Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2022

Double Award Science: Physics

Unit P2

Higher Tier

[GDW62]

GDW62

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 ten** 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**.

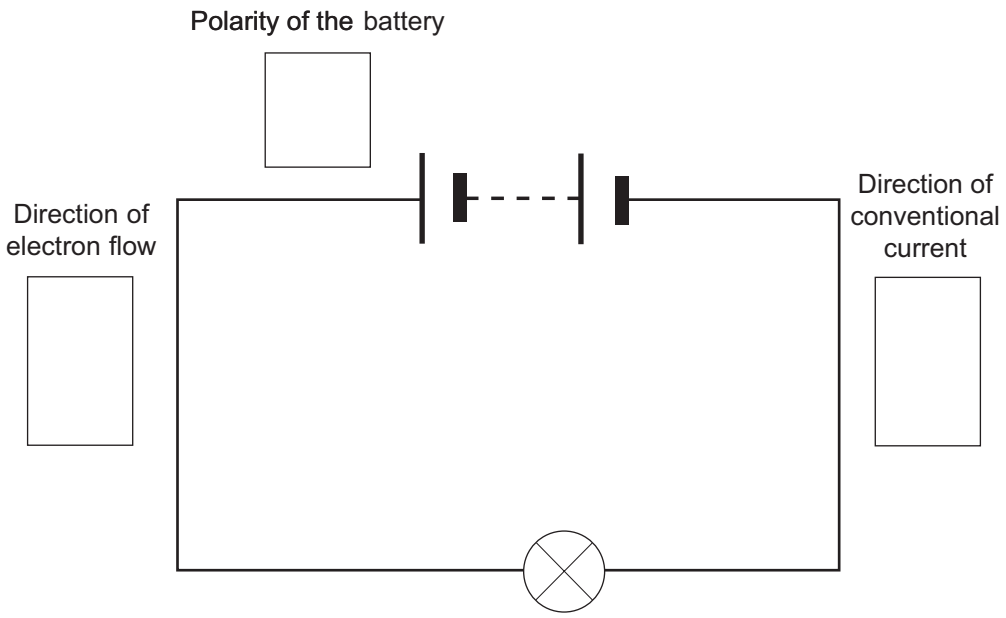
13000.06**R**

1 **(a)** State, in terms of particles, why conductors are better than insulators at conducting electricity.

_____

_____ [1]

The circuit below shows a bulb connected to a battery.

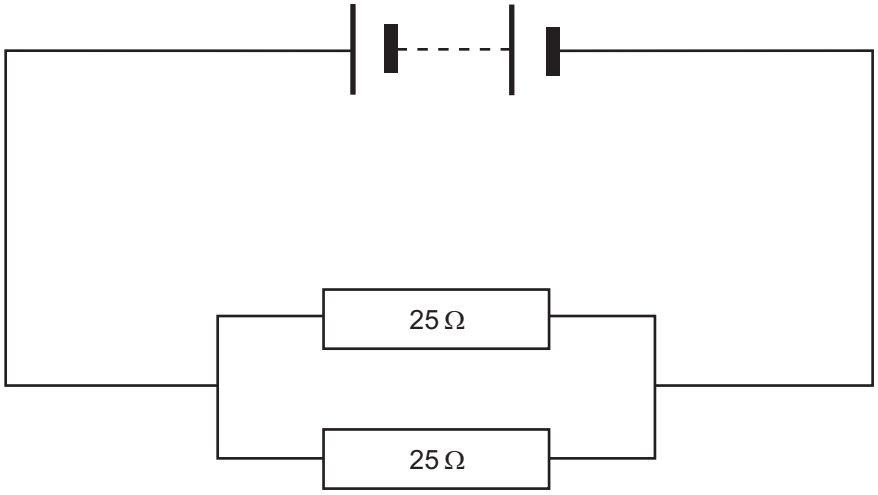


(b) Complete the diagram above to include:

- a + or – to show the polarity of the battery;
- an arrow in the box to show the direction of electron flow;
- an arrow in the box to show the direction of conventional current.

[3]

(c) Two equal resistors of 25 Ω each are connected as shown below.



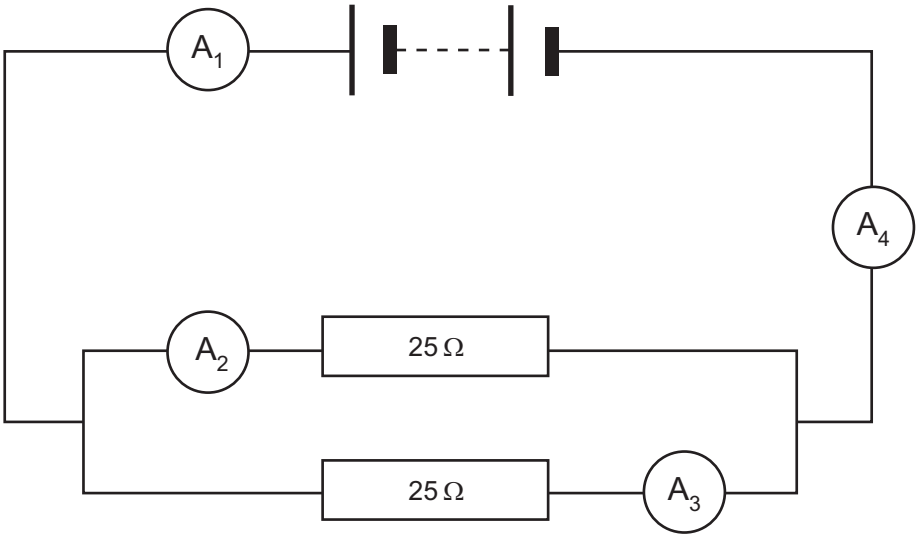
(i) Calculate the total resistance of the circuit above.

Resistance = _____ Ω [1]

[Turn over

Ammeters are placed in the circuit.

The current in ammeter A_1 is 0.6A.



(ii) State the readings on the other three ammeters.

A_2 = _____ A

A_3 = _____ A

A_4 = _____ A

[3]

(d) A washing machine of resistance 20 Ω is connected to a 230 V supply.

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Use the information above to calculate the current flowing through the washing machine.

You are advised to show your working out.

Current = _____ A [3]

[Turn over

2 You are asked to describe the formation of a star.

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

Your answer should include the following:

- the materials used to form the star;

_____

_____

_____

- the force involved and what this force does;

_____

_____

_____

- the name of the nuclear reaction;

_____

_____

- the name of the new element produced in this process.

_____

_____ [6]

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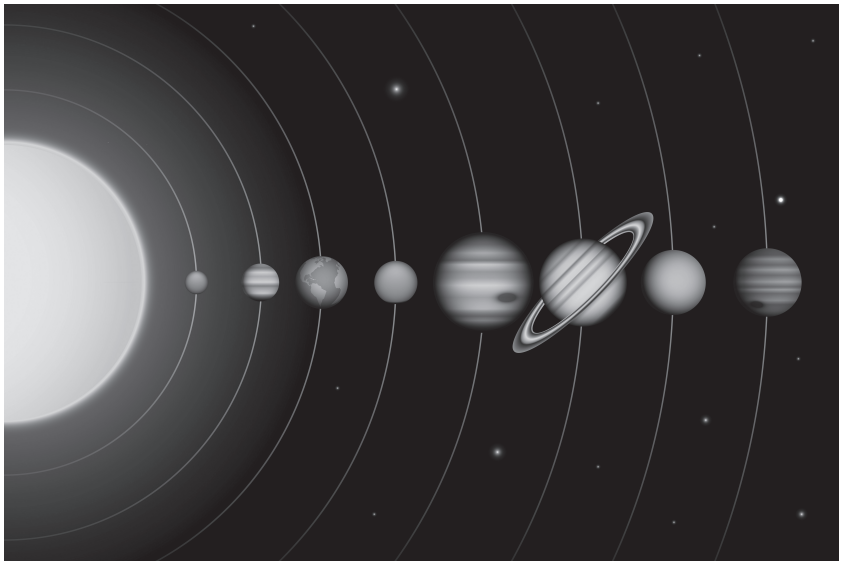
(Questions continue overleaf)

3 The diagram shows the planets in our Solar System.



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(a) State the name of:

the planet closest to the Sun;

_____

the planet furthest from the Sun;

_____

the **gas** planet closest to the Sun;

_____

the **rocky** planet furthest from the Sun.

_____

[4]

(b) Give the names of two objects other than planets that orbit the Sun.

_____

State why objects such as these remain in orbit.

_____ [3]

(c) Objects that orbit the Earth are called satellites.

What is an artificial satellite?

_____

State a major use of artificial satellites.

_____ [2]

4 **(a)** Some appliances use direct current (d.c.) and some use alternating current (a.c.).

(i) State what is meant by direct current (d.c.).

_____

Give a source of direct current in the home.

_____ [2]

(ii) State fully what is meant by alternating current (a.c.).

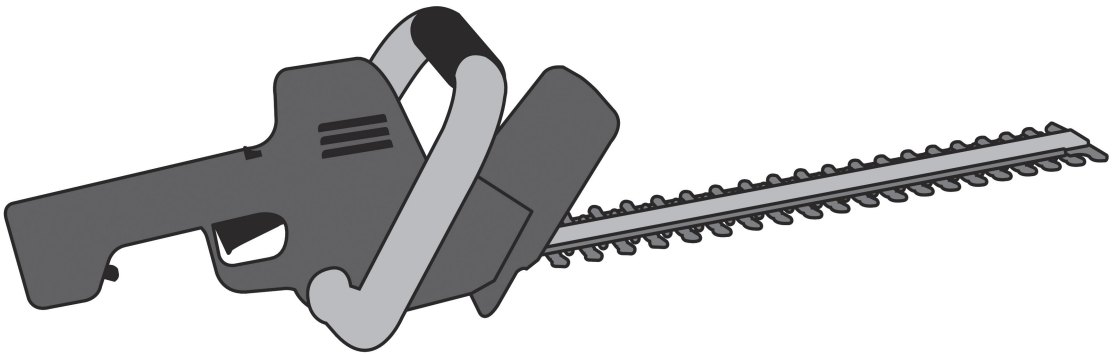
_____

_____

Give a source of alternating current in the home.

_____ [3]

A gardener spent 30 minutes cutting a hedge using a battery-powered hedge trimmer.



© Getty Images

(b) The hedge trimmer has a power of 72 W.

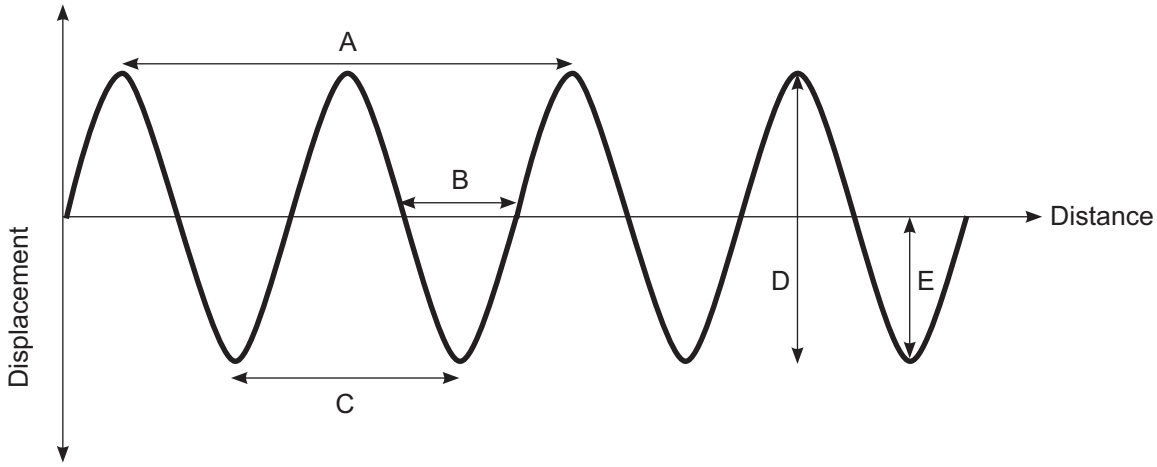
Calculate the energy used by the hedge trimmer for the 30 minutes it takes the gardener to cut the hedge.

You are advised to show your working out.

Energy = _____ J [4]

[Turn over

5 **(a)** Use the information on the wave below to state its amplitude and wavelength.



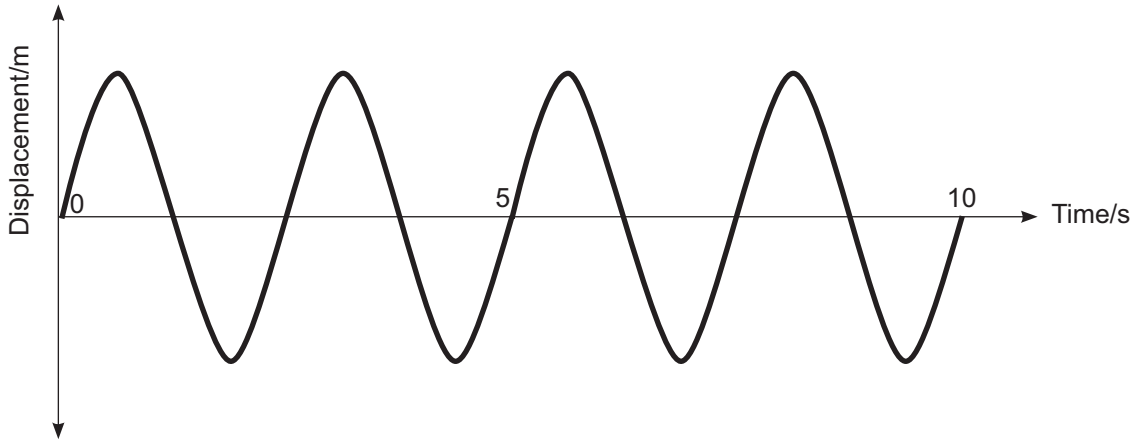
Which letter (A, B, C, D or E) represents the amplitude of the wave?

_____

Which letter (A, B, C, D or E) represents the wavelength of the wave?

_____ [2]

A graph representing a wave is shown below.



(b) Use the information on the graph above to calculate the frequency of the wave.

You are advised to show your working out.

Frequency = _____ Hz [3]

[Turn over

A radio wave transmitter gives out a signal for the local radio station.

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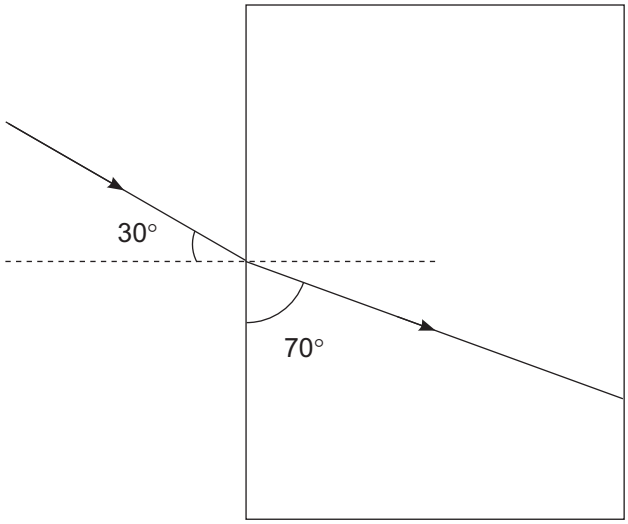
(c) If radio waves have a velocity of 3×10^8 m/s and the frequency of the wave is 3×10^4 Hz, calculate the wavelength of the radio wave.

You are advised to show your working out.

Wavelength = _____ m [3]

6 A student directs a ray of light through a glass block.



(a) What is the angle of incidence?

Angle of incidence = _____ °

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

Angle of refraction = _____ ° [2]

(b) Complete the diagram above to show what happens to the ray of light as it leaves the glass block. [2]

(c) What happens to the speed of light as it leaves the glass block?

_____ [1]

[Turn over

7 **(a)** Define the focal length of a converging lens.

_____

_____

_____ [3]

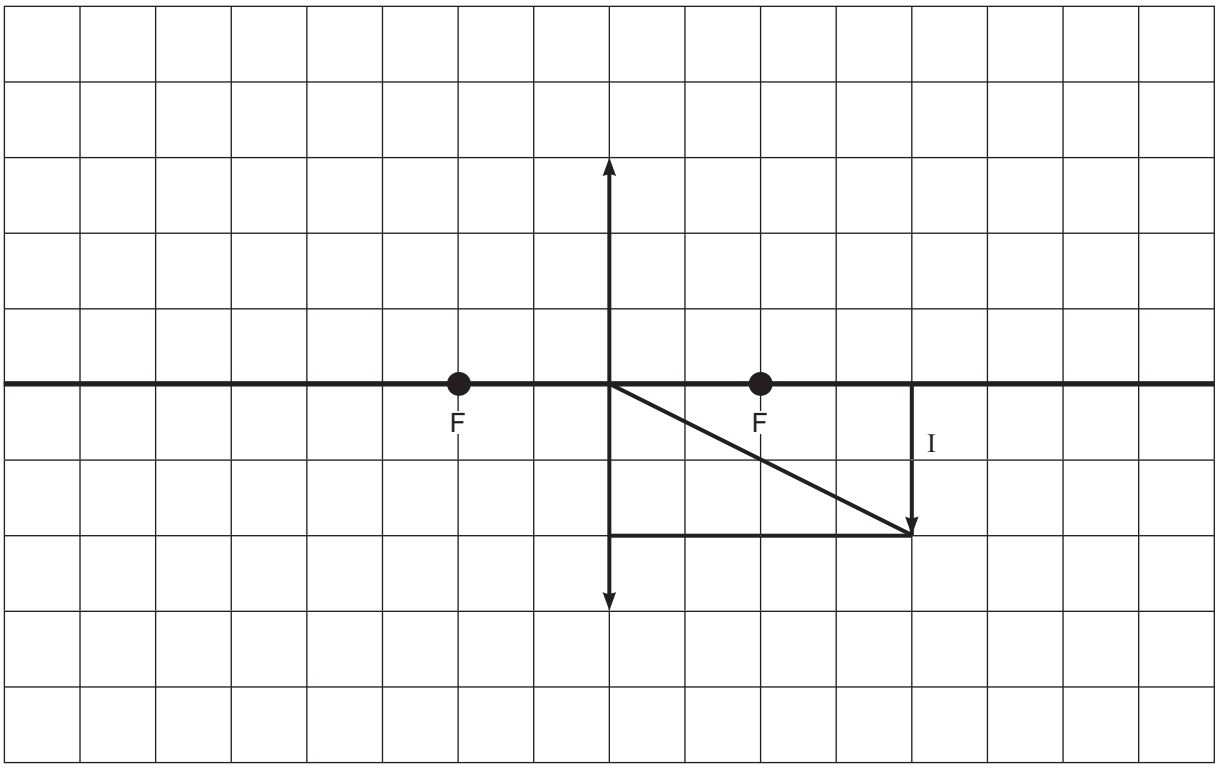
(b) **(i)** The diagram below shows an image, I, that has been formed when light from an object has passed through a converging lens.

Each point F represents a principal focus.

Complete the diagram below to show the position of the **original object**.

- trace **backwards** the two rays shown, from the tip of the image, I, that would have come from the tip of the object;
- include arrows to show the direction of these two rays that formed the image; and
- mark the object that produced the image. [4]

Note: Each square represents 1 cm × 1 cm



(ii) What is the height of the object?

Height = _____ cm [1]

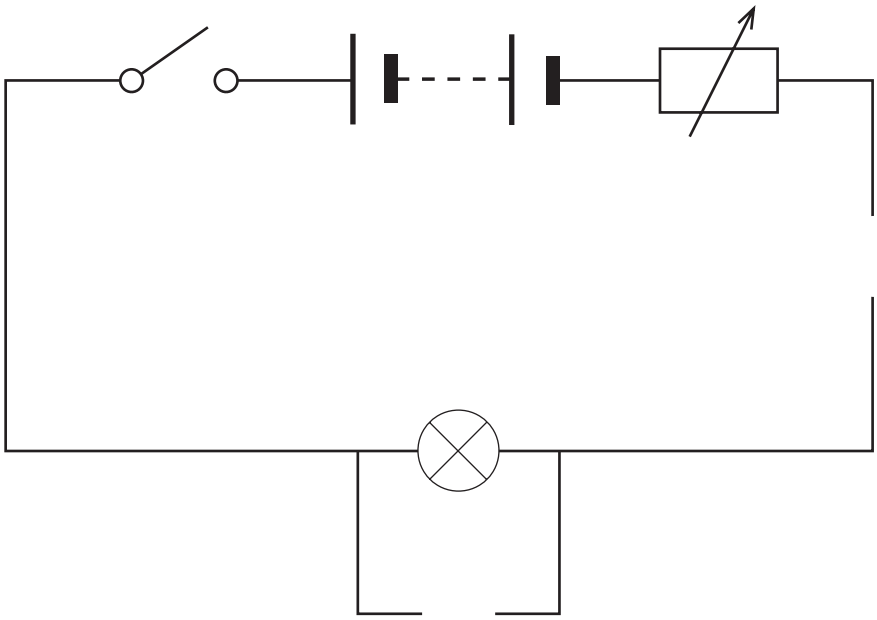
(iii) The image in the ray diagram is real.

What do you understand by a real image?

_____ [1]

[Turn over

8 A student wants to investigate how the current through a filament lamp depends on the voltage across it. The student starts to draw the circuit diagram but leaves out two symbols.



(i) Complete the circuit diagram above to include the two missing components.

What is the purpose of the variable resistor?

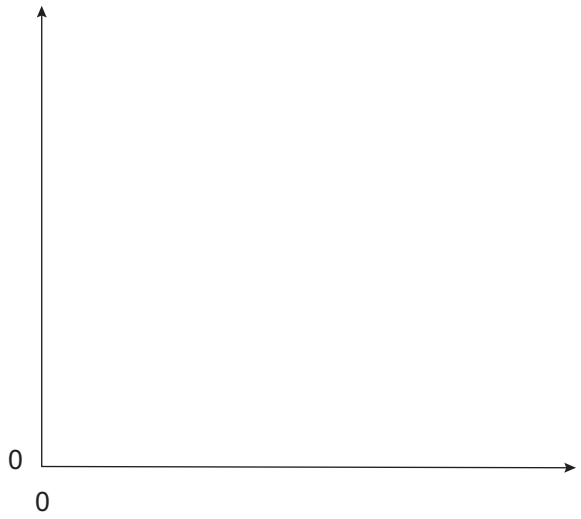
_____

_____ [3]

The voltage–current characteristic graph is to be plotted.

(ii) Label the axes of the graph on which the characteristic would be plotted.

Draw the shape of the graph you would expect the student to obtain.



[4]

(iii) How does the resistance of a filament lamp change when the current through it increases?

_____ [1]

[Turn over

9 A student connects a power supply to an electromagnet.

The electromagnet consists of wire wrapped around a soft iron core.
A current flows through the wire.

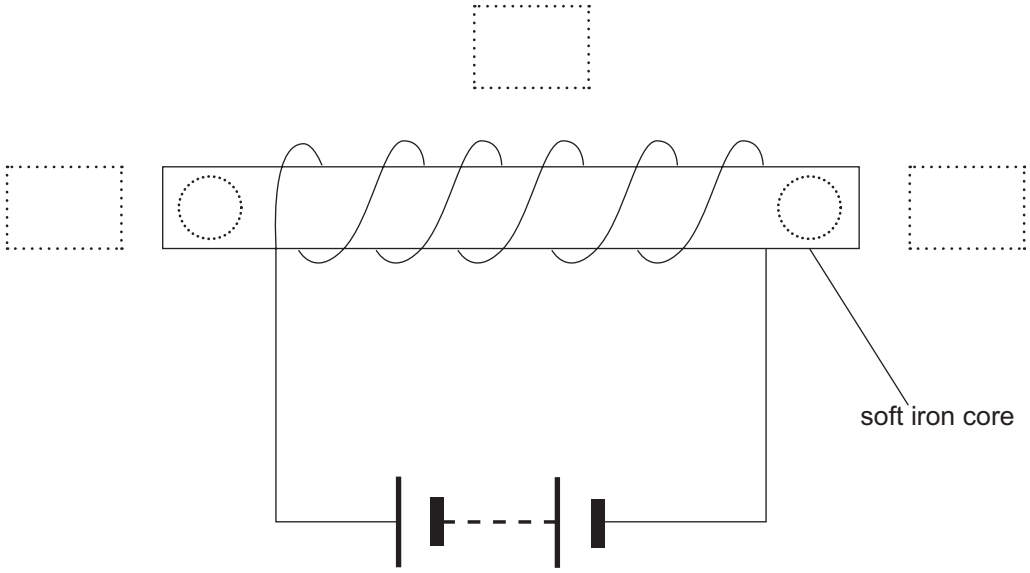
(a) State 3 ways to **decrease** the strength of this electromagnet.

1. _____

2. _____

3. _____ [3]

The diagram below shows the electromagnet.



(b) **(i)** In the **dotted circles on the soft iron core**, mark the north (**N**) and south (**S**) poles of the electromagnet.

Draw an arrow in each of the 3 dotted **boxes** to show the direction of the magnetic field at these places around the electromagnet. [4]

(ii) What piece of equipment could you use to show the direction of the magnetic field around the electromagnet?

_____ [1]

10 **(a)** What do we call the event that formed the universe?

_____

How many years ago was the universe formed?

_____ [2]

After this event there was rapid expansion and cooling.

(b) **(i)** Name the two particles formed as the universe **initially** cooled.

_____ and _____ [2]

After these initial particles were formed the universe continued to expand. Further cooling allowed new particles to form.

(ii) What was the next particle to form after this further expansion and cooling?

_____ [1]

Eventually, as the expansion continued, the temperature dropped so much that elements began to form.

(iii) Name the first element to form in the universe.

_____ [1]

(c) Apart from red-shift, give one piece of evidence to explain how the universe was formed.

_____ [1]

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For Examiner's use only	
Question Number	Marks
1	
2	
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Total Marks	

Examiner Number

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