Electromagnetic Induction – 2019 June

1. 0625/31/M/J/19/No.11

(a) Fig. 11.1 shows in each of the diagrams a current-carrying conductor and a magnetic field pattern.

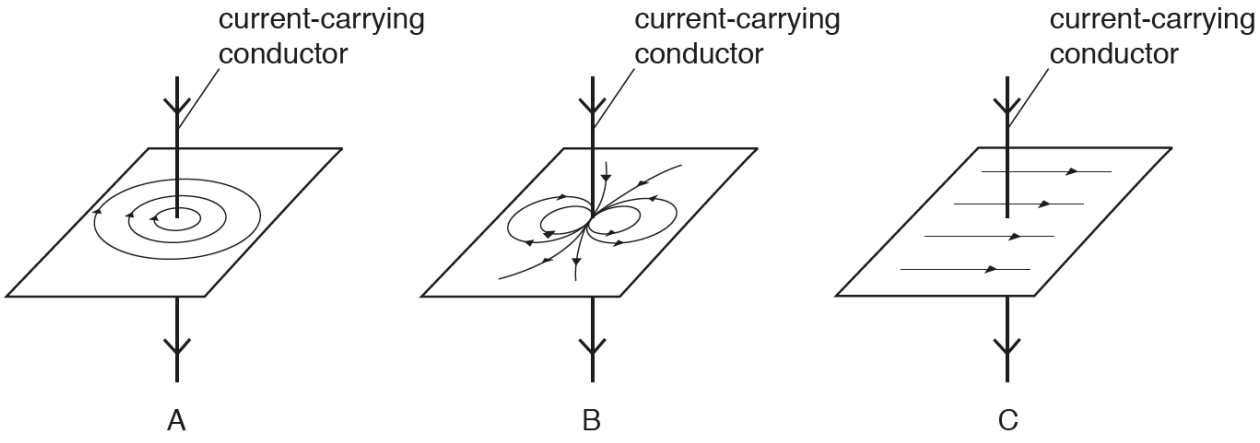
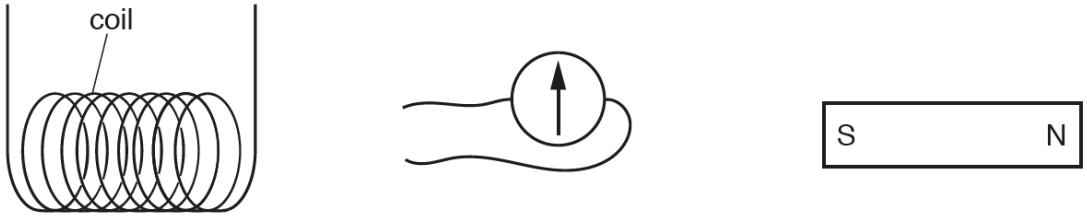


Fig. 11.1

State the diagram which correctly shows the magnetic field around a current-carrying conductor.

..... [1]

(b) Fig. 11.2 shows three pieces of equipment.



coil with 100 turns of wire

sensitive centre-zero meter

bar magnet

Fig. 11.2

(i) Describe how to generate and detect an electromotive force (e.m.f.) using the equipment in Fig. 11.2. You may draw a diagram.

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.....

..... [3]

(ii) Describe **two** changes that will generate a larger e.m.f. using similar equipment to that in Fig. 11.2.

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..... [2]

(c) A student connects a lamp and centre-zero galvanometer in series with a generator, as shown in Fig. 11.3.

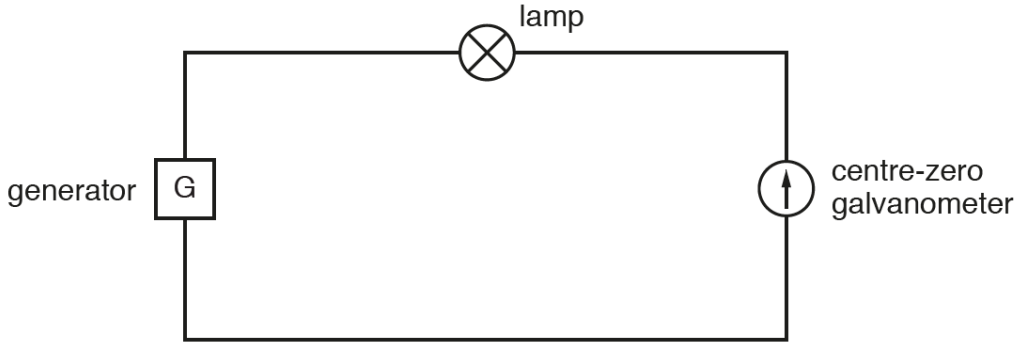

Fig. 11.3

The student observes the galvanometer needle moving from side-to-side repeatedly.

Explain why the needle moves in this way.

.....

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..... [1]

[Total: 7]

2. 0625/32/M/J/19/No.11

Fig. 11.1 shows a transformer that can provide two different output voltages from a 240 volt mains a.c. supply.

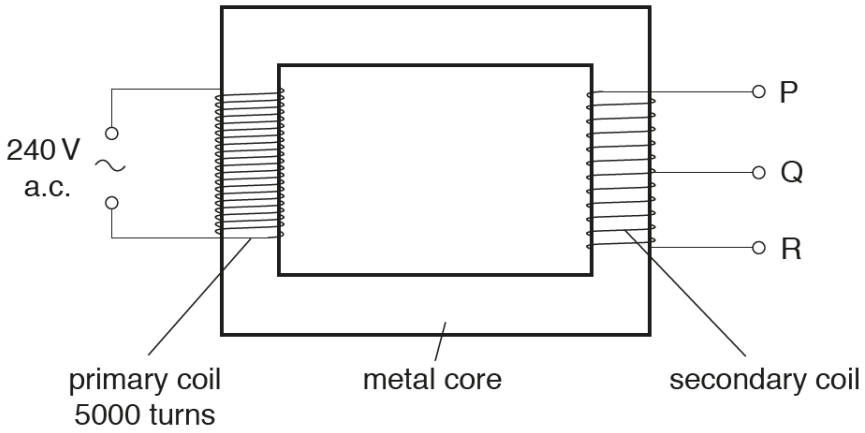

Fig. 11.1

In the transformer, the primary coil has 5000 turns.

The secondary coil has 250 turns between P and R.

(a) State the term used to describe this type of transformer.

..... [1]

(b) The primary and secondary coils are mounted on a metal core.

State the metal used for the core and explain why it is suitable.

metal .....

explanation .....

.....

[2]

(c) **(i)** The secondary coil has 125 turns between P and Q. Calculate the output voltage between connections P and Q.

voltage = ... V [3]

(ii) Compare the output voltage between P and Q with the output voltage between P and R.

Explain your answer.

comparison .....

explanation .....

[2]

[Total: 8]

3. 0625/33/M/J/19/No.10

Fig. 10.1 shows a desktop computer. The computer is connected to a mains supply by a plug containing a fuse.

Fig. 10.1

(a) The computer has a metal case. A fault occurs and a live wire touches the metal case.

Explain how an earth wire and the fuse in the plug protect the user.

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.....

..... [3]

(b) The computer contains a transformer. The input voltage to the transformer is 240 V and the output voltage is 12.0 V. The input coil of the transformer has 3000 turns.

Calculate the number of turns on the output coil.

number of turns = ... [3]

[Total: 6]

4. 0625/33/M/J/19/No.12

A student uses the equipment shown in Fig. 12.1.

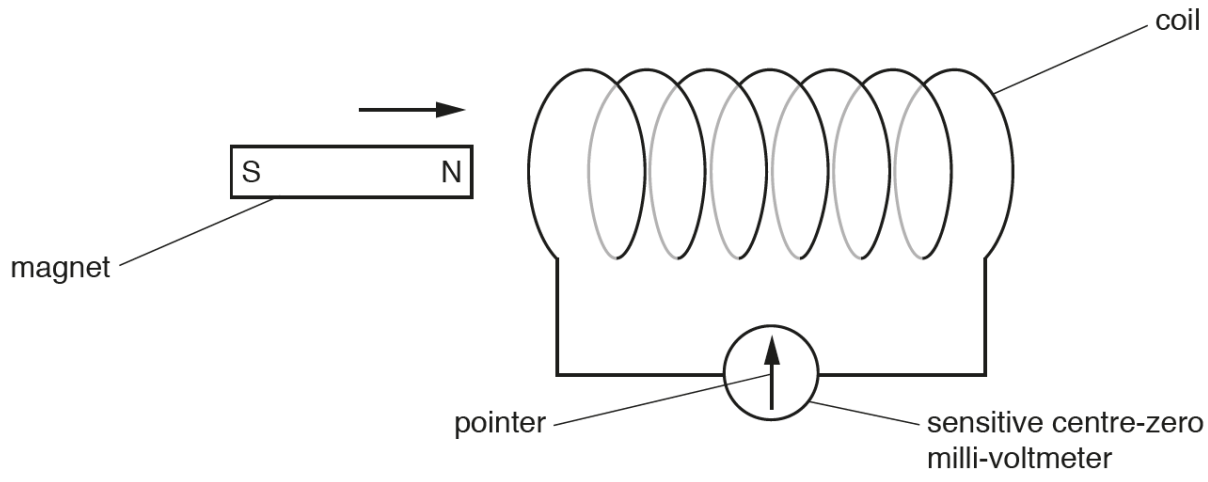

Fig. 12.1

The student moves the magnet to the right into the coil and then holds the magnet stationary for a few seconds. The pointer deflects to the right and then returns to the centre.

The student then moves the magnet to the left so that it is completely out of the coil and moves it far away from the coil.

(a) Describe how the pointer moves when the student moves the magnet out of the coil.

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..... [2]

(b) Explain why the pointer behaves as described in **(a)**.

.....

.....

.....

.....

..... [3]

[Total: 5]

5. 0625/41/M/J/19/No.8

A student turns the handle of an alternating current (a.c.) generator and the coil rotates.

Fig. 8.1 represents the structure of the a.c. generator.

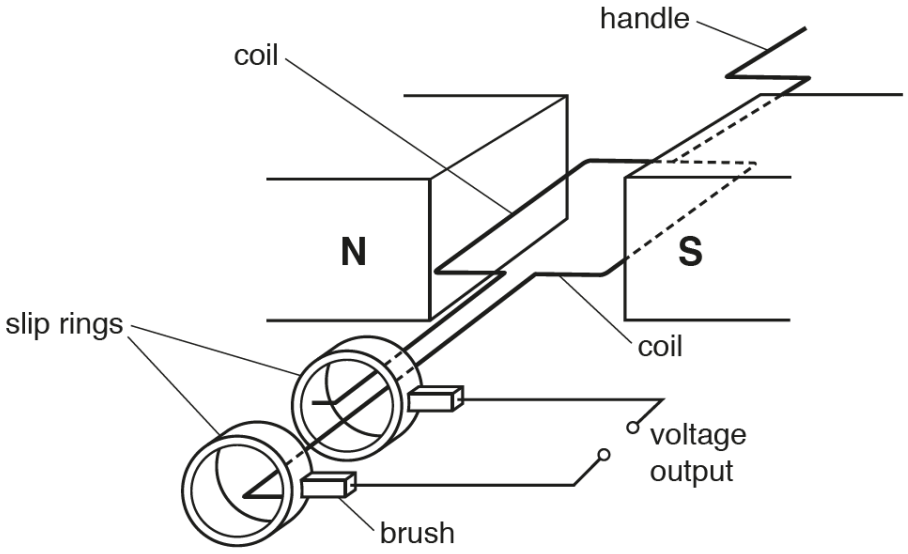

Fig. 8.1

(a) There is an alternating voltage output between the two terminals.

(i) Explain why rotating the coil produces an output voltage.

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.....

.....

..... [3]

(ii) State the position of the rotating coil when the alternating output voltage is at a maximum value and explain why the maximum output occurs at this position.

.....

.....

..... [2]

(b) A lamp and an open switch are connected in series to the output terminals of the a.c. generator.

The switch is closed and the lamp lights up. The student has to apply a greater force on the handle.

Explain why a greater force is needed to keep the lamp lit.

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..... [3]

[Total: 8]

6. 0625/43/M/J/19/No.10

Fig. 10.1 shows a simple alternating current generator.

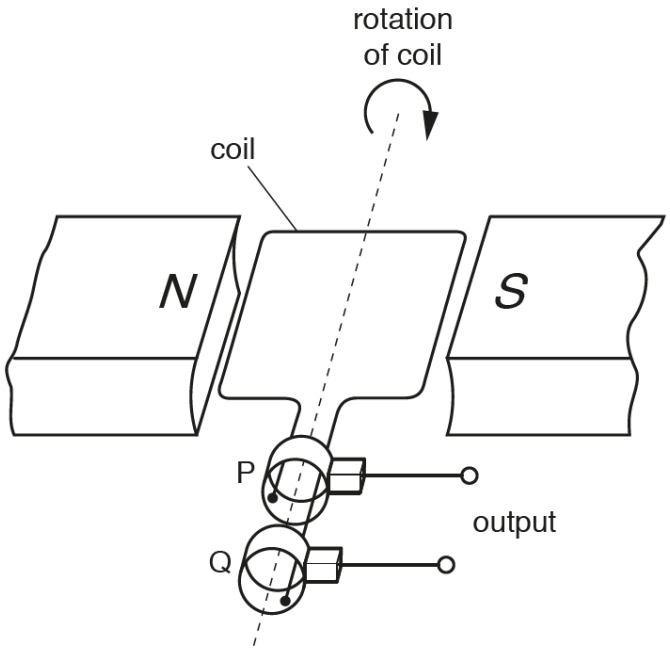

Fig. 10.1

(a) On Fig. 10.2, sketch a graph to show how the electromotive force (e.m.f.) induced varies with time for one revolution of the coil. Assume that the coil starts in the horizontal position, as shown in Fig. 10.1.
Label the points on the time axis where the coil has completed 1/4 revolution and 3/4 revolution. [3]

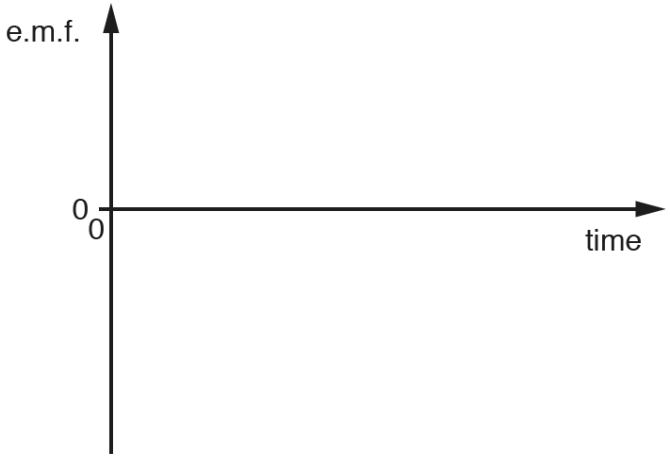

Fig. 10.2

(b) Explain why an e.m.f. is induced only when the coil is turning.

.....

.....

..... [1]

(c) State the name of the components labelled P and Q and state their purpose.

Name: .....

Purpose: .....

..... [2]

(d) State **two** possible changes that cause a larger e.m.f. to be induced.

1. .....

2. .....
[2]

[Total: 8]

7. **(a)** The electrical energy produced by a power station is transmitted over long distances at a very high voltage.

Explain why a very high voltage is used.

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..... [3]

(b) Fig. 10.1 represents a transformer.

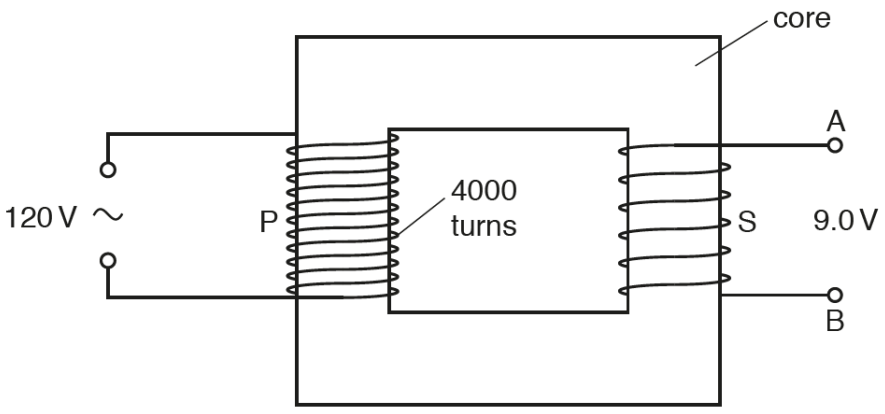

Fig. 10.1

(i) The primary coil P has 4000 turns and an input of 120 V. The secondary coil S has an output of 9.0 V.

Calculate the number of turns in the secondary coil.

number = ... [2]

(ii) State a suitable material for the core of the transformer.

..... [1]

[Total: 6]