Electromagnetism – 2020 O Level 5054

1. Nov/2020/Paper_12/No.34

What is used with a magnet to create an induced electromotive force (e.m.f.) in a simple a.c. generator?

A a battery

B a coil of wire

C a voltmeter

D a relay

2. Nov/2020/Paper_12/No.35

What changes kinetic (movement) energy into electrical energy?

A a car battery

B an electric fire

C an electric motor

D a wind turbine

3. Nov/2020/Paper_12/No.36

A transformer has 4800 turns on its primary coil and 480 turns on its secondary coil.

The primary coil is connected to a 240 V a.c. supply. The secondary coil is connected to a lamp.

How does the output current in the lamp compare with the input current?

A higher frequency a.c.

B lower frequency a.c.

C current in one direction only

D the same frequency a.c.

4. Nov/2020/Paper_21/No.6

When electricity is transmitted over large distances, a transformer is used to increase the voltage before transmission. A second transformer is used at the destination to decrease the voltage to the usual mains value.

(a) Sketch a labelled diagram to show the structure of a transformer that is used to **increase** voltage.

[2]

(b) Describe the principle of operation of a transformer.

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..... [3]

(c) Explain **one** advantage of transmitting electricity at a high voltage.

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[Total: 7]

5. Nov/2020/Paper_22/No.9c,9d

(c) Fig. 9.2 shows the N-pole of a magnet placed in front of the S-pole of a second magnet.

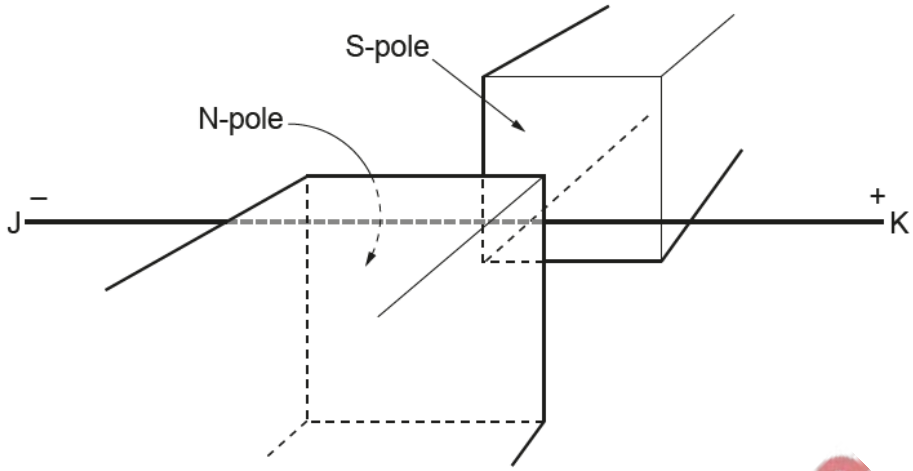

Fig. 9.2

A section of a horizontal, metal wire JK lies in the magnetic field between the two magnetic poles. End K of the metal wire is connected to the positive terminal of a battery and end J is connected to the negative terminal.

(i) Explain in terms of electrons, why there is a current in the wire and state the direction of the conventional current.

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(ii) The part of JK that is in the magnetic field experiences a force F.

State the direction of F and describe how this direction is deduced.

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..... [4]

(iii) The equipment in Fig. 9.2 is used in a similar experiment.

The part of JK that lies between the poles of the magnets, now passes through a long iron tube that is fixed in position.

The tube is shown in Fig. 9.3.

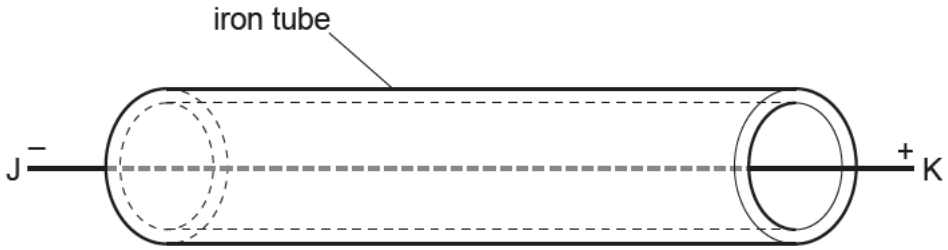

Fig. 9.3

JK is connected to the battery in the same way as before.

State what happens to force F on the wire.

Explain your answer.

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(d) The iron tube and the wire JK are removed.

A square, vertical coil is placed between the poles so that the plane of the coil lies in the magnetic field as shown in Fig. 9.4.

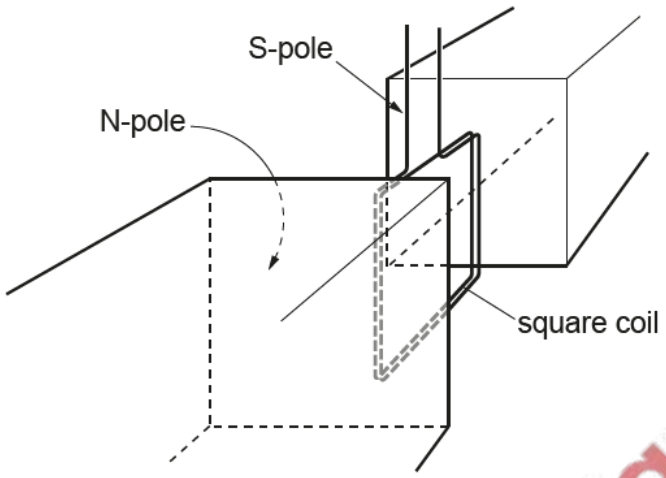

Fig. 9.4

Explain why the coil tries to rotate when there is a current in the coil.

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6. June/2020/Paper_12/No.39

A rectangular current-carrying coil is pivoted between the poles of an electromagnet.

Which action does **not**, on its own, increase the size of the turning effect exerted on the coil?

A increasing the current in the coils of the electromagnet

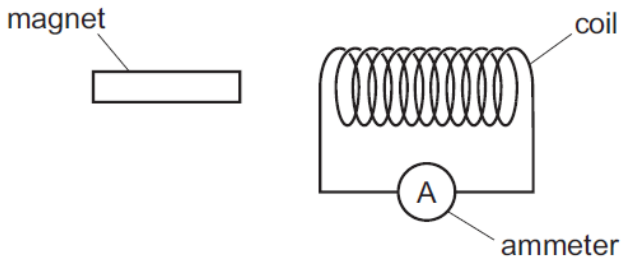
B increasing the current in the rectangular coil

C reversing the current in the electromagnet

D increasing the number of turns on the rectangular coil

7. June/2020/Paper_12/No.40

The diagram shows a coil connected to a very sensitive ammeter. A magnet is next to the coil.



Which action results in a zero reading on the ammeter?

A moving the coil and the magnet at the same speed in opposite directions

B moving the coil and the magnet at the same speed in the same direction

C moving the coil away from the stationary magnet

D moving the magnet towards the stationary coil

8. June/2020/Paper_21/No.10b

(b) Fig. 10.3 shows the structure of the motor.

When the mass reaches the top of its motion, the switch is opened. This disconnects the battery and causes the mass to fall. The coil turns as the mass falls.

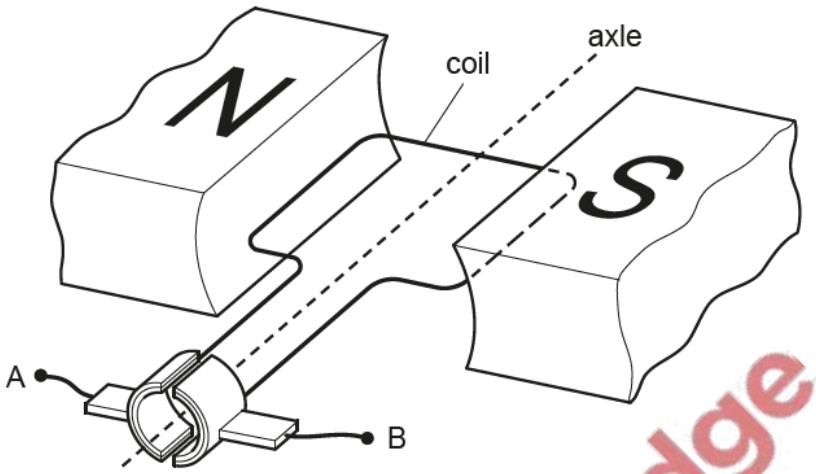


Fig. 10.3

As the coil turns, a small voltage is produced.

(i) Explain why a voltage is produced as the coil turns.

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(ii) As the mass falls, a student connects a wire between the points A and B shown in Fig. 10.3.

He notices that the mass takes a longer time to fall when the wire is connected.

The student suggests that this is an example of Lenz's law.

State Lenz's law and suggest why the mass takes longer to fall.

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9. June/2020/Paper_22/No.5

The components of the electromagnetic spectrum have different uses.

Microwaves are used in cooking and ultraviolet rays are used in sterilisation.

(a) Draw **one** line from each component of the spectrum to another suitable use for that component.

component	use
	sunbeds
microwaves	television controller
	satellite television
ultraviolet	airport security check of cases

[2]

(b) Fig. 5.1 shows a microwave oven used to heat soup. The container for the soup is a glass bowl.

Microwaves created inside the oven are reflected by the metal walls.

Fig. 5.1

(i) Explain why the choice of material for the container is important in microwave cooking.

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(ii) The soup is mostly water.

Microwaves are completely absorbed by a few centimetres of water.

As a result, microwaves do not reach the centre of the soup.

The instructions suggest that, after the microwave oven is turned off, the soup:

- is not stirred
- is left for some minutes so that the centre becomes hot.

State the name of and describe each of the **two** processes by which thermal energy transfers throughout the soup after the microwave oven is turned off.

name of first process .....

description .....

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name of second process .....

description .....

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..... [3]

[Total: 6]

10. June/2020/Paper_22/No.9a

(a) Fig. 9.1 shows a simple relay used to switch a mains electric motor on and off.

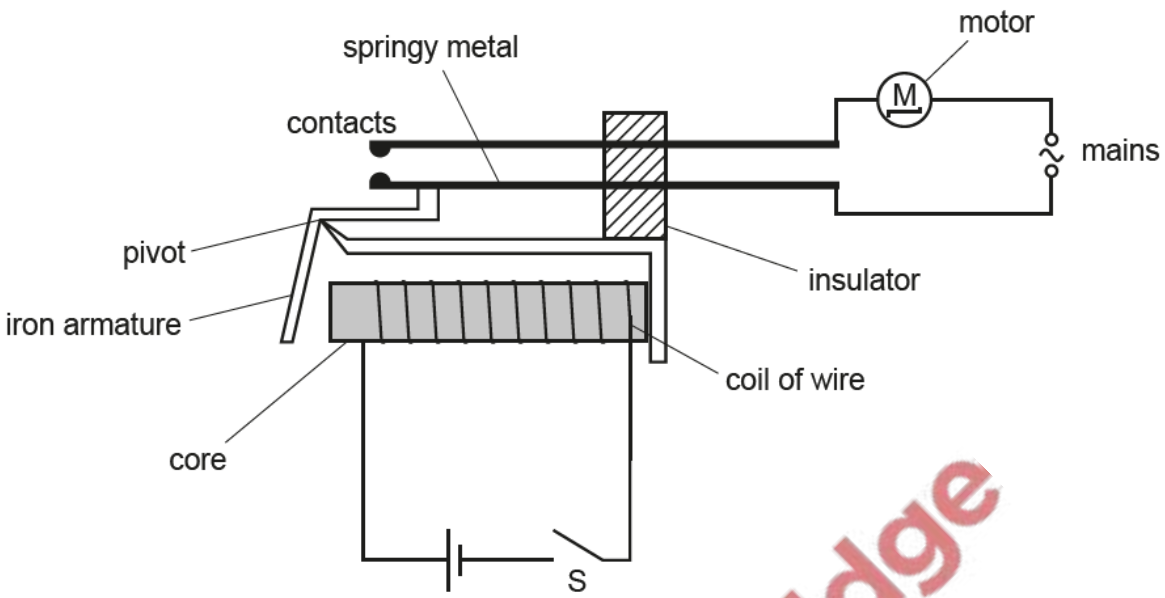

Fig. 9.1

(i) Explain why the motor switches on when switch S is closed.

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(ii) Explain why the core is made of iron rather than steel.

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(iii) A student suggests that the motor can be turned on and off without a relay.

He suggests connecting the mains to a simple switch in series with the motor.

Suggest **one** reason why, in some situations, using the relay is better.

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