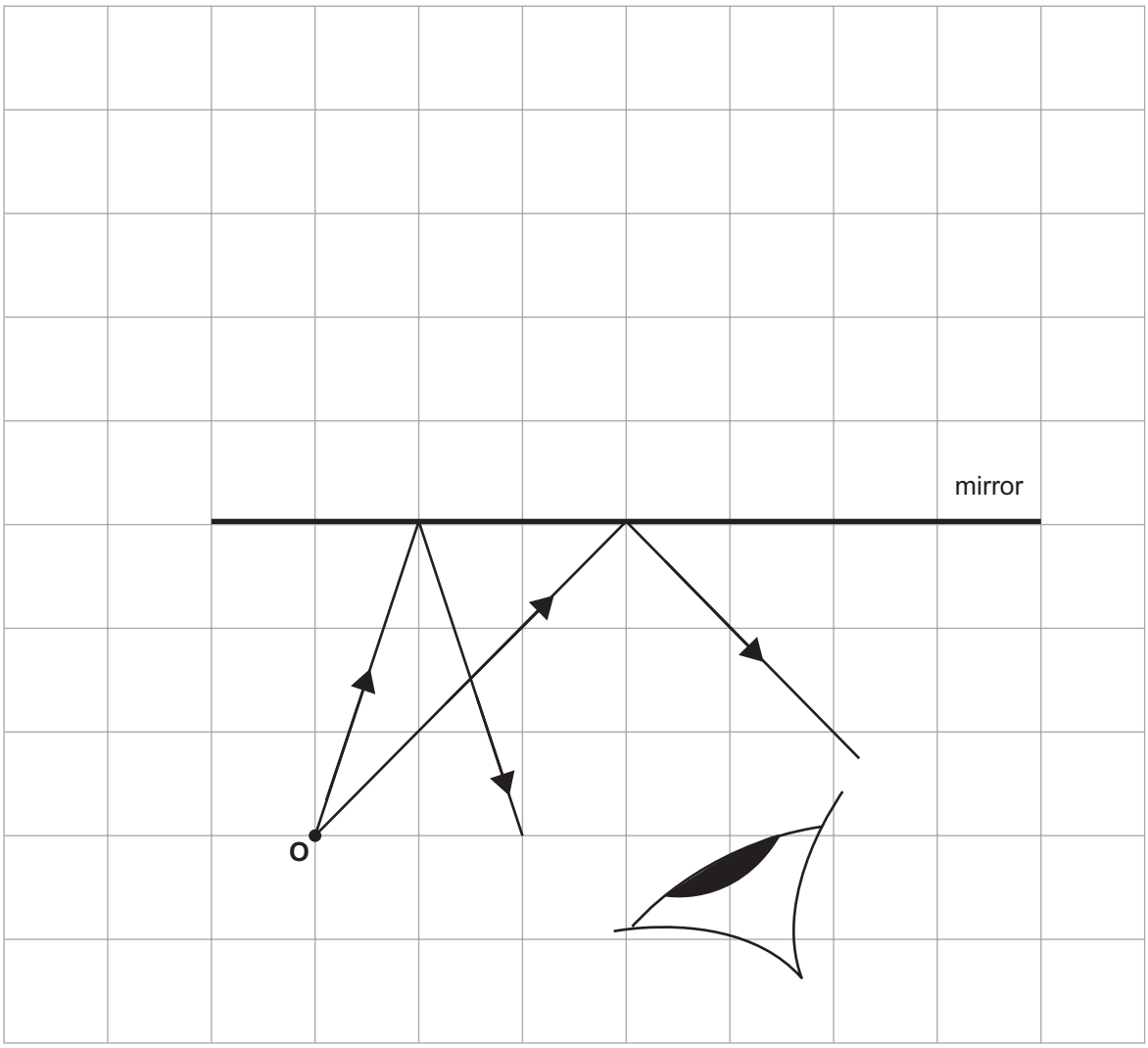
Danger	**Electromagnetic wave**
Heating of internal tissues	ultraviolet
Damage to skin cells and may lead to cancer	microwave
Felt as heat and causes skin burns	infrared

[2]

2 **(a)** The diagram below shows an object (**O**) placed in front of a plane mirror. Two rays from **O** are shown being reflected by the mirror into the eye.

(i) Using the two reflected rays, show clearly and accurately on the diagram how the mirror image of **O** is located.

You must show clearly any construction lines you use.
Label the image clearly with the letter **I**. [3]



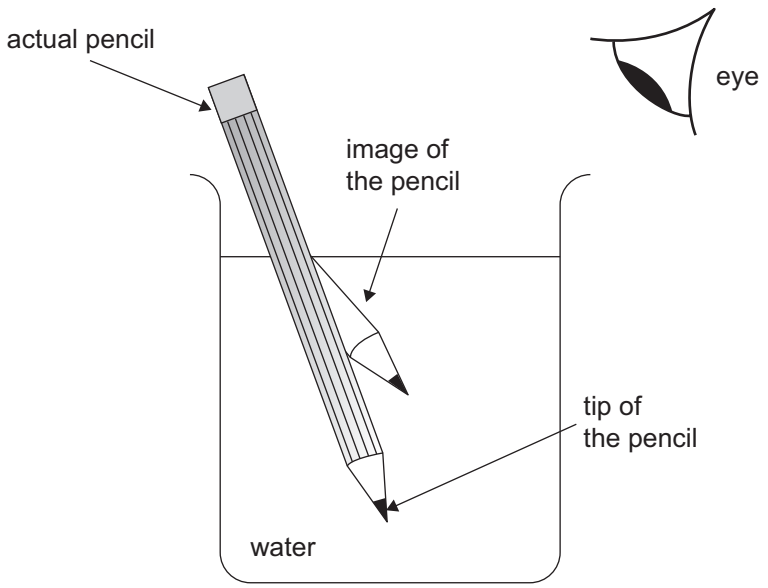
(ii) The image in a plane mirror is laterally inverted.
Explain what this means.

_____

_____

_____ [1]

(b) A pencil placed in a beaker of water appears to be bent.
This is shown in the diagram below.



(i) Draw a ray of light from the tip of the actual pencil to show how it reaches the eye. [2]

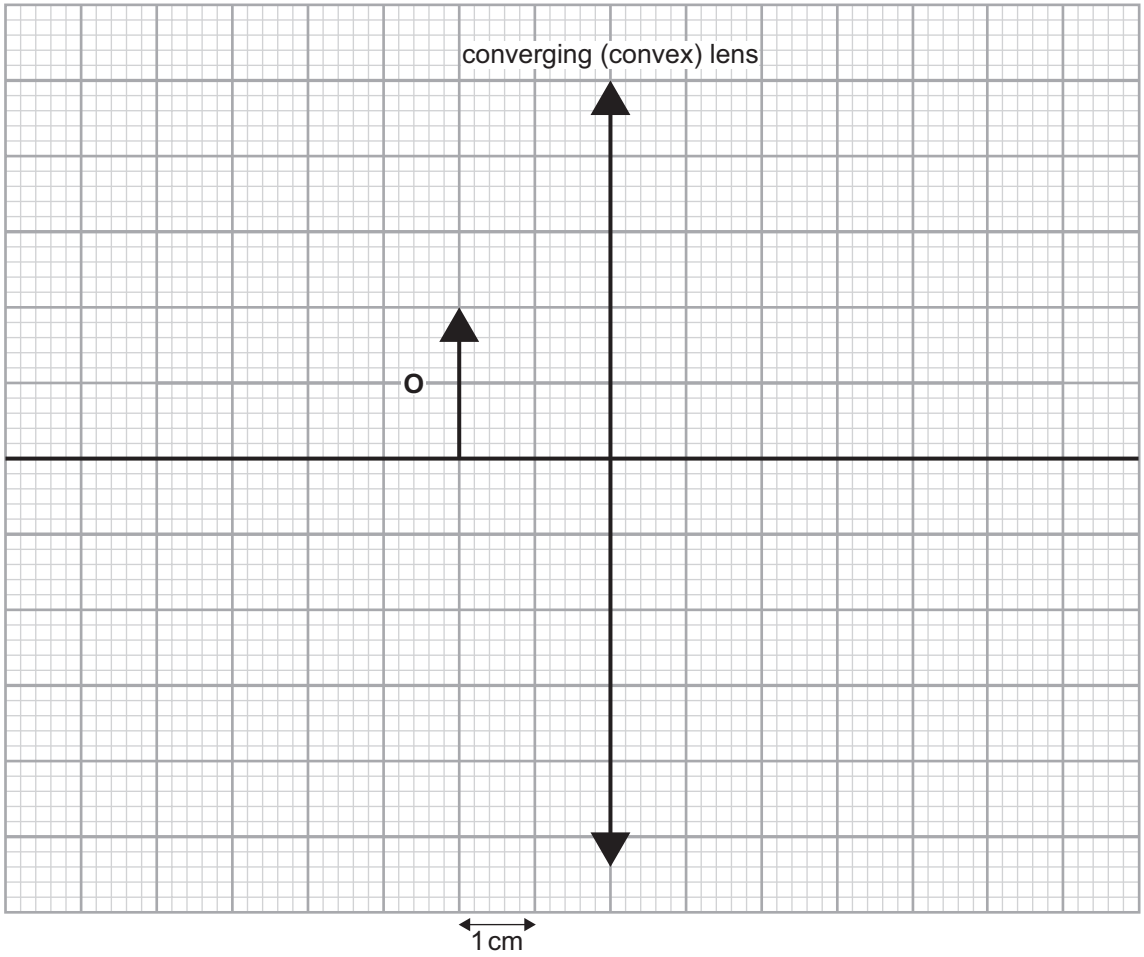
(ii) Explain why the ray takes the path you have drawn.

_____

_____ [1]

[Turn over

(c) The diagram below shows the position of an object (**O**) placed in front of a converging (convex) lens of focal length 4 cm.



(i) Clearly mark the position of the principal focus with the letter **F** on the diagram. [1]

(ii) Draw two rays of light from the top of the object and their path after refraction by the lens to find the position of the image.
Place arrows on the rays to show their direction.
Draw the image and label it with the letter **I**.
You should show any construction lines you make use of to locate the image. [5]

(iii) State three properties of the image in this ray diagram.

1. _____

2. _____

3. _____ [3]

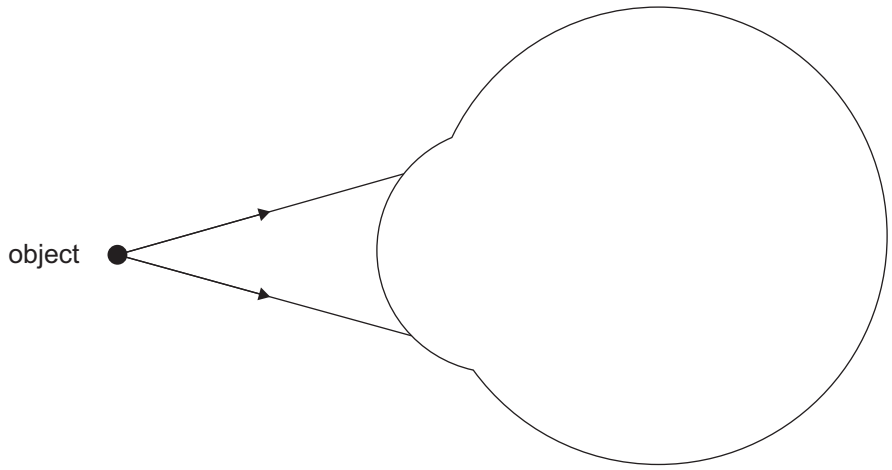
(iv) Name an optical instrument which uses a converging lens in this manner.

Optical instrument _____ [1]

[Turn over

(d) A person is long-sighted.

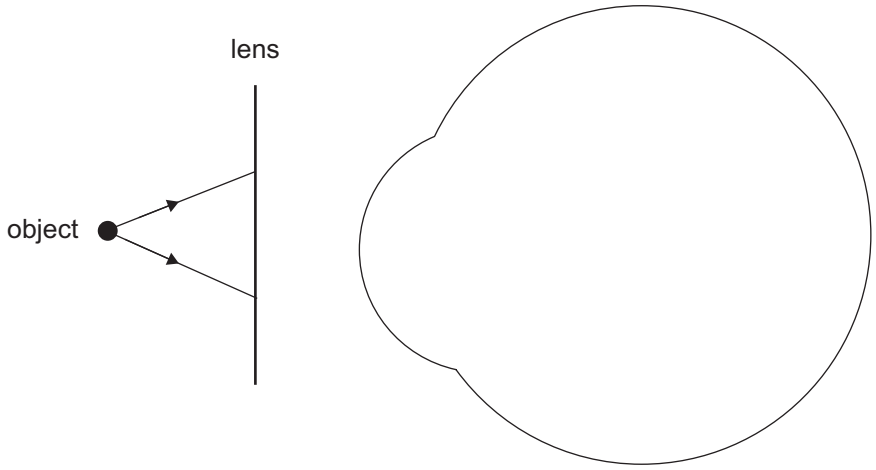
(i) Complete the diagram below to show how two rays from a nearby object are refracted by this person's eye. [2]



(ii) Long sight can be corrected using the appropriate lens.

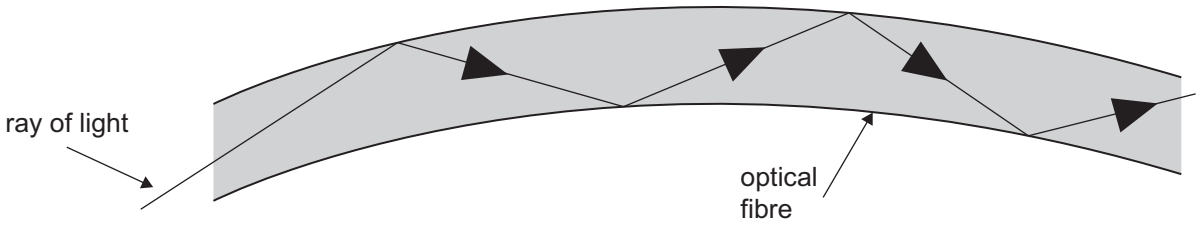
What type of lens is used? _____ [1]

(iii) Complete the diagram below to show how the two rays of light from this nearby object are refracted by the lens and by the eye.



[3]

(e) The diagram below represents the passage of light along an optical fibre.



(i) What is the name of the effect that is used for the passage of light along the optical fibre?

_____ [1]

(ii) Complete the following sentence to describe the condition that must be met so the ray of light remains in the optical fibre.

The angle of incidence in the optical fibre must be _____

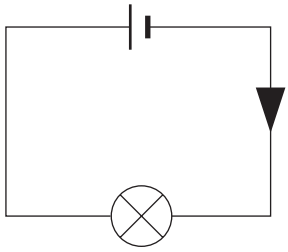
_____ [1]

(iii) Name an application of optical fibres.

_____ [1]

[Turn over

3 **(a)** **(i)** The circuit diagram below is of a cell connected to a lamp.
What does the arrow on the circuit diagram represent?

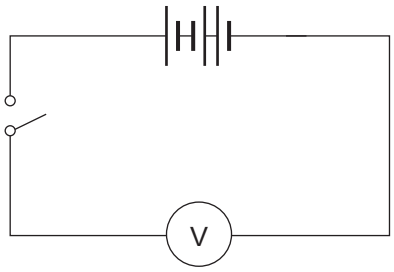


_____ [1]

(ii) In the circuit shown above, a current of 0.5 A passes through the lamp for 20 s.
Calculate the amount of electric charge that has passed through the lamp.
Show your working out.

Electric charge = _____ C [3]

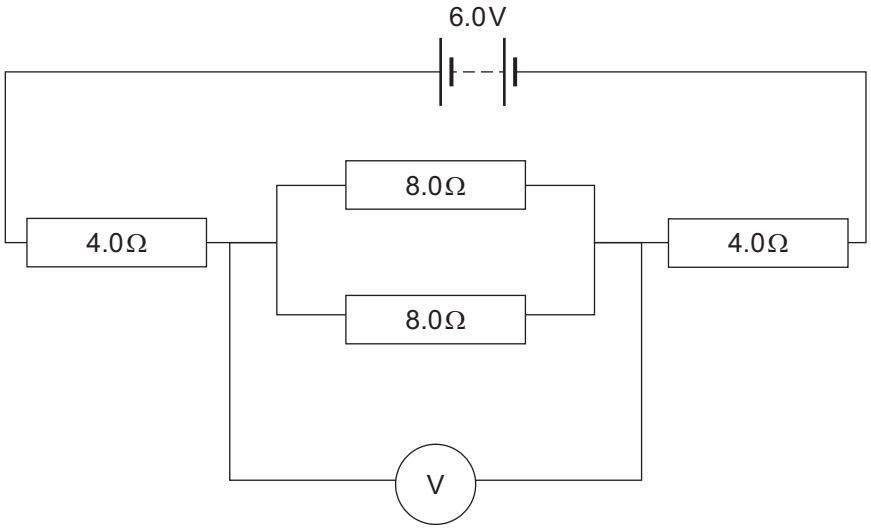
(iii) Three 1.5 V cells are connected as shown in the circuit diagram below.



What reading is shown on the voltmeter when the switch is closed?

Reading on the voltmeter = _____ V [1]

(b) (i) Calculate the total resistance of the circuit shown below.



Show your working out.

Resistance = _____ Ω [3]

(ii) Calculate the current in the circuit.
Show your working out.

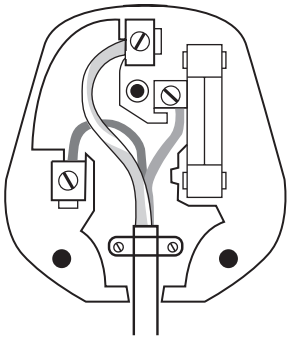
Current = _____ A [3]

(iii) Calculate the reading on the voltmeter.
Show your working out.

Reading = _____ V [2]

[Turn over

(c) Electrical appliances in the home are connected to the mains supply using a three-pin plug.



Source: CCEA

The three-pin plug is designed to prevent the user from suffering an electric shock.

Describe the main features of the three-pin plug and how the user is kept safe.

In your description you should state:

- the names of the three wires of the plug;
- the wire that protects the user from receiving an electric shock; and
- how this wire and the fuse protect the user from receiving an electric shock.

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

Write your answers in the appropriate space on the page opposite.

[6]

(d) The diagram below shows a portable electric heater that can be used to boil water and make coffee or tea in a car.

Source: © Ron Giling / Alamy

The heater uses 6 V and has a power output of 72 W.
This heater consists of a coil of wire as the heating element.

(i) Calculate the current in the heating element when the heater is switched on.
Show your working out.

Current = _____ A [3]

(ii) Calculate the resistance of the heating element when the heater is switched on.
Show your working out.

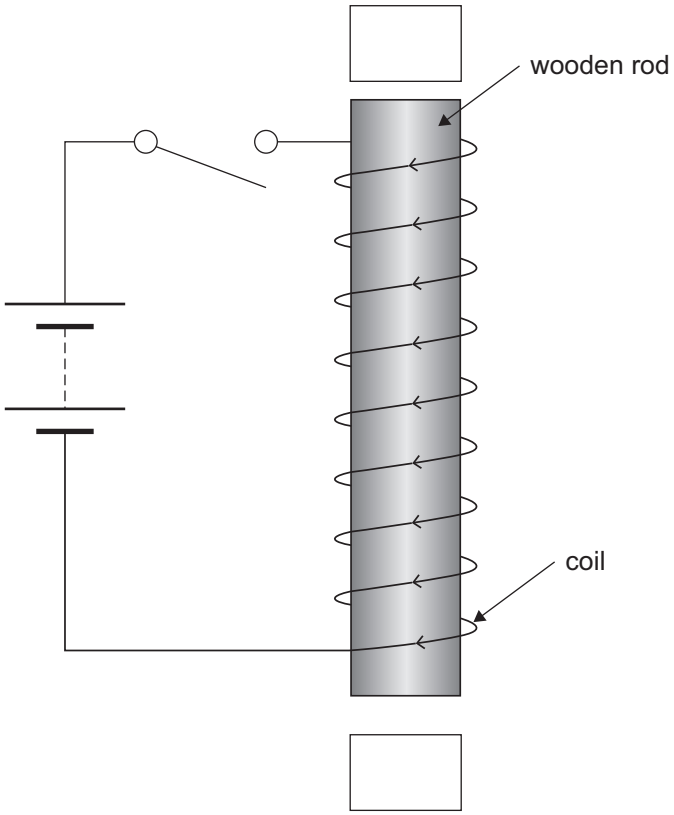
Resistance = _____ Ω [3]

(iii) The wire used to make the heating element has a resistance of **5 Ω per metre**. Calculate the length of wire needed.
Give your answer in cm.
Show your working out.

Length of wire needed = _____ cm [1]

[Turn over

4 **(a)** A simple electromagnet is shown in the diagram below.
The coil is wound around a wooden rod.
When the switch is closed, a current flows from a battery causing one end of the coil to become a north pole and the other end to become a south pole.



(i) Mark the north pole of the electromagnet with an N and the south pole of the electromagnet with an S. [1]

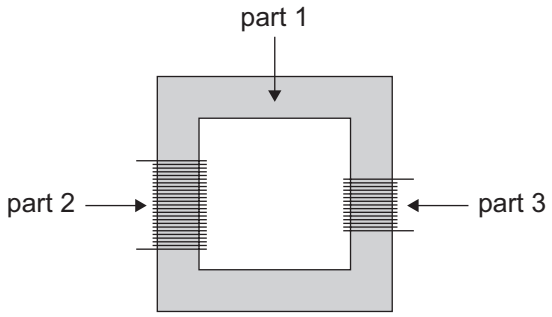
(ii) State three changes that could be made to increase the strength of the electromagnet.

1. _____

2. _____

3. _____ [3]

(b) A **step-down** transformer is shown in the diagram below.
It consists of three main parts.
The transformer is designed to change the mains voltage of 240 V to the 6 V needed to operate a charger.



(i) What is the function of part 1?

_____ [1]

(ii) Explain why part 2 is the primary coil and part 3 the secondary coil.

_____

_____ [1]

(iii) The primary coil has 600 turns. Calculate the number of turns on the secondary coil.
Show your working out.

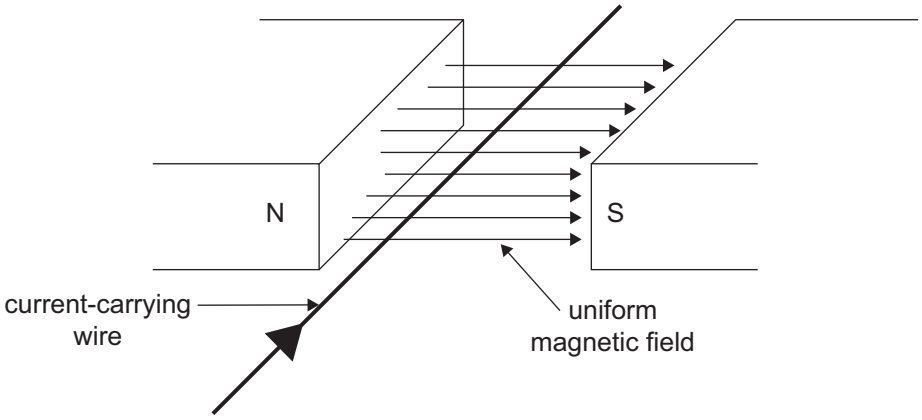
Number of turns on secondary coil = _____ [3]

(iv) What type of voltage, a.c. or d.c., is connected to part 2? _____

What type of voltage, a.c. or d.c., is obtained from part 3? _____ [2]

[Turn over

(c) A student observes that when a wire carrying a current is placed at right angles to a uniform magnetic field, it experiences a force and moves.



(i) Name the rule that is used to determine the direction of the force on the current-carrying wire.

_____ [1]

(ii) Use this rule to determine the direction of the force on the wire.
Tick the correct answer.

Upwards	
Downwards	
Out of page	
Into Page	
Left	
Right	

[1]

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(Questions continue overleaf)

5 **(a)** The Big Bang model describes the formation and evolution of the Universe.

(i) When did the Big Bang occur?

_____ [1]

(ii) Cosmic microwave background radiation provides evidence for the Big Bang model. Name another observation that provides evidence for the Big Bang model.

_____ [1]

(iii) Explain how this observation supports the Big Bang model.

_____

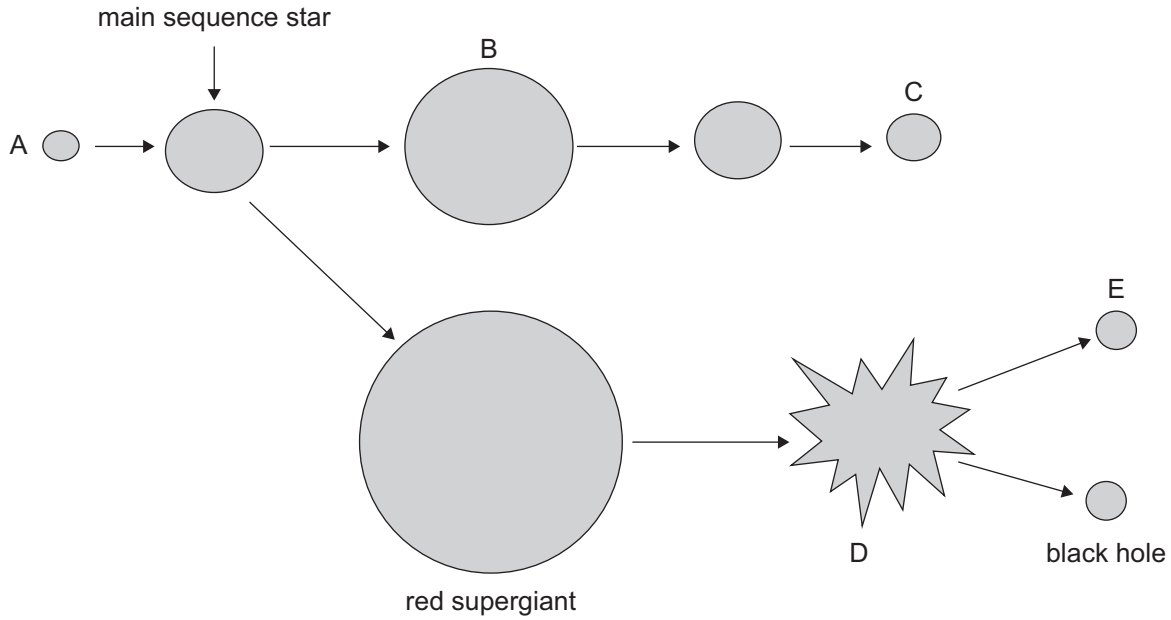
_____ [1]

(b) Complete the following statements about stars.

Stars are composed mainly of _____ and _____.

The energy of a star is supplied by nuclear _____. [3]

(c) The diagram below shows the life cycle of stars.



(i) Name the stages in the life cycle marked with letters.

A = _____

B = _____

C = _____

D = _____

E = _____ [3]

[Turn over

(ii) Our Sun is a main sequence star. Such a star is stable for many billions of years.
What two forces provide this stability?
State the directions in which they act.

_____

_____

_____ [3]

(iii) What is a light year?

_____

_____ [2]

(iv) The nearest star to Earth, apart from our Sun, is Alpha Centauri.
It is 4.4 light years from Earth.
Calculate this distance in kilometres.
The speed of light is 3×10^5 km/s.
One year equals 3.15×10^7 s.
Show your working out.

Distance = _____ km [2]

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Question Number	Marks
1	
2	
3	
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Total Marks	

Examiner Number

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