

Topic 7 Magnetism

Name: _____

Class: _____

Date: _____

Time: **37 minutes**

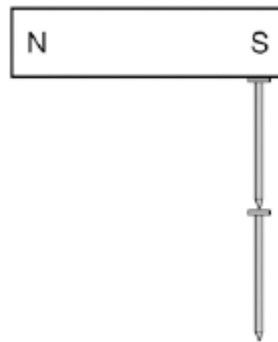
Marks: **37 marks**

Comments:

Q1.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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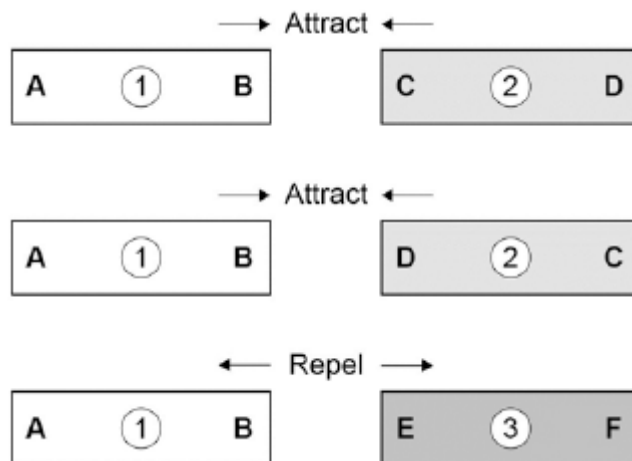
The iron nails have become magnets.

(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

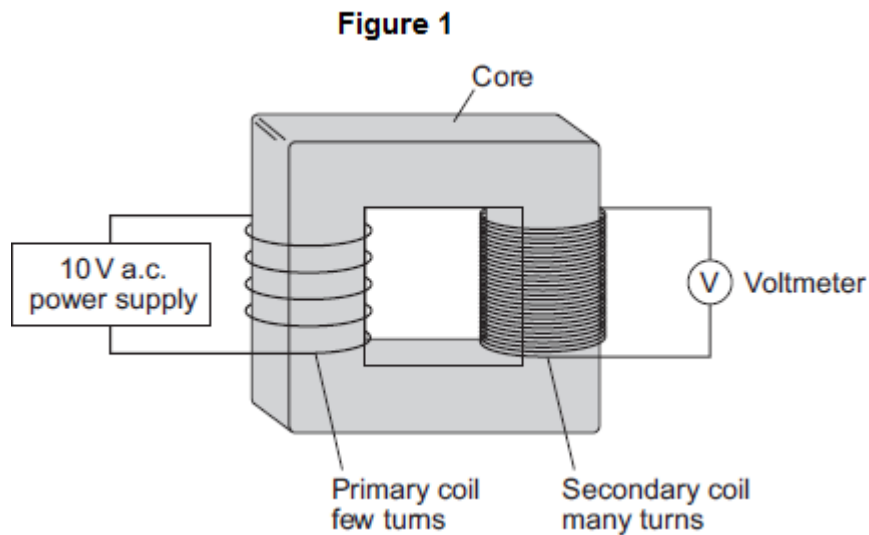
Give **one** reason why the results from the investigation **do not** support the student's hypothesis.

.....

.....

(1)
(Total 5 marks)

Q2.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

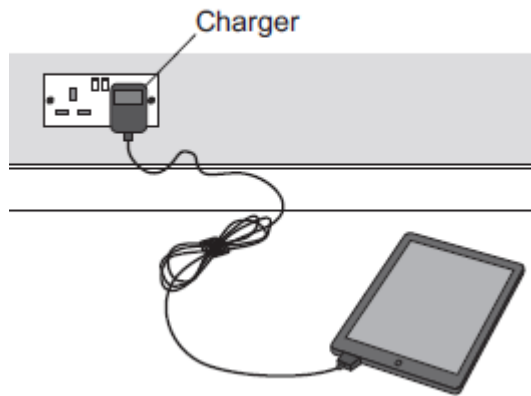
Give the reason for your answer.

.....
.....

(2)

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

Figure 2



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)

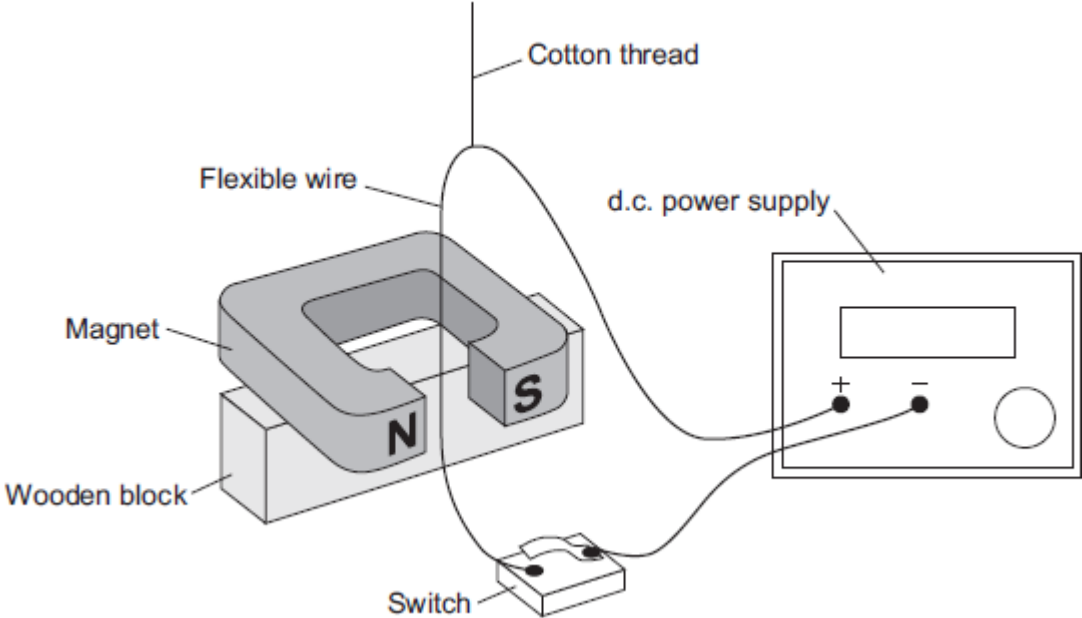
(ii) Give **one** advantage of a switch mode transformer over a traditional transformer.

.....
.....

(1)

(Total 5 marks)

Q3. 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.

generator	motor	transformer
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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.

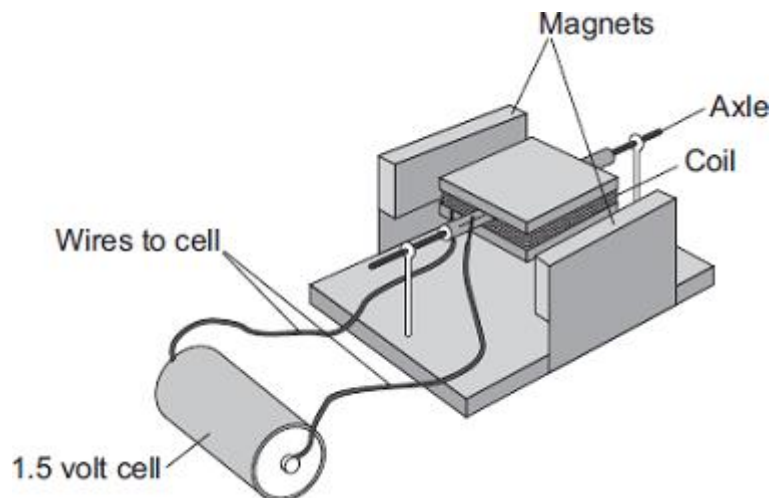
The wire is at 90° to the direction of the magnetic field.

The wire is at 45° to the direction of the magnetic field.

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

(1)
(Total 5 marks)

Q4.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)

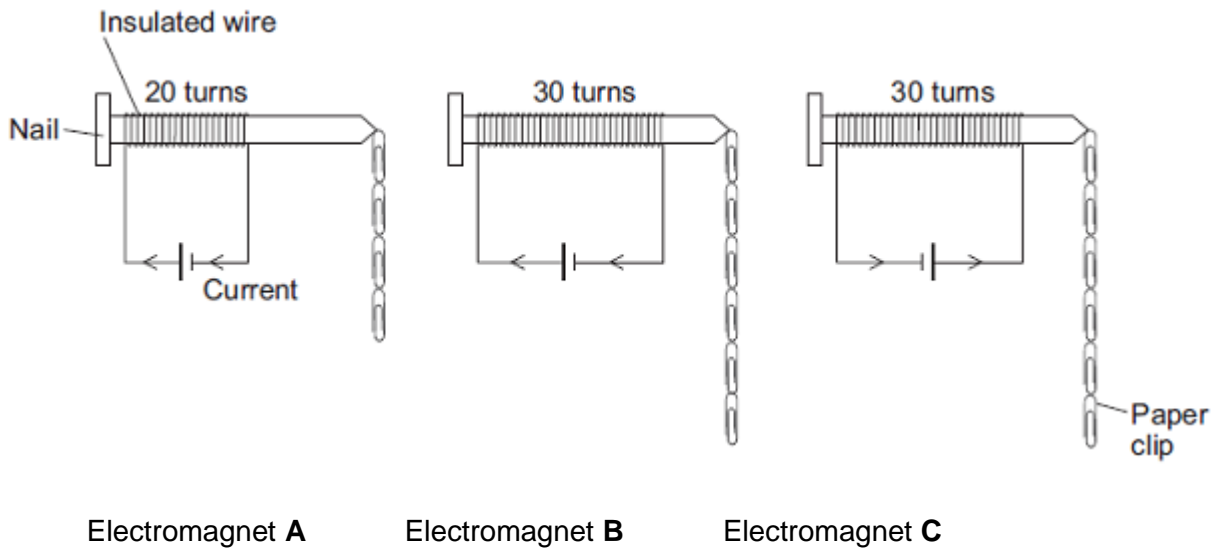
(Total 5 marks)

Q5.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.

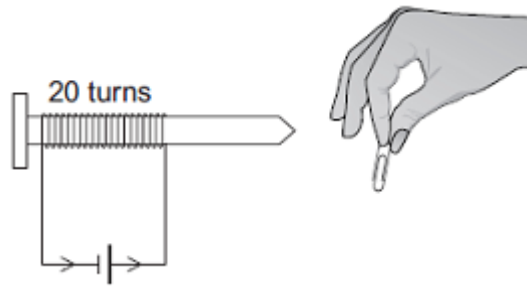
1

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.

.....

.....

.....

(2)

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

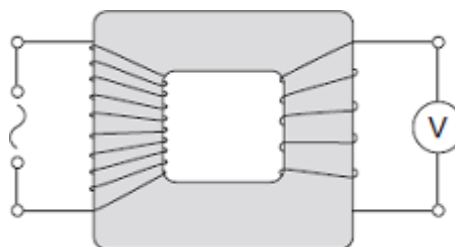
Suggest the maximum number of paper clips that could be hung in a line from the end of this electromagnet.

Maximum number of paper clips =

(1)

(Total 7 marks)

Q6. The diagram shows a transformer with a 50 Hz (a.c.) supply connected to 10 turns of insulated wire wrapped around one side of the iron core. A voltmeter is connected to 5 turns wrapped around the other side of the iron core.



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

Draw a ring around the correct answer.

step-down

step-up

switch mode

(1)

- (b) The table shows values for the potential difference (p.d.) of the supply and the voltmeter reading.

p.d. of the supply in volts	Voltmeter reading in volts
6.4	3.2
3.2	
	6.4

- (i) Complete the table.

(2)

- (ii) Transformers are used as part of the National Grid.

How are the values of p.d. in the table different to the values produced by the National Grid?

.....
.....

(1)

- (c) Transformers will work with an alternating current (a.c.) supply but will **not** work with a direct current (d.c.) supply.

- (i) Describe the difference between a.c. and d.c.

.....
.....
.....
.....

(2)

(ii) Explain how a transformer works.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4)
(Total 10 marks)

M1.(a) induced 1

(b) bar 2 1

(the same end) of bar 1 attracts both ends of bar 2

or

only two magnets can repel so cannot be bar 1 or bar 3

1

(c) so the results for each magnet can be compared

or

so there is only one independent variable

fair test is insufficient

allow different thickness of paper would affect number of sheets each magnet could hold

accept it is a control variable

1

(d) because the magnet with the biggest area was not the strongest

accept any correct reason that confirms the hypothesis is wrong eg smallest magnet holds more sheets than the largest

1

[5]

M2.(a) (i) Iron 1

(ii) 50

ignore references to current

reason only scores if 50 chosen

1

there are more turns on the secondary coil (than the primary coil)
accept it is a step-up transformer
not more coils

1

(b) (i) 200

1

(ii) any **one** from:

- Lighter
- smaller
- use very little power / current (when switched on with no load / phone attached).

accept more efficient

do not accept uses no power / current

a disadvantage of a traditional transformer is insufficient on its own

1

[5]

M3.(a) motor

1

(b) increase the strength of the magnetic field

accept use a stronger magnet

use a larger / bigger magnet is insufficient

do not accept move magnets closer

1

increase the (size of the) current

accept use a current greater than 2 (A)

accept increase the p.d. / voltage (of the power supply)

increase the power supply is insufficient

1

(c) any **one** from:

- (reverse the) direction of the current
accept swap the wires at the power supply connections
swap the wires around is insufficient
- (change the) direction of the magnetic field
accept turn the magnet around
do not accept use an a.c. supply

1

(d) The wire is parallel to the direction of the magnetic field.

1

[5]

M4.(a) a force

1

(b) any **two** from:

- more powerful magnet
do not allow 'bigger magnet'
- reduce the gap (between magnet and coil)
- increase the area of the coil
- more powerful cell
do not allow 'bigger cell'
accept battery for cell
accept add a cell
accept increase current / potential difference
- more turns (on the coil)
allow 'more coils on the coil'
do not allow 'bigger coil'

2

(c) reverse the (polarity) of the cell
allow 'turn the cell the other way round'
accept battery for cell

1

reverse the (polarity) of the magnet
allow 'turn the magnet the other way up'

1

[5]

M5.(a)	(i)	increase		1
	(ii)	A and B and B and C <i>both required for the mark either order</i>		1
	(iii)	any two from:		
		• size of nail or nail material <i>allow (same) nail</i>		
		• current <i>allow (same) cell allow p.d. same amount of electricity is insufficient</i>		
		• (size of) paper clip		
		• length of wire <i>accept type / thickness of wire</i>		2
	(b)	4		1
		B picks up the same number as C, so this electromagnet would pick up the same number as A or direction of current does not affect the strength of the electromagnet <i>allow it has got the same number of turns as A</i>		1
	(c)	2		1
		<i>allow 1 or 3</i>		1
				[7]

M6.(a) step-down 1

(b) (i) 1.6
correct order only 1

12.8	1
(ii) values of p.d. are smaller than 230 V	1
(c) (i) a.c. is constantly changing direction <i>accept a.c. flows in two / both directions</i> <i>accept a.c. changes direction(s)</i> <i>a.c. travels in different directions is insufficient</i>	1
d.c. flows in one direction only	1
(ii) an alternating current / p.d. in the primary creates a <u>changing / alternating magnetic</u> field	1
(magnetic field) in the (iron) <u>core</u> <i>current in the core negates this mark</i> <i>accept voltage for p.d.</i>	1
(and so) an <u>alternating</u> p.d.	1
(p.d.) is <u>induced</u> across secondary coil	1

[10]