

Name:

Date:

P7 - Test 2  
MAGNETISM  
Beginner

**GCSE**

**PHYSICS**

**AQA - Triple Science**

Mark

Grade

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### Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

### Instructions

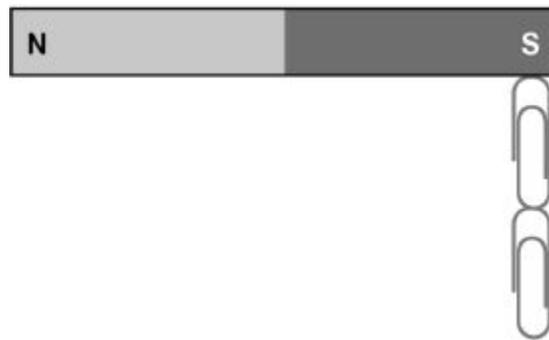
- Answer all questions
- Answer questions in the space provided
- All working must be shown

### Information

- The marks for the questions are shown in brackets

1. **Figure 1** shows two paper clips hanging from a bar magnet.

**Figure 1**



The paper clips have become magnetised.

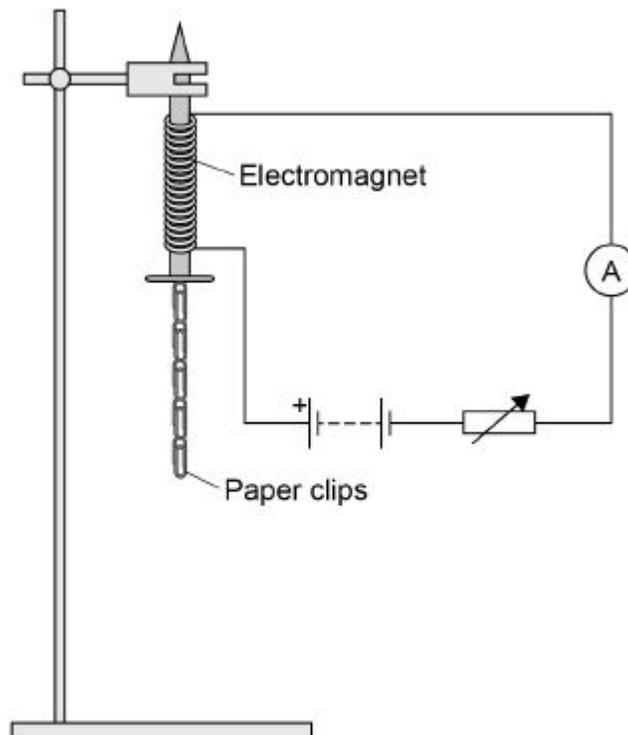
(a) Label the north and south poles of both paper clips.

(1)

A student investigated how the number of turns of wire on an electromagnet affects the strength of the electromagnet.

**Figure 2** shows the equipment used by the student. Throughout the investigation the student kept the current through the wire constant.

**Figure 2**



- (b) The student measured the strength of the electromagnet by counting the number of paper clips the electromagnet could hold.

Explain why it was important that the paper clips were all the same size.

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(2)

The table below shows the student's results.

<b>Number of turns of wire on the electromagnet</b>	<b>Number of paper clips held</b>
10	3
20	6
30	9
40	12

- (c) Describe the pattern shown in the table.

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(2)

(d) The student then used 50 turns of wire on the electromagnet.

The electromagnet picked up 18 paper clips. This was more paper clips than the student had expected.

Which **one** is the most likely cause of this result?

Tick **one** box.

The paper clips used with 50 turns were larger than the others.

There were less than 50 turns of wire on the electromagnet.

Some of the paper clips were already magnetised.

(1)

(e) The student repeated the measurement for 50 turns of wire three more times.

This gave her the following set of results.

18      16      14      15

Explain what the student should now do with the **four** results for 50 turns of wire.

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(3)

(f) The student wrote the hypothesis:

'Increasing the current through the wire will make the electromagnet stronger.'

Describe how the student should change the investigation to test this hypothesis.

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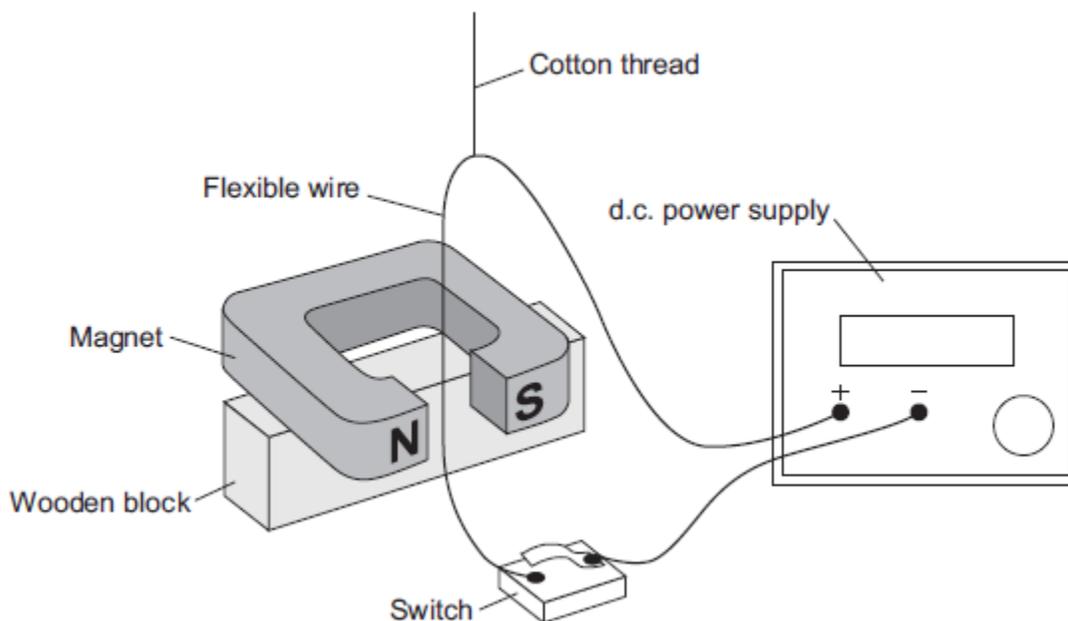
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(3)  
(Total 12 marks)

2. The diagram shows a demonstration carried out by a teacher.



When the switch is closed, there is a current of 2 A through the wire. The wire experiences a force and moves.

(a) Use the correct word from the box to complete the sentence.

<b>generator</b>	<b>motor</b>	<b>transformer</b>
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The demonstration shows the \_\_\_\_\_ effect.

(1)

(b) State **two** changes that the teacher could make to the demonstration, each of which would increase the force on the wire. The teacher does not touch the wire.

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

(2)

(c) State **one** change that the teacher could make to the demonstration to change the direction of the force on the wire.

\_\_\_\_\_

\_\_\_\_\_

(1)

(d) With the switch closed, the teacher changes the position of the wire so that the force on the wire is zero.

What is the position of the wire?

Tick (✓) **one** box.

The wire is at  $90^\circ$  to the direction of the magnetic field.

The wire is at  $45^\circ$  to the direction of the magnetic field.

The wire is parallel to the direction of the magnetic field.

(1)

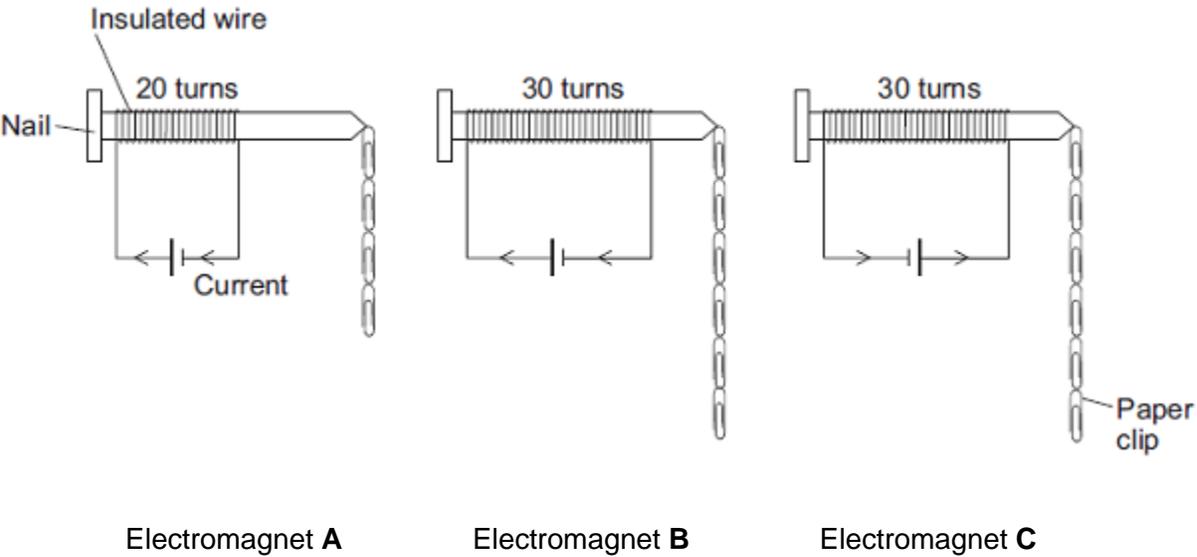
(Total 5 marks)

**3.** A student is investigating the strength of electromagnets.

**Figure 1** shows three electromagnets.

The student hung a line of paper clips from each electromagnet.

**Figure 1**



No more paper clips can be hung from the bottom of each line of paper clips.

(a) (i) Complete the conclusion that the student should make from this investigation.

Increasing the number of turns of wire wrapped around the nail will  
\_\_\_\_\_ the strength of the electromagnet.

(1)

(ii) Which **two** pairs of electromagnets should be compared to make this conclusion?

**Pair 1:** Electromagnets \_\_\_\_\_ and \_\_\_\_\_

**Pair 2:** Electromagnets \_\_\_\_\_ and \_\_\_\_\_

(1)

(iii) Suggest **two** variables that the student should control in this investigation.

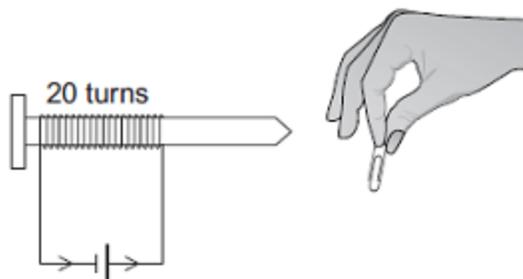
1. \_\_\_\_\_

2. \_\_\_\_\_

(2)

- (b) The cell in electromagnet **A** is swapped around to make the current flow in the opposite direction. This is shown in **Figure 2**.

**Figure 2**



What is the maximum number of paper clips that can now be hung in a line from this electromagnet?

Draw a ring around the correct answer.

**fewer than 4                      4                      more than 4**

Give **one** reason for your answer.

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**(2)**

- (c) Electromagnet **A** is changed to have only 10 turns of wire wrapped around the nail.

Suggest the maximum number of paper clips that could be hung in a line from the end of this electromagnet.

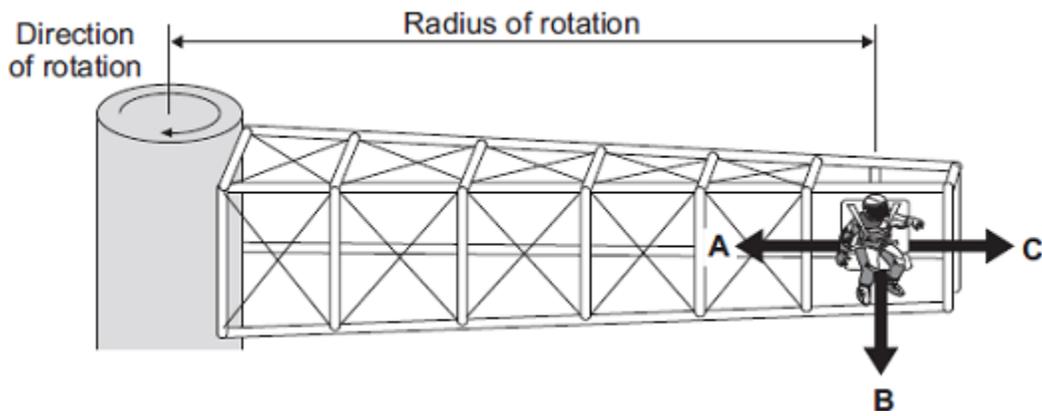
Maximum number of paper clips = \_\_\_\_\_

**(1)**

**(Total 7 marks)**

4.

The diagram shows a 'G-machine'. The G-machine is used in astronaut training.

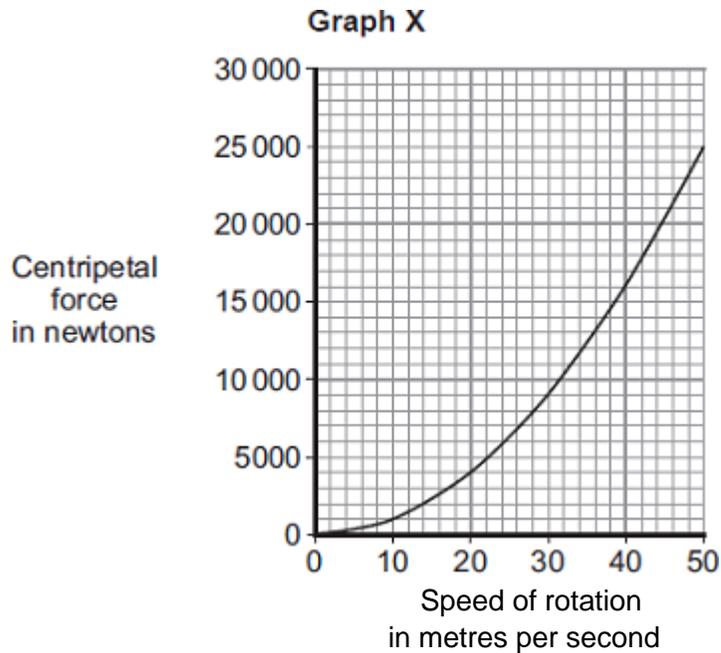


The G-machine moves the astronaut in a horizontal circle.

Force A is known as the **centripetal** force acting on the astronaut

(a) The centripetal force on the astronaut is measured.

**Graph X** shows how the centripetal force is affected by the speed of rotation. The radius of rotation is kept the same.



(i) Use **Graph X** to determine the centripetal force on the astronaut when rotating at a speed of 30 metres per second.

Centripetal force = \_\_\_\_\_ newtons

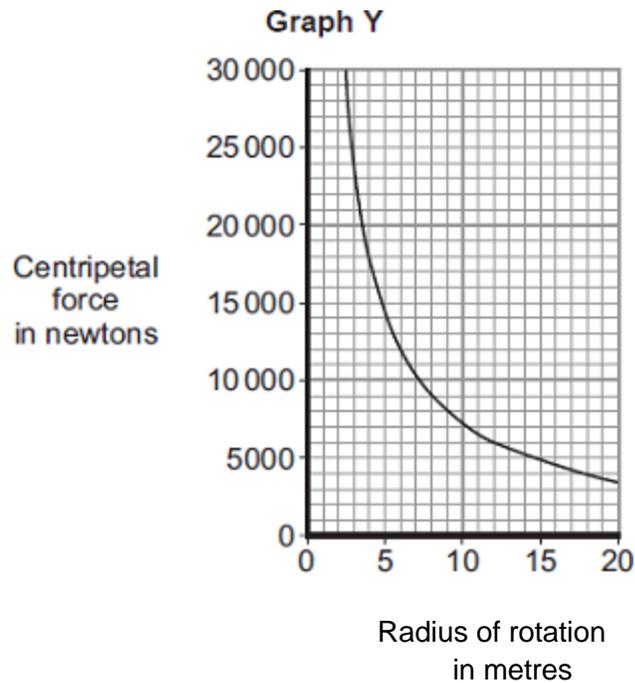
(1)

- (ii) Complete the following sentence to give the conclusion that can be made from **Graph X**.

Increasing the speed of rotation of a G-machine will \_\_\_\_\_  
the centripetal force on the astronaut.

(1)

- (iii) **Graph Y** shows how the centripetal force is affected by the radius of rotation, when the speed of rotation is kept the same.

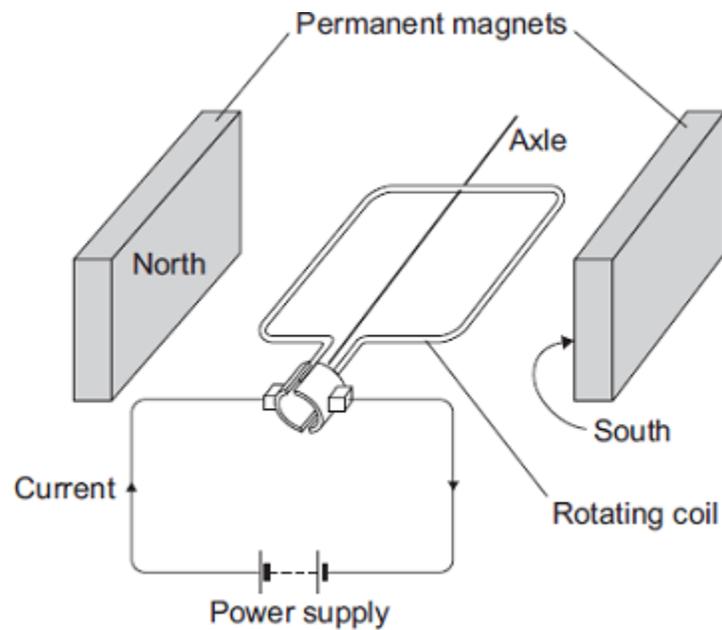


Complete the following sentence to give the conclusion that can be made from **Graph Y**.

The greater the radius of rotation, the \_\_\_\_\_ the  
centripetal force on the astronaut.

(1)

(b) The G-machine is rotated by an electric motor. The diagram shows a simple electric motor.



The following statements explain how the motor creates a turning force. The statements are in the wrong order.

- M** – The magnetic field interacts with the magnetic field of the permanent magnets.
- N** – A magnetic field is created around the coil.
- O** – The power supply applies a potential difference across the coil.
- P** – This creates a force that makes the coil spin.
- Q** – A current flows through the coil.

Arrange the statements in the correct order. Two of them have been done for you.



(2)

(c) The electric motor produces a turning force.

Give **two** ways of increasing the turning force.

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_

(2)

(d) Draw a ring around the correct answer to complete the sentence.

It costs a lot of money to send astronauts into space.

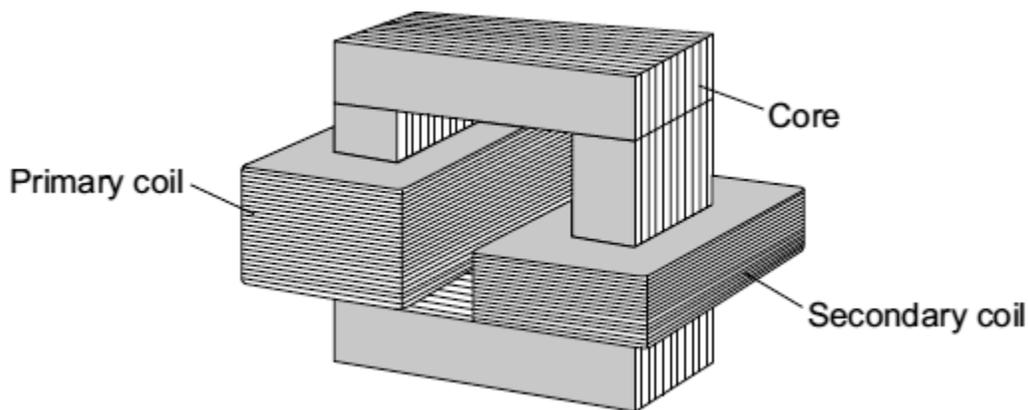
This is 

an economic
an environmental
a social

 issue.

(1)  
(Total 8 marks)

**5.** A teacher demonstrates a small transformer.



(a) (i) What is the core made of?

Draw a ring around the correct word in the box.

aluminium	copper	iron
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(1)

(ii) The potential difference (p.d.) across the secondary coil is less than the p.d. across the primary coil.

What sort of transformer is it?

\_\_\_\_\_

(1)

(b) Where is a step-up transformer used as part of the National Grid?

\_\_\_\_\_

(1)

(c) The teacher writes a note about the transformer but leaves **five** spaces.

Use the correct words from the box to complete the spaces.

<b>coil</b>	<b>core</b>	<b>current</b>	<b>ends</b>	<b>field</b>	<b>wire</b>
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A transformer works because an alternating \_\_\_\_\_ in the primary \_\_\_\_\_ produces a changing magnetic \_\_\_\_\_ in the \_\_\_\_\_ and then in the secondary coil.

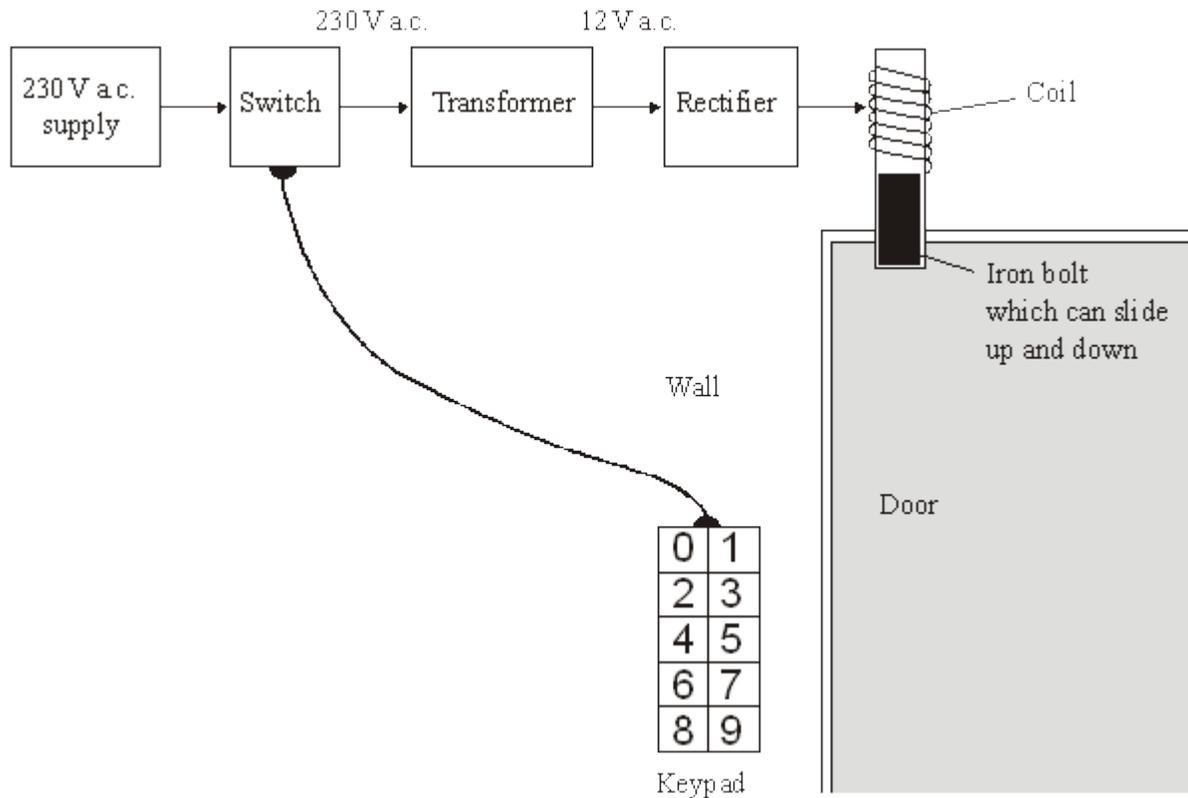
This induces an alternating potential difference across the \_\_\_\_\_ of the secondary coil.

(5)  
(Total 8 marks)

6.

The diagram shows the design for a remotely controlled door bolt.

When the correct numbers are entered into the keypad the transformer switches on. Then the door can be opened.



(a) What kind of transformer is shown in the diagram?

\_\_\_\_\_

(1)

(b) What does the abbreviation a.c. stand for?

\_\_\_\_\_

(1)

(c) Complete the sentences using the correct words from the box.

<b>attracts</b>	<b>downwards</b>	<b>magnet</b>	<b>reflects</b>	<b>repels</b>
<b>sideways</b>	<b>switch</b>	<b>transformer</b>	<b>upwards</b>	

(i) When a current flows in the coil, the coil becomes a \_\_\_\_\_ .

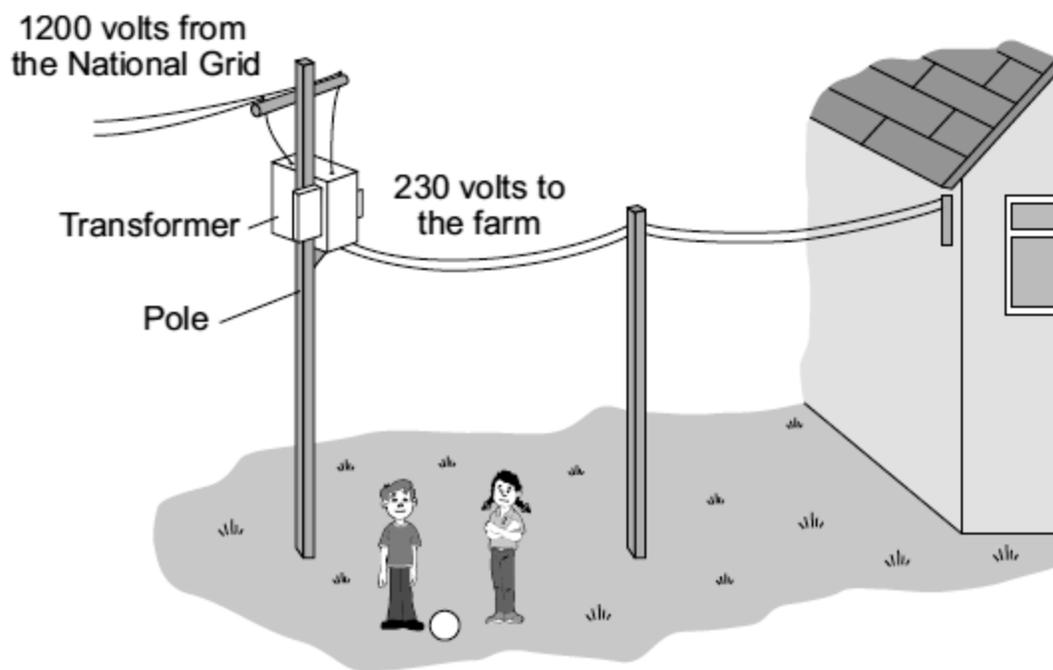
(ii) The coil \_\_\_\_\_ the iron bolt which moves \_\_\_\_\_

(3)

(Total 5 marks)

7.

The diagram shows part of the system used to supply a farm with electricity.



(a) The core of the transformer is made of metal.

Complete the following sentence by drawing a ring around the correct word in the box.

The metal used for the core of the transformer is

copper.
iron.
steel.

(1)

(b) (i) What sort of transformer is shown in the diagram?

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(1)

(ii) Complete the following sentence by drawing a ring around the correct line in the box.

In this transformer, the number of turns on the secondary coil is

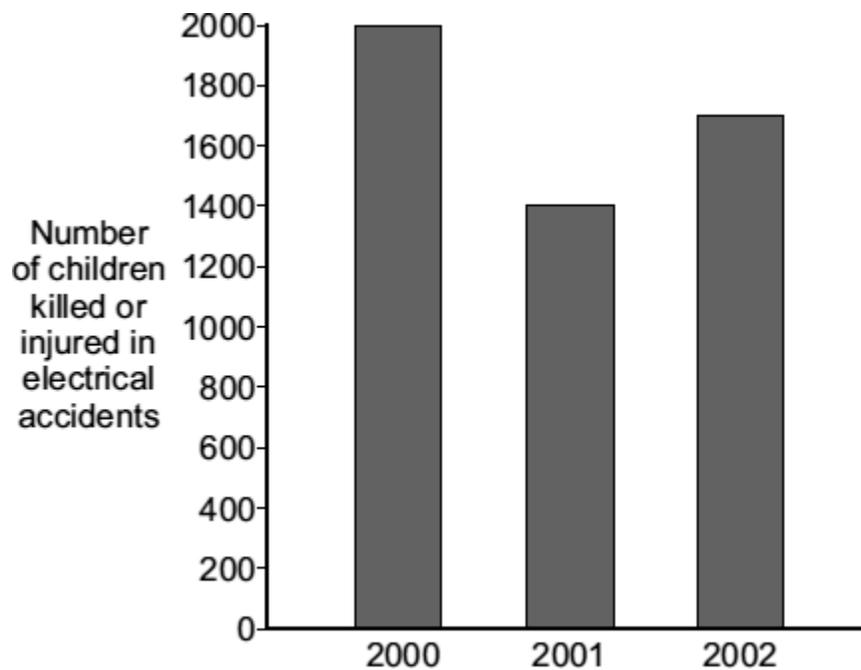
less than
the same as
greater than

the number of turns on the primary coil.

(1)

(c) Transformers and other electrical equipment can be dangerous.

The following bar chart shows the numbers of children, aged 14 or under, killed or injured in electrical accidents in the UK in 2000, 2001 and 2002.



(i) In which of these years were most children killed or injured in electrical accidents?

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(1)

- (ii) A newspaper claims that the number of children killed or injured by electrical accidents will increase in 2011.

Which of the following gives a reason why the information given in the graph does not support this claim.

Put a tick (✓) in the box next to your answer.

The pattern shows an upward trend.

The pattern shows a downward trend.

There is no pattern.

**(1)**  
**(Total 5 marks)**