

Name:

Date:

P7 - Test 1
MAGNETISM
Beginner

GCSE

PHYSICS

AQA - Triple Science

Mark

Grade

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

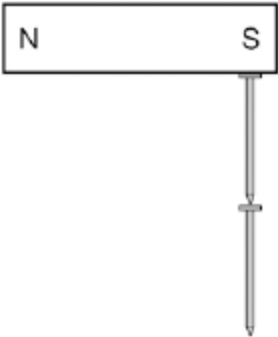
- The marks for the questions are shown in brackets

1.

Figure 1 shows two iron nails hanging from a bar magnet.

The iron nails which were unmagnetised are now magnetised.

Figure 1



(a) Complete the sentence.

Use a word from the box.

forced	induced	permanent
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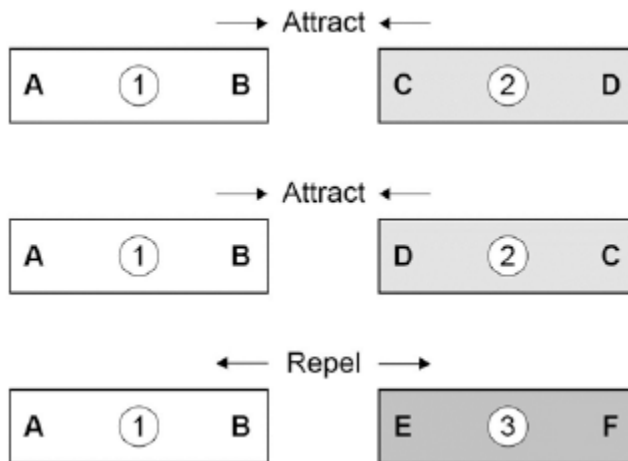
The iron nails have become _____ magnets.

(1)

- (b) Each of the three metal bars in **Figure 2** is either a bar magnet or a piece of unmagnetised iron.

The forces that act between the bars when different ends are placed close together are shown by the arrows.

Figure 2



Which **one** of the metal bars is a piece of unmagnetised iron?

Tick **one** box.

Bar 1

Bar 2

Bar 3

Give the reason for your answer.

(2)

- (c) A student investigated the strength of different fridge magnets by putting small sheets of paper between each magnet and the fridge door.

The student measured the maximum number of sheets of paper that each magnet was able to hold in place.

Why was it important that each small sheet of paper had the same thickness?

(1)

- (d) Before starting the investigation the student wrote the following hypothesis:

'The bigger the area of a fridge magnet the stronger the magnet will be.'

The student's results are given in the table below.

Fridge magnet	Area of magnet in mm ²	Number of sheets of paper held
A	40	20
B	110	16
C	250	6
D	340	8
E	1350	4

Give **one** reason why the results from the investigation **do not** support the student's hypothesis.

(1)

(Total 5 marks)

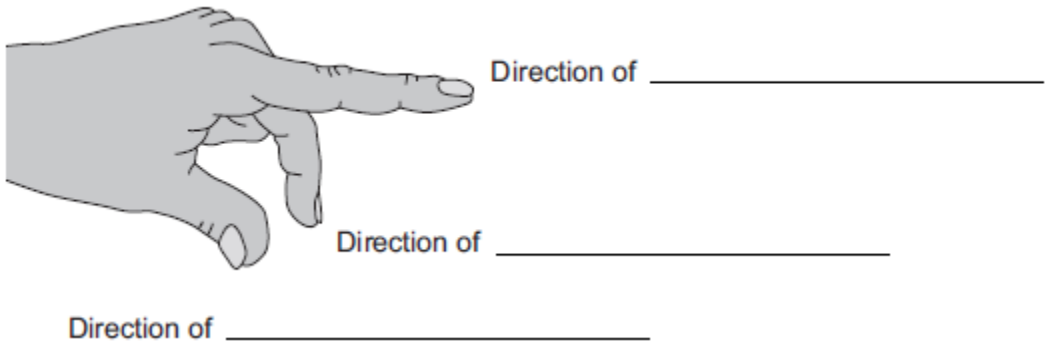
2.

The left-hand rule can be used to identify the direction of the force acting on a current-carrying conductor in a magnetic field.

(a) Use words from the box to label **Figure 1**.

current	field	force	potential difference
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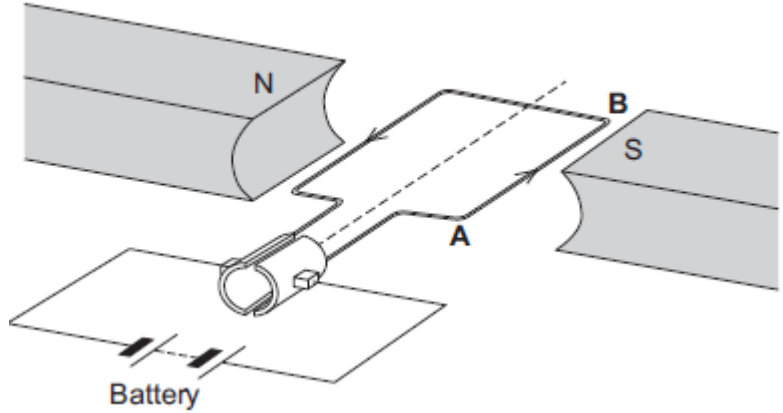
Figure 1



(3)

(b) **Figure 2** shows an electric motor.

Figure 2



(i) Draw an arrow on **Figure 2** to show the direction of the force acting on the wire **AB**.

(1)

(ii) Suggest **two** changes that would increase the force acting on the wire **AB**.

- 1. _____
- 2. _____

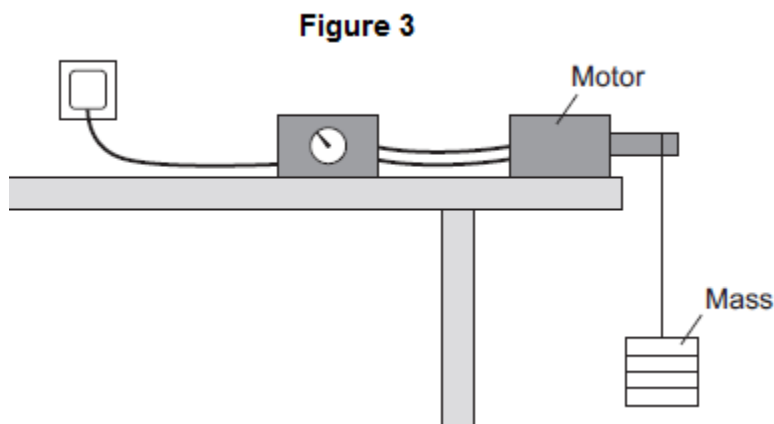
(2)

(iii) Suggest **two** changes that would reverse the direction of the force acting on the wire **AB**.

- 1. _____
- 2. _____

(2)

(c) A student used an electric motor to lift a mass. This is shown in **Figure 3**.



The student varied the electrical input power to the motor. For each different electrical input power, he recorded the time taken to lift the mass and calculated the output power of the motor.

The results are shown in the table.

Test	Electrical input power in watts	Work done lifting the mass in joules	Time taken to lift the mass in seconds	Output power in watts
A	20	24	2.4	10
B	40	24	1.2	20
C	60	24	0.8	30
D	80	24	0.2	120

The result for **Test D** is anomalous.

(i) Calculate the efficiency of the motor in **Test D**.

Efficiency = _____

(2)

(ii) Comment on your answer to part (c)(i).

(1)

(iii) Suggest a reason for this anomalous result.

(1)

(Total 12 marks)

3.

(a) **Diagram 1** shows a magnetic closure box when open and shut. It is a box that stays shut, when it is closed, due to the force between two small magnets.

These boxes are often used for jewellery.

Diagram 1

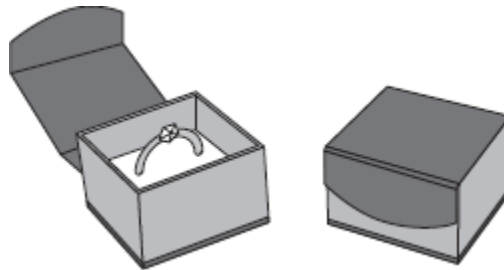
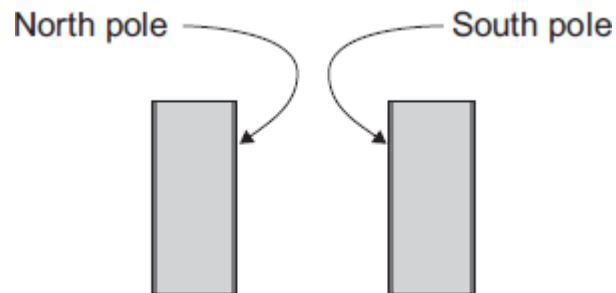


Diagram 2 shows the two magnets. The poles of the magnets are on the longer faces.

Diagram 2



(i) Draw, on **Diagram 2**, the magnetic field pattern between the two facing poles.

(2)

- (ii) The magnets in the magnetic closure box must **not** have two North poles facing each other.

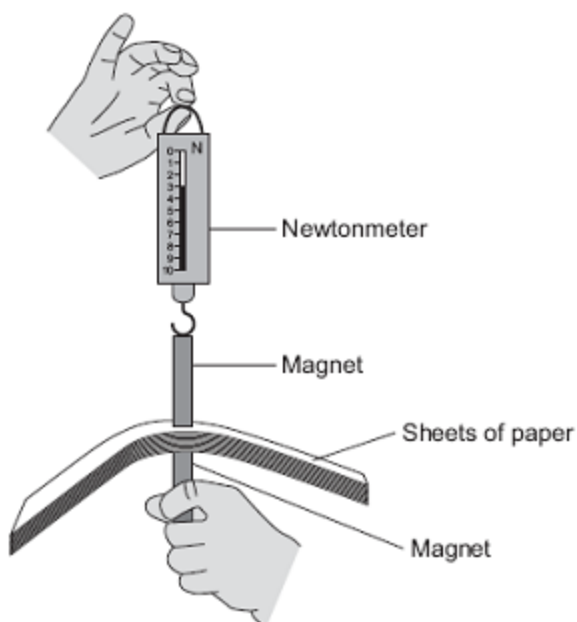
Explain why.

(2)

- (b) A student is investigating how the force of attraction between two bar magnets depends on their separation.

She uses the apparatus shown in **Diagram 3**.

Diagram 3



She uses the following procedure:

- ensures that the newtonmeter does not have a zero error
- holds one of the magnets
- puts sheets of paper on top of the magnet
- places the other magnet, with the newtonmeter magnetically attached, close to the first magnet
- pulls the magnets apart
- notes the reading on the newtonmeter as the magnets separate
- repeats with different numbers of sheets of paper between the magnets.

The results are shown in the table.

Number of sheets of paper between the magnets	10	20	30	40	50	60	70	80	120
Newtonmeter reading as the magnets separate	3.1	2.6	2.1	1.5	1.1	1.1	1.1	1.1	1.1

- (i) Describe the pattern of her results.

(2)

- (ii) No matter how many sheets of paper the student puts between the magnets, the force shown on the newtonmeter never reaches zero.

Why?

(1)

- (iii) The student is unable to experiment with fewer than 10 sheets of paper without glueing the magnet to the newtonmeter.

Suggest why.

(2)

- (iv) Suggest **three** improvements to the procedure that would allow the student to gain more accurate results.

(3)

- (v) The thickness of one sheet of paper is 0.1 mm.

What is the separation of the magnets when the force required to separate them is 2.1 N?

Separation of magnets = _____ mm

(3)

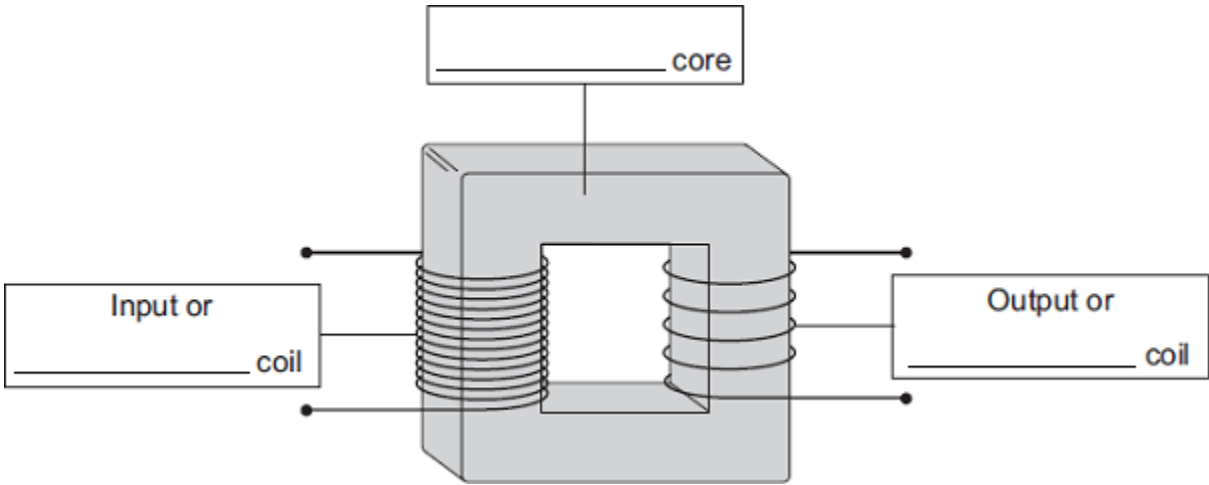
(Total 15 marks)

4.

(a) The diagram shows the structure of a traditional transformer.

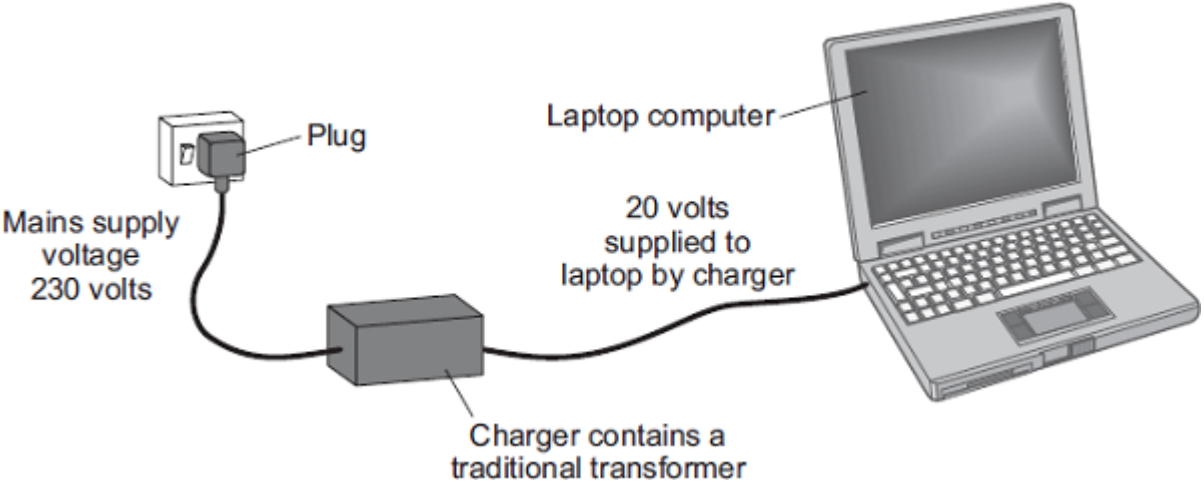
Use words from the box to label the diagram.

aluminium	brass	iron	large	primary	secondary
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(3)

(b) Batteries inside laptop computers are charged using laptop chargers. The laptop charger contains a traditional transformer.



The laptop charger contains a step-down transformer.

What does a step-down transformer do?

(1)

- (c) Laptop batteries and mobile phone batteries can only be recharged a limited number of times. When a battery cannot be recharged, it is better to recycle the battery than to throw it away.

Draw a ring around the correct answer to complete the sentence.

The batteries are recycled mainly due to

an environmental
a political
a social

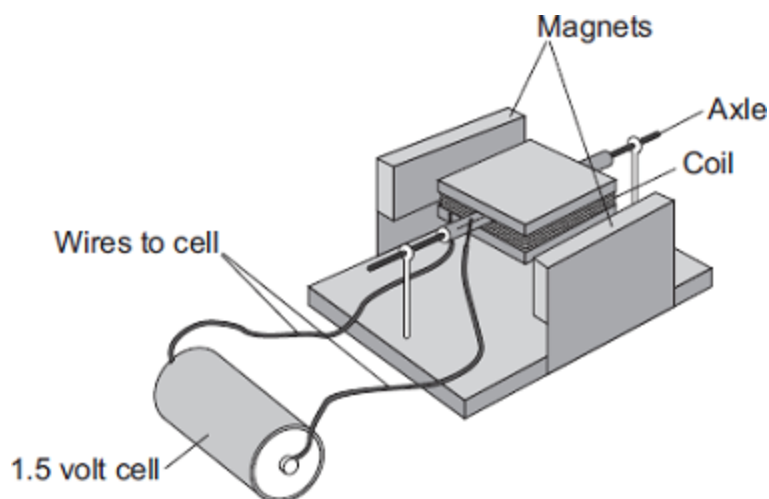
consideration.

(1)

(Total 5 marks)

5.

A student has made a simple electric motor. The diagram shows the electric motor.



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

Once the coil is spinning, one side of the coil is pushed by

the cell
the coil
a force

and

the other side is pulled, so the coil continues to spin.

(1)

(b) Suggest **two** changes to the electric motor, each one of which would make the coil spin faster.

1. _____

2. _____

(2)

(c) Suggest **two** changes to the electric motor, each one of which would make the coil spin in the opposite direction.

1. _____

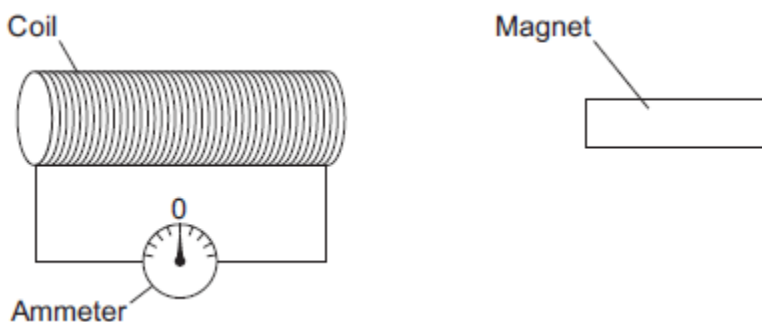
2. _____

(2)

(Total 5 marks)

6.

The figure below shows a coil and a magnet. An ammeter is connected to the coil.



The ammeter has a centre zero scale, so that values of current going in either direction through the coil can be measured.

- (a) A teacher moves the magnet slowly towards the coil.

Explain why there is a reading on the ammeter.

(6)

(b) The table below shows some other actions taken by the teacher.

Complete the table to show the effect of each action on the ammeter reading.

Action taken by teacher	What happens to the ammeter reading?
Holds the magnet stationary and moves the coil slowly towards the magnet	
Holds the magnet stationary within the coil	
Moves the magnet quickly towards the coil	
Reverses the magnet and moves it slowly towards the coil	

(4)

(c) The magnet moves so that there is a steady reading of 0.05 A on the ammeter for 6 seconds.

Calculate the charge that flows through the coil during the 6 seconds.

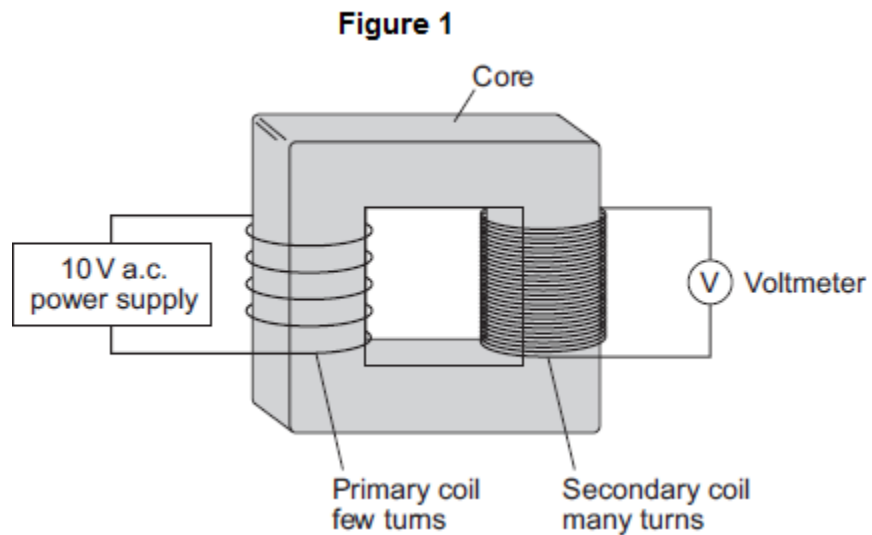
Give the unit.

Charge = _____

(3)

(Total 13 marks)

7. **Figure 1** shows a traditional transformer.



(a) (i) Which metal should the core of the transformer be made from?

Tick (✓) **one** box.

aluminium

copper

iron

(1)

(ii) What would the reading be on the voltmeter shown in **Figure 1**?

Draw a ring around the correct answer.

2 V

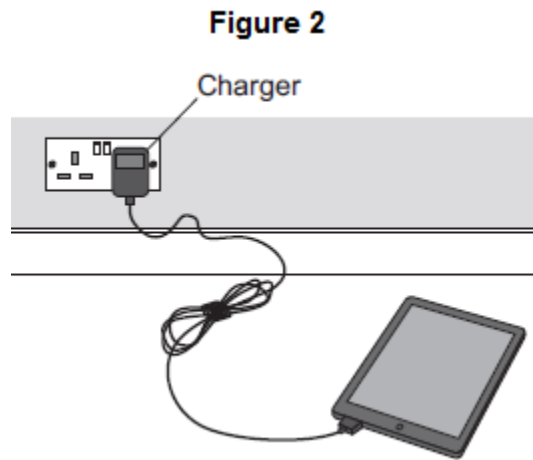
10 V

50 V

Give the reason for your answer.

(2)

(b) **Figure 2** shows a tablet computer and its charger.



The charger contains a switch mode transformer.

(i) Use the correct answer from the box to complete the sentence.

200	1000	20 000
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Switch mode transformers operate at frequencies

from 50 kHz to _____ kHz.

(1)

(ii) Give **one** advantage of a switch mode transformer over a traditional transformer.

(1)

(Total 5 marks)