TUTOR ZONE

Name

Percentage	
Grade	

GCSE Physics

Magnets

Duration: 50 mins

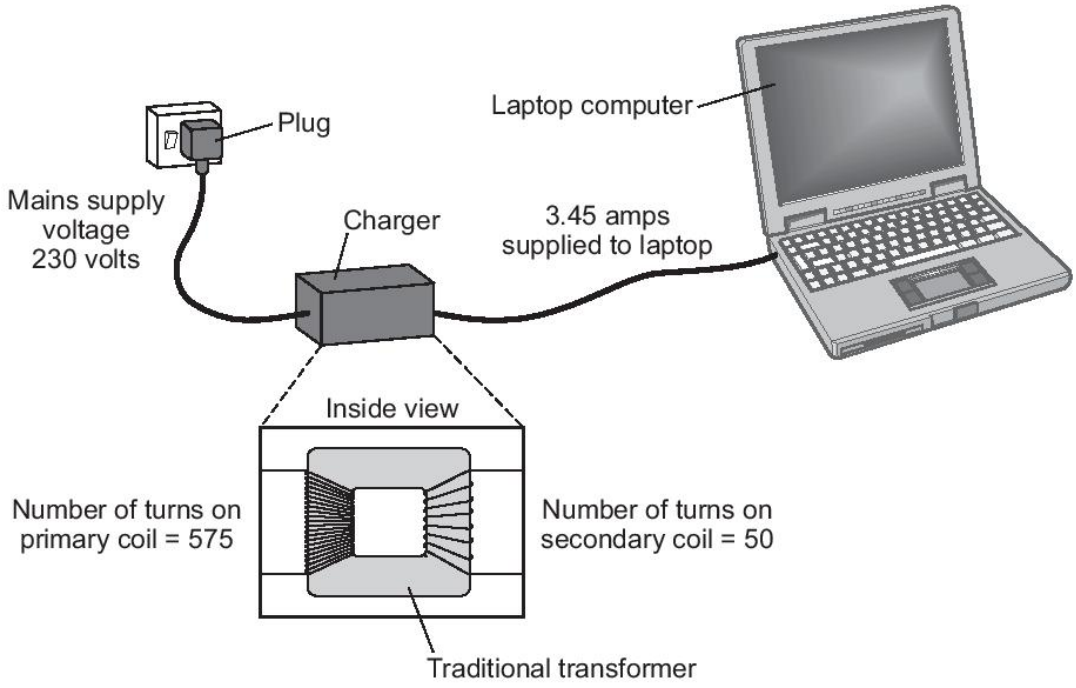
Total Marks: 51

Information for Candidates:

- Use black or blue ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional paper is used, the question number(s) must be clearly shown
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

Do not write in this table	
Question	Mark
TOTAL	

7 Batteries inside laptop computers are charged using laptop chargers. The laptop charger contains a traditional transformer.



7 (a) The alternating current flowing through the primary coil of the transformer creates an alternating current in the secondary coil.

Explain how.

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(3 marks)

7 (b) (i) Use information from the diagram to calculate the potential difference the charger supplies to the laptop.

Use the correct equation from the Physics Equations Sheet.

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Potential difference = ... V

(2 marks)

7 (b) (ii) Calculate the current in the primary coil of the transformer when the laptop is being charged.

Assume the transformer is 100% efficient.

Use the correct equation from the Physics Equations Sheet.

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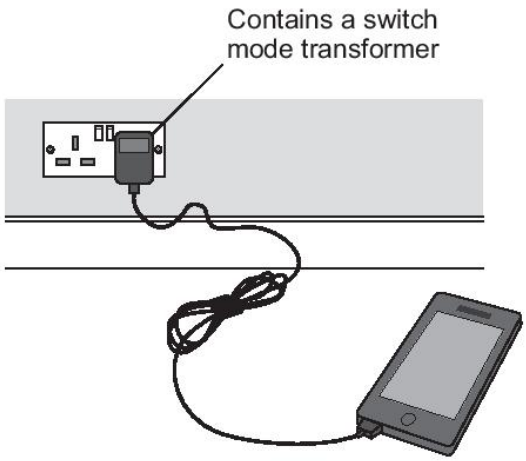
Current = ... A

(2 marks)

Question 7 continues on the next page

7 (c) Switch mode transformers can be used in mobile phone chargers.



Switch mode transformers and traditional transformers can both use the UK mains supply.

The switch mode transformer is smaller and lighter than the traditional transformer used in the laptop charger.

Give **one** other advantage of the switch mode transformer.

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(1 mark)

7 (d) Laptop batteries and mobile phone batteries can only be recharged a limited number of times. After this, the batteries cannot store enough charge to be useful. Scientists are developing new batteries that can be recharged many more times than existing batteries.

Suggest **one** other advantage of developing these new batteries.

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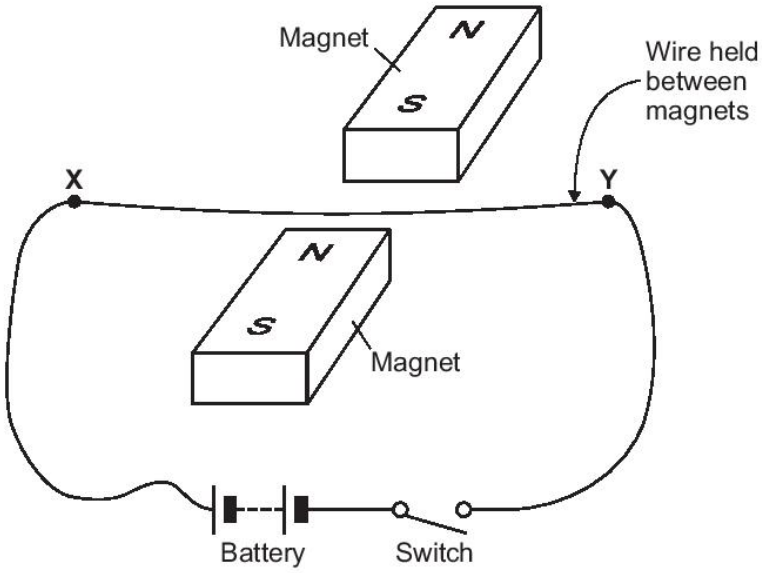
(1 mark)

9

END OF QUESTIONS

5 **Figure 10** shows apparatus set up by a student.

Figure 10



Closing the switch creates a force that acts on the wire **XY**.

5 (a) (i) Explain why a force acts on the wire **XY** when the switch is closed.

[3 marks]

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5 (a) (ii) The force causes the wire **XY** to move.
Draw an arrow on **Figure 10** to show the direction in which the wire **XY** will move.

[1 mark]

5 (a) (iii) State the effect that this experiment demonstrates.

[1 mark]

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5 (b) The student replaced the battery with a low frequency alternating current (a.c.) power supply.

The student closed the switch.

5 (b) (i) Describe the movement of the wire.

[1 mark]

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5 (b) (ii) Give a reason for your answer to part **(b)(i)**.

[1 mark]

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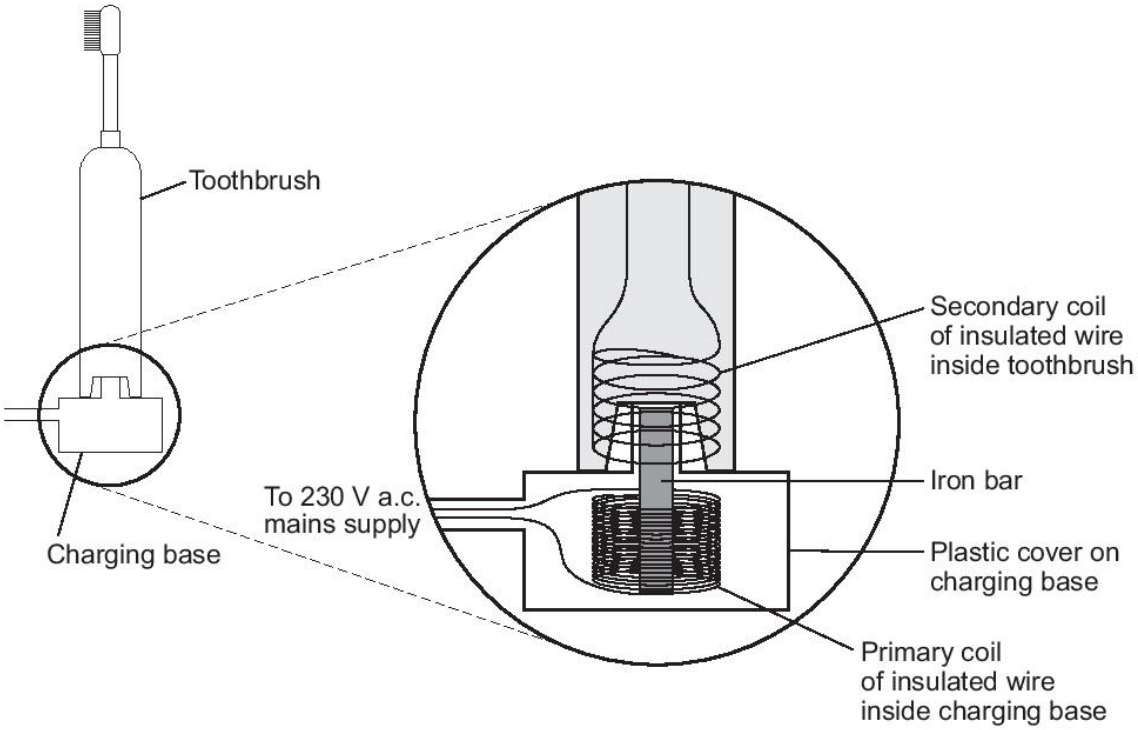
7

Turn over for the next question

8 An electric toothbrush is charged by standing it on a separate charging base. **Figure 15** shows the inside of the electric toothbrush and the charging base.

Figure 15



8 (a) An alternating potential difference (p.d.) across the coil in the charging base creates an alternating current in the coil inside the toothbrush.

Explain how.

[3 marks]

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8 (b) When the toothbrush is being charged, the p.d. across the primary coil in the charging base is 230 V.

The charging p.d. across the secondary coil in the toothbrush is 7.2 V.

The primary coil in the charging base has 575 turns of wire on its coil.

Calculate the number of turns on the secondary coil inside the toothbrush.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

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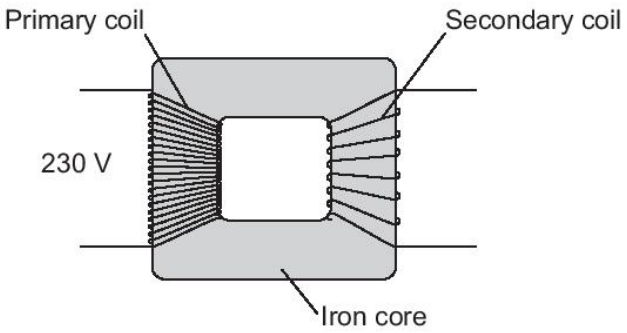
Number of turns on the secondary coil = ...

5

END OF QUESTIONS

2 **Figure 2** shows the structure of a traditional transformer.

Figure 2



2 (a) There is an alternating current in the primary coil of the transformer.

State what is produced in the iron core.

[2 marks]

_____

_____

2 (b) A transformer has only **one** turn of wire on the secondary coil.
The potential difference across the secondary coil is 11.5 V
The potential difference across the primary coil is 230 V

Calculate the number of turns on the primary coil.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

_____

_____

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Number of turns on the primary coil = _____

Question 2 continues on the next page

2 (c) In most transformers, the power output is less than the power input.

State why.

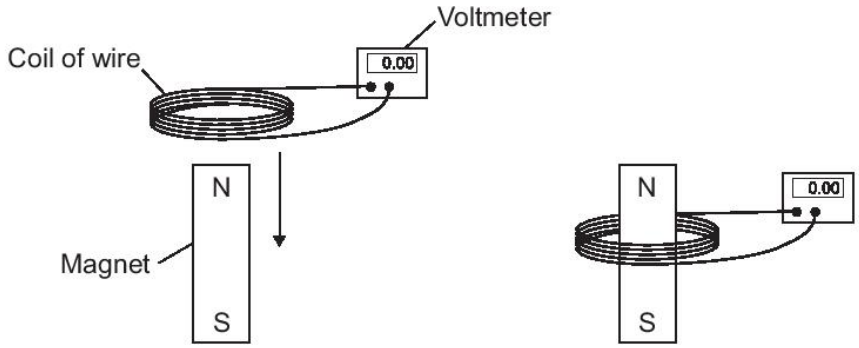
[1 mark]

_____

_____

2 (d) Two students investigated how magnets can be used to produce a potential difference. The students held a coil of wire above a magnet. The students quickly lowered the coil so that the magnet was inside the coil, as shown in **Figure 3**.

Figure 3



The students recorded the maximum potential difference for coils with different numbers of turns of wire. The results are shown in **Table 1**.

Table 1

Number of turns of wire in the coil	Maximum potential difference in volts	
	Results from student 1	Results from student 2
5	0.09	0.08
10	0.20	0.15
15	0.31	0.25
20	0.39	0.33
25	0.51	0.39

2 (d) (i) State the resolution of the voltmeter.

Give **one** reason why the resolution of the voltmeter is suitable for this investigation.

[2 marks]

Resolution _____

Reason _____

_____

2 (d) (ii) The two students used exactly the same equipment to carry out their investigations. Both students recorded their results correctly.

Give the reason why student 2 got different results from student 1.

[1 mark]

_____

_____

2 (d) (iii) The students decided that even though the results were different, there was no need to repeat the investigation.

How do the results show that the investigation is reproducible?

[1 mark]

_____

_____

2 (d) (iv) State the name of the process which causes the potential difference to be produced in this investigation.

[1 mark]

_____

2 (e) A transformer has been developed that can be used with many different devices.

Suggest **one** advantage of having a transformer that can be used with many different devices.

[1 mark]

_____

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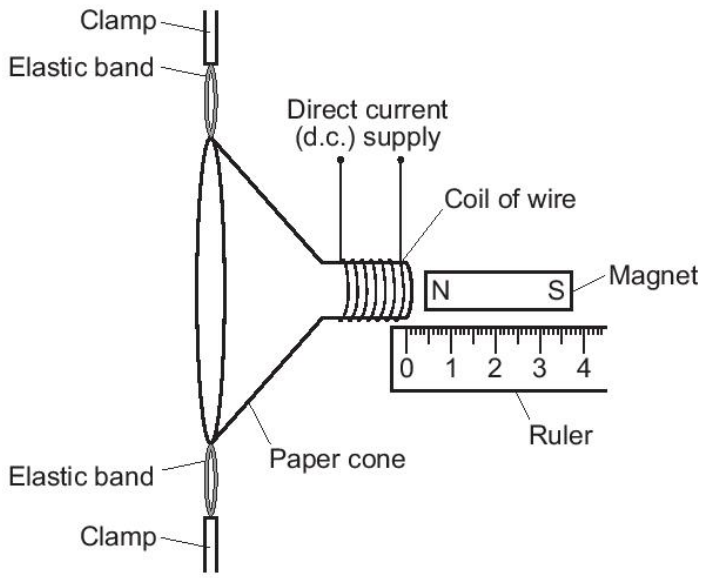
11

Answer **all** questions in the spaces provided.

1 **Figure 1** shows a loudspeaker made by a student. When there is a current in the coil the paper cone moves.

Figure 1



The student investigates how changing the size of the current in the coil of wire affects the distance moved by the paper cone.

1 (a) State **two** variables the student should control.

[2 marks]

1 _____

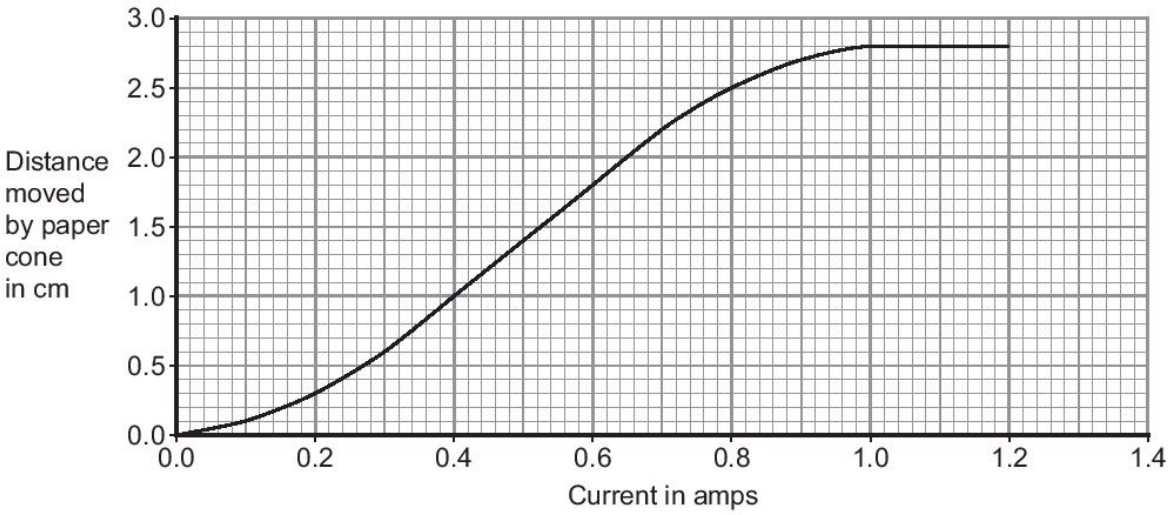
_____

2 _____

_____

1 (b) The results of the student's investigation are shown in **Figure 2**.

Figure 2



1 (b) (i) When the current increases from 0.5 A to 0.9 A, how much does the distance moved increase?

[2 marks]

_____

Increase in distance moved = _____ cm

1 (b) (ii) State **two** conclusions that can be made from the graph.

[2 marks]

1 _____

_____

2 _____

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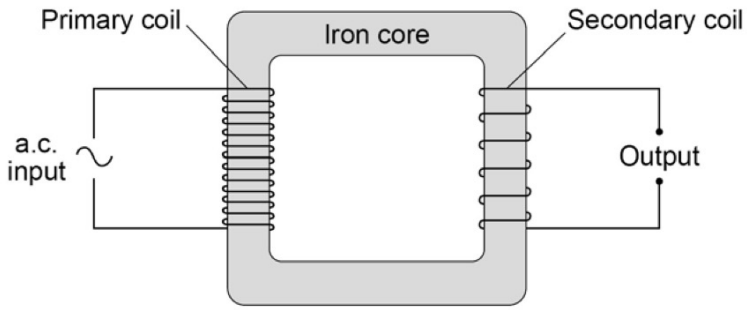
6

Turn over ▶

0 6 **Figure 12** shows the construction of a simple transformer.

Figure 12



0 6 . 1 Why is iron a suitable material for the core of a transformer?

[1 mark]

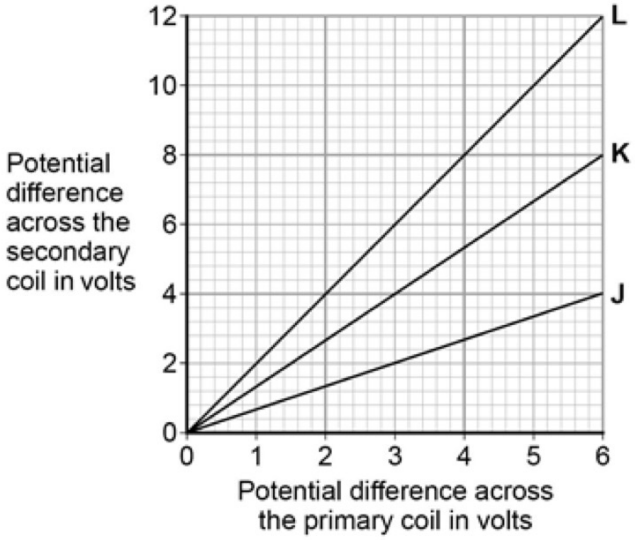
Tick **one** box.

- It is a metal. ☐
- It will not get hot. ☐
- It is easily magnetised. ☐
- It is an electrical conductor. ☐

A student makes three simple transformers, **J**, **K** and **L**.

Figure 13 shows how the potential difference across the secondary coil of each transformer varies as the potential difference across the primary coil of each transformer is changed.

Figure 13



0 6 . 2 How can you tell that transformer **J** is a step-down transformer?

[1 mark]

0 6 . 3 Each of the transformers has 50 turns on the primary coil.

Calculate the number of turns on the secondary coil of transformer **L**.

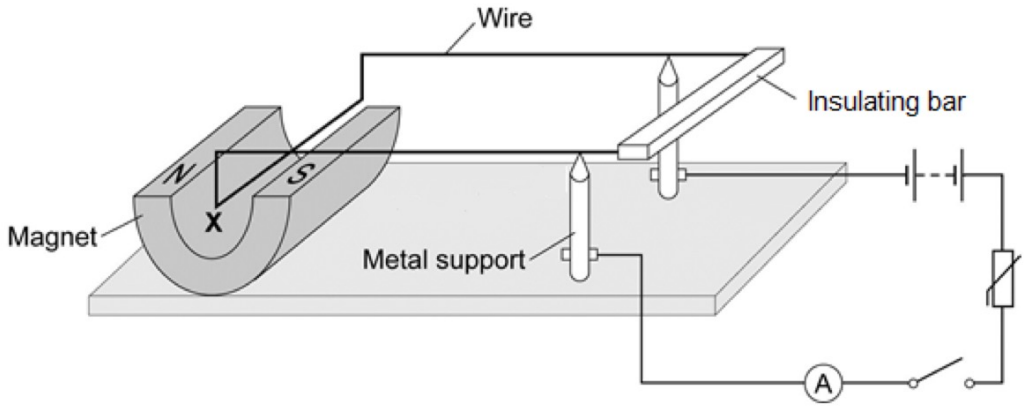
Use the correct equation from the Physics Equations Sheet.

[3 marks]

Number of turns on the secondary coil = _____

1 2 **Figure 20** shows a piece of apparatus called a current balance.

Figure 20



When the switch is closed, the part of the wire labelled **X** experiences a force and moves downwards.

1 2 . 1 What is the name of the effect that causes the wire **X** to move downwards?

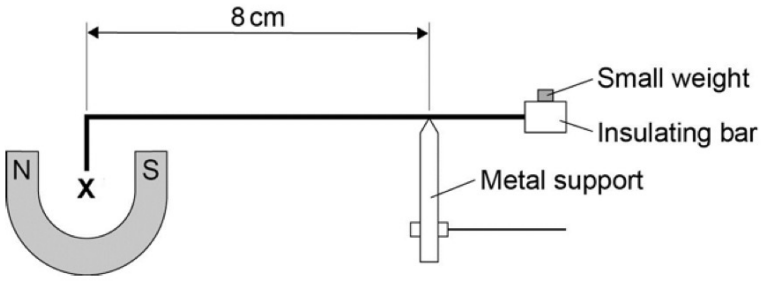
[1 mark]

1 2 . 2 Suggest one change you could make to the apparatus in **Figure 20** that would increase the size of the force that wire **X** experiences.

[1 mark]

Figure 21 shows how a small weight placed on the insulating bar makes the wire **X** go back and balance in its original position.

Figure 21



1 2 . 3 The wire **X** is 5 cm long and carries a current of 1.5 A.

The small weight causes a clockwise moment of 4.8×10^{-4} Nm.

Calculate the magnetic flux density where the wire **X** is positioned

Give the unit.

[6 marks]

Magnetic flux density = _____ Unit _____

END OF QUESTIONS