**1** Fig. 11.1 shows a flexible wire hanging between two magnetic poles. The flexible wire is connected to a 12 V d.c. supply that is switched off.

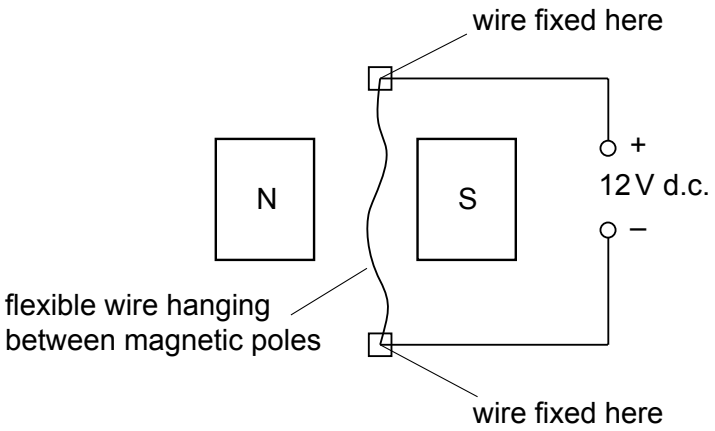


**Fig. 11.1**

**(a)** Explain why the wire moves when the supply is switched on.

.....

.....

..... [2]

**(b)** State the direction of the deflection of the wire.

.....

..... [2]

**(c)** When the wire first moves, energy is changed from one form to another. State these two forms of energy.

from ..... to ..... [1]

**(d)** Fig. 11.2 shows the flexible wire made into a rigid rectangular coil and mounted on an axle.

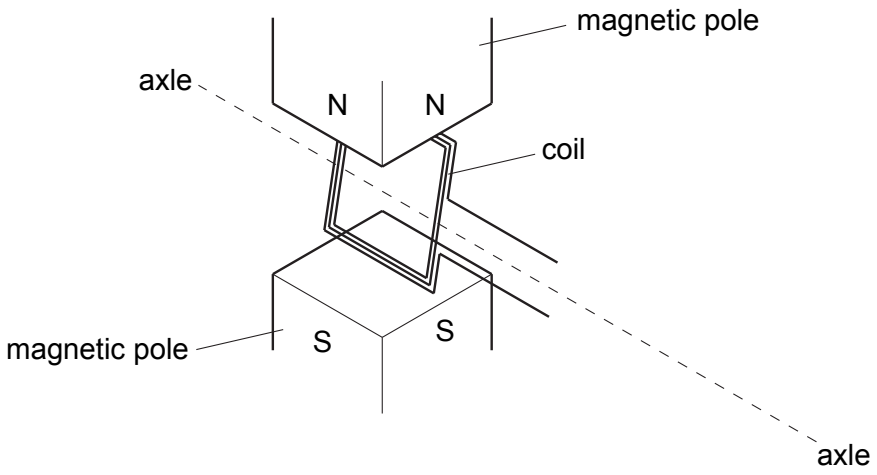


**Fig. 11.2**

**(i)** Add to the diagram an arrangement that will allow current to be fed into the coil whilst allowing the coil to turn continuously. Label the parts you have added. [1]

**(ii)** Briefly explain how your arrangement works.

.....

..... [2]

[ Total : 8 ]

**2** Fig. 10.1 shows the basic parts of a transformer.

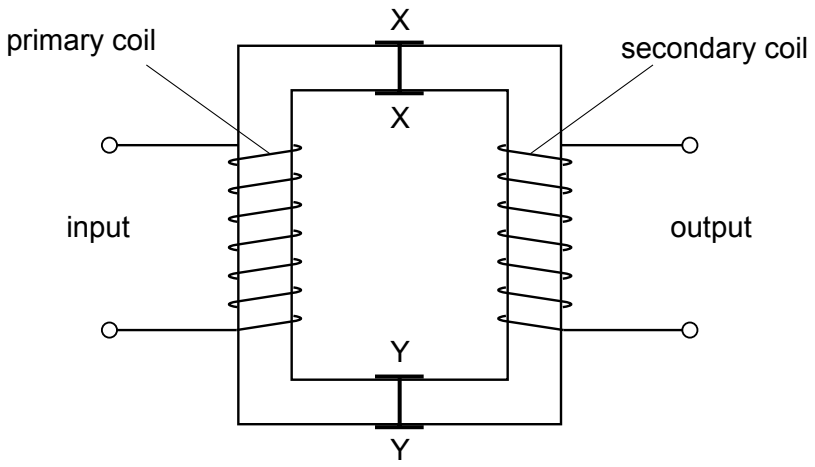


**Fig. 10.1**

**(a)** Use ideas of electromagnetic induction to explain how the input voltage is transformed into an output voltage. Use the three questions below to help you with your answer.

What happens in the primary coil?

.....

.....

.....

.....

What happens in the core?

.....

.....

What happens in the secondary coil?

.....

.....

..... [5]

**(b)** State what is needed to make the output voltage higher than the input voltage.

..... [1]

**(c)** The core of this transformer splits along XX and YY. Explain why the transformer would not work if the two halves of the core were separated by about 30 cm.

.....

..... [1]

**(d)** A 100% efficient transformer is used to step up the voltage of a supply from 100 V to 200 V. A resistor is connected to the output. The current in the primary coil is 0.4 A.

Calculate the current in the secondary coil.

current = …… [2]

**3** Electromagnetic induction can be demonstrated using a solenoid, a magnet, a sensitive ammeter and connecting wire.

**(a)** In the space below, draw a labelled diagram of the apparatus set up to demonstrate electromagnetic induction. [2]

**(b)** State one way of using the apparatus to produce an induced current.

.....

.....[1]

**(c)** Explain why your method produces an induced current.

.....

.....

.....[2]

**(d)** Without changing the apparatus, state what must be done to produce

**(i)** an induced current in the opposite direction to the original current,

.....

.....

**(ii)** a larger induced current.

.....

.....
[2]

[ Total : 7 ]

**4** **(a)** An engine on a model railway needs a 6 V a.c. supply. A mains supply of 240 V a.c. is available.

**(i)** In the space below, draw a labelled diagram of a transformer suitable for producing the required supply voltage.

**(ii)** Suggest suitable numbers of turns for the coils.

.....

.....

[4]

**(b)** The power needed for this model engine is 12 W. Calculate the current taken from the mains when just this engine is in use, assuming that the transformer is 100% efficient.

current = ……..[2]

**(c)** Explain why transformers will only work when connected to an a.c. supply.

.....

.....

.....[2]

[ Total :8 ]

**5** A transformer has an output of 24 V when supplying a current of 2.0 A. The current in the primary coil is 0.40 A and the transformer is 100% efficient.

**(a)** Calculate

**(i)** the power output of the transformer,

power = .....

**(ii)** the voltage applied across the primary coil.

voltage = .....
[4]

**(b)** Explain

**(i)** what is meant by the statement that the transformer is 100% efficient,

.....

.....

.....

**(ii)** how the transformer changes an input voltage into a different output voltage.

.....

.....

.....

.....
[4]

[Total :8 ]

**6** Fig. 8.1 shows the outline of an a.c. generator. The peak output voltage of the generator is 6.0 V and the output has a frequency of 10 Hz.

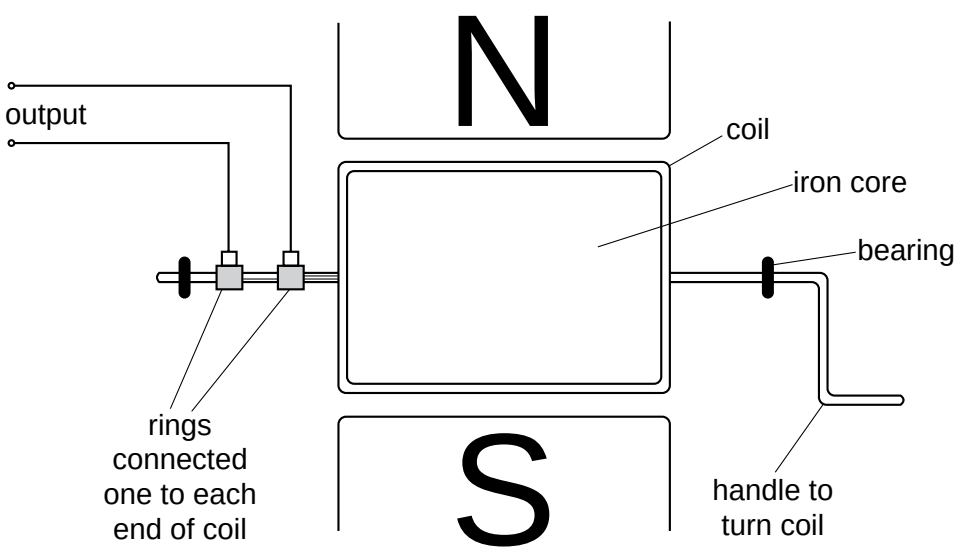


**Fig. 8.1**

**(a)** Fig. 8.2 shows the axes of a voltage-time graph for the generator output.

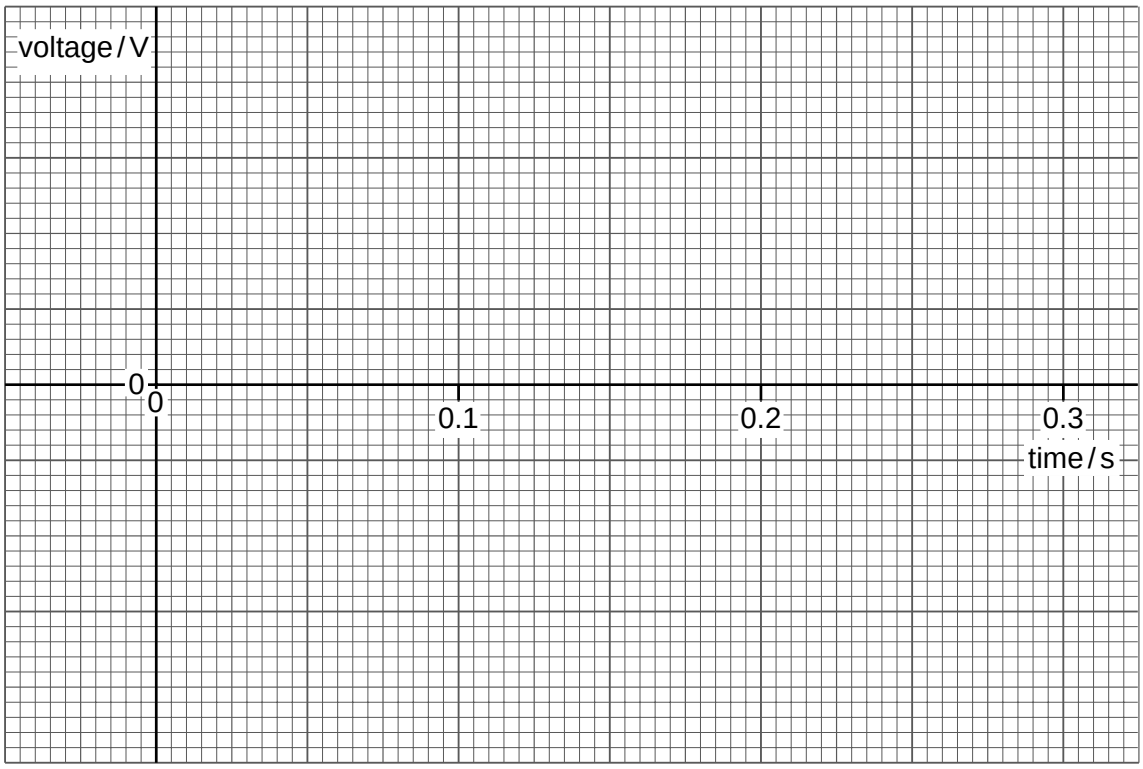


**Fig. 8.2**

On Fig. 8.2,

**(i)** mark suitable voltage values on the voltage axis,

**(ii)** draw a graph of the generator output. [3]

**(b)** The generator shown in Fig. 8.1 works by electromagnetic induction.

Explain how this effect produces the output voltage.

.....

.....

.....

..... [3]

**(c)** State the energy changes that occur in the generator when it is producing output.

..... [2]

[Total : 8 ]