

Topic 7 Magnetism

Name: _____

Class: _____

Date: _____

Time: **38 minutes**

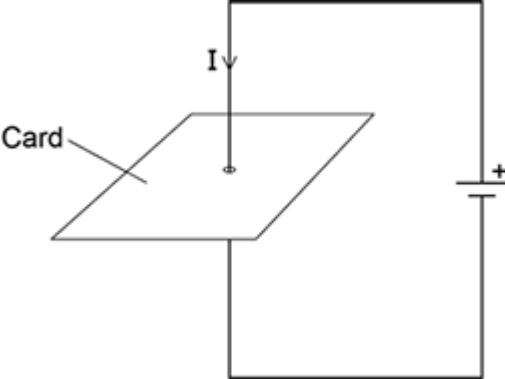
Marks: **38 marks**

Comments:

Q1.Figure 1 shows a straight wire passing through a piece of card.

A current (I) is passing down through the wire.

Figure 1



(a) Describe how you could show that a magnetic field has been produced around the wire.

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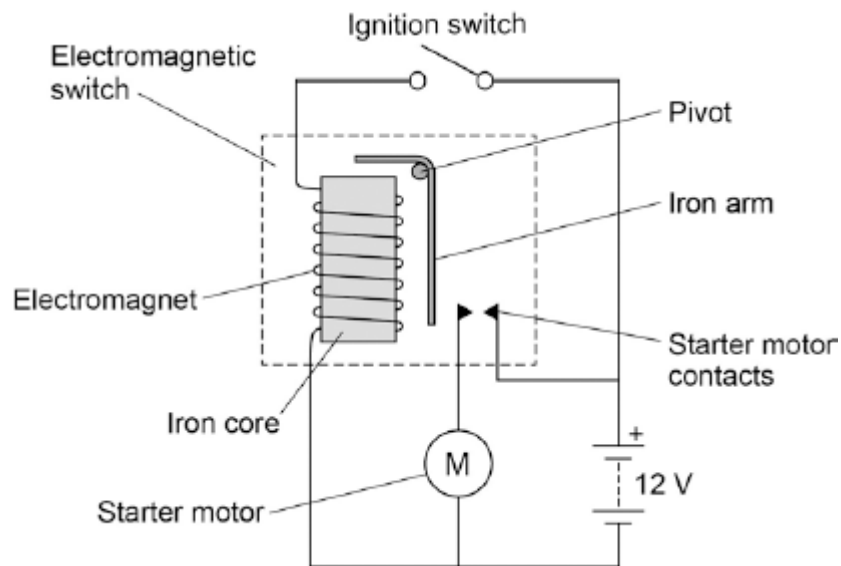
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(2)

(b) **Figure 2** shows the ignition circuit used to switch the starter motor in a car on. The circuit includes an electromagnetic switch.

Figure 2



Explain how the ignition circuit works.

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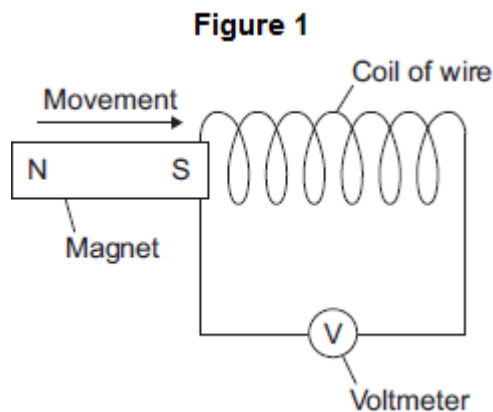
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(4)
(Total 6 marks)

Q2.Figure 1 shows a magnet moving into a coil of wire. This movement causes a reading on the voltmeter.



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

generated	induced	produced
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Moving the magnet into the coil of wire causes a reading on the voltmeter because a potential difference is across the ends of the wire.

(1)

- (b) A student investigated how the number of turns on the coil of wire affects the maximum voltmeter reading. The student changed the number of turns on the coil of wire, then moved the magnet into the coil. The student recorded the maximum voltmeter reading.

To obtain valid data, suggest **two** variables that the student should control in this investigation.

1.....

.....

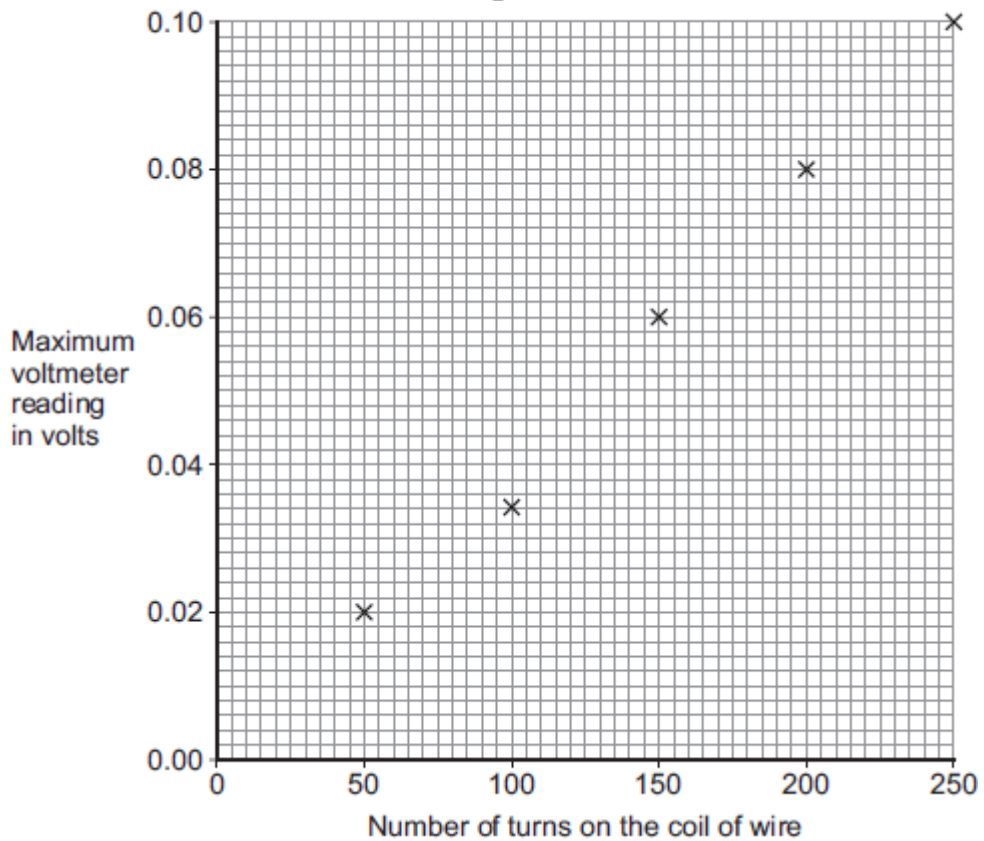
2.....

.....

(2)

- (c) The student's results are shown in **Figure 2**.

Figure 2



- (i) One of the results is anomalous.
Suggest a reason for the anomalous result.

.....

(1)

- (ii) Draw a line of best fit on **Figure 2**.

(1)

- (d) A data-logger can automatically record and store data.

It may have been better for the student to have used a data-logger in his investigation rather than a voltmeter.

Suggest **one** reason why.

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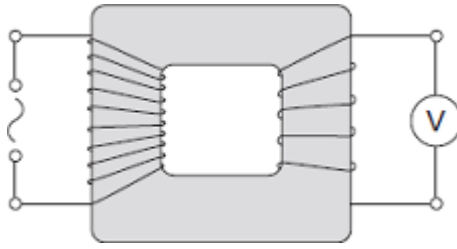
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(1)

(Total 6 marks)

Q3.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.

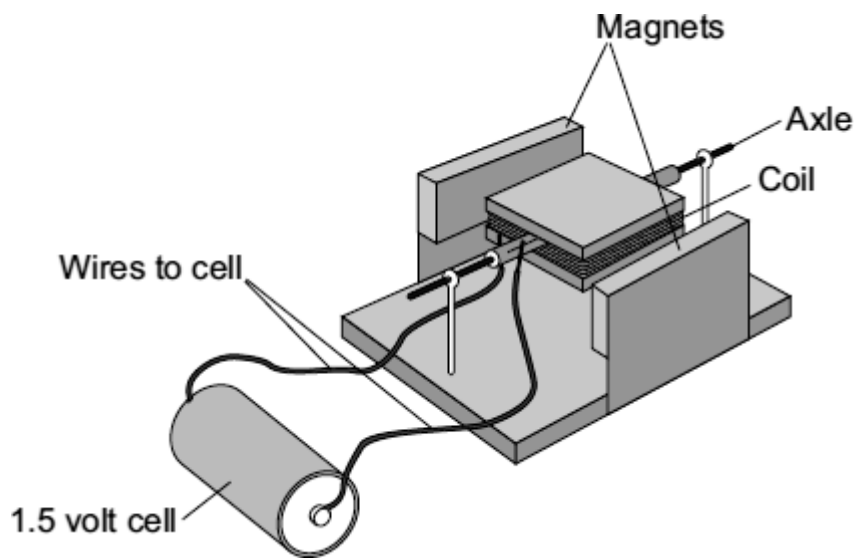
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(4)

(Total 10 marks)

Q4.

(a) Complete the description of the device shown below by drawing a ring around the correct line in each box.



(i) The device is being used as

an electric motor. a generator. a transformer.
--

(1)

(ii) The coil needs a flick to get started. Then one side of the coil is pushed by the

cell	and the other side is pulled, so that the coil spins.
coil	
force	

(1)

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

- 1
-
- 2
-

(2)

(c) Suggest **two** changes to the device, each one of which would make the coil spin in

the opposite direction.

1

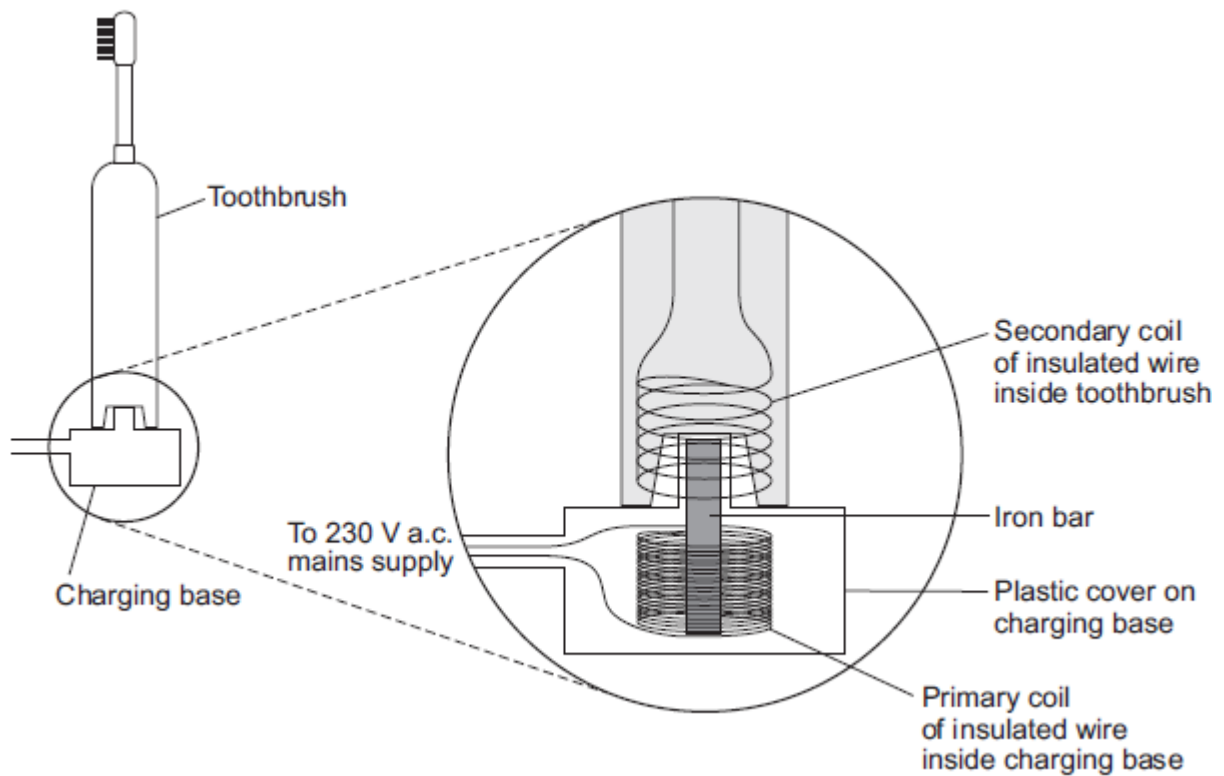
.....

2

.....

(2)
(Total 6 marks)

Q5.An electric toothbrush is charged by standing it on a separate charging base.
The diagram shows the inside of the electric toothbrush and the charging base.



- (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.

.....

.....

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.....

.....

.....

.....

(3)

- (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.

.....

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.....

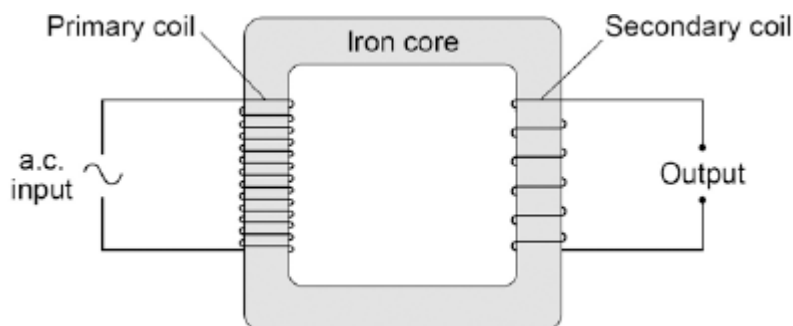
Number of turns on the secondary coil =

(2)

(Total 5 marks)

Q6.Figure 1 shows the construction of a simple transformer.

Figure 1



- (a) Why is iron a suitable material for the core of a transformer?

Tick **one** box.

It is a metal.

It will not get hot.

It is easily magnetised.

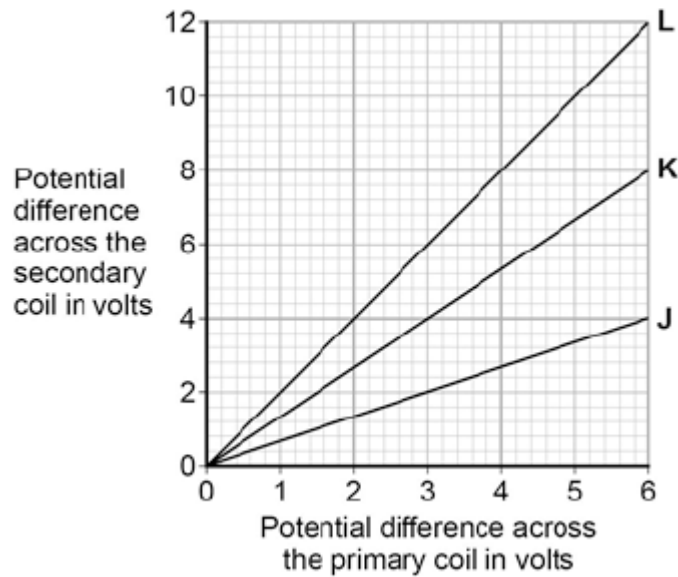
It is an electrical conductor.

(1)

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

Figure 2 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 2



How can you tell that transformer **J** is a step-down transformer?

.....

.....

(1)

(c) 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.

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

Number of turns on the secondary coil =

(3)
(Total 5 marks)

M1.(a) move a (magnetic / plotting) compass around the wire

1

the changing direction of the compass needle shows a magnetic field has been produced

OR

sprinkle iron filings onto the card (1)

tapping the card will move the filings to show the magnetic field (pattern) (1)

1

(b) **Level 2 (3–4 marks):**

A detailed and coherent explanation is provided. The response makes logical links between clearly identified, relevant points that explain how the ignition circuit works.

Level 1 (1–2 marks):

Simple statements are made. The response may fail to make logical links between the points raised.

0 marks:

No relevant content.

Indicative content

- closing the (ignition) switch causes a current to pass through the electromagnet
- the iron core (of the electromagnet) becomes magnetised
- the electromagnet / iron core attracts the (short side of the) iron arm
- the iron arm pushes the (starter motor) contacts (inside the electromagnetic switch) together
- the starter motor circuit is complete
- a current flows through the starter motor (which then turns)

4

[6]

M2.(a) induced

1

(b) any **two** from:

- use the same (strength) magnet
same size magnet is insufficient

- the speed that the magnet is moved
accept movement of the magnet
- the area of the turns
same type / length of wire is insufficient
- the magnetic pole being moved towards the coil (of wire).
use the same voltmeter is insufficient

2

- (c) (i) voltmeter misread
or
number of turns miscounted
result misread is insufficient
human error is insufficient
allow the magnet was moved at a (slightly) different speed (into the coil) than for the other readings
allow spacing between the turns had changed

1

- (ii) line of best fit passing through all points except (100, 0.034)
line does not need to go back to origin

1

- (d) any **one** from:
- can re-check data / readings.
accept can go back to data
 - can take more readings (in a given time)
can store data is insufficient
 - easier to identify maximum value.
automatically records data is insufficient
accept is more accurate
accept eliminates human error

1

[6]

M3.(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
accept a.c. flows in two / both directions
accept a.c. changes direction(s)
a.c. travels in different directions is insufficient

1

d.c. flows in one direction only

1

(ii) an alternating current / p.d. in the primary creates a changing / alternating magnetic field

1

(magnetic field) in the (iron) core
current in the core negates this mark
accept voltage for p.d.

1

(and so) an alternating p.d.

1

(p.d.) is induced across secondary coil

1

[10]

M4. (a) (i) an electric motor

1

(ii) 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

[6]

M5.(a) an alternating current through the primary coil (in the charging base)

it must be clear which coil is being referred to

1

causes a changing / alternating magnetic field in / around the (iron) bar

1

which induces an (alternating) p.d. across the secondary coil (in the toothbrush)

accept induces an (alternating) current in the secondary coil

1

(b) 18

allow 1 mark for correct substitution, ie

$$\frac{230}{7.2} = \frac{575}{n_s}$$

2

[5]

M6.(a) It is easily magnetised.

1

(b) p.d. across the secondary coil is smaller (than p.d. across the primary coil)

1

(c) ratio $\frac{V_p}{V_s} = \underline{6}$

$$V_s = 12$$

accept any other correct ratio taken from the graph

1

$$\underline{6} = \frac{50}{N_p}$$

$$12 = N_p$$

use of the correct turns ratio and substitution or correct transformation and substitution

1

$$N_p = 100$$

allow 100 with no working shown for 3 marks

1

[5]