1 **(a)** The transformer in Fig. 8.1 is used to convert 240V a.c. to 6V a.c.

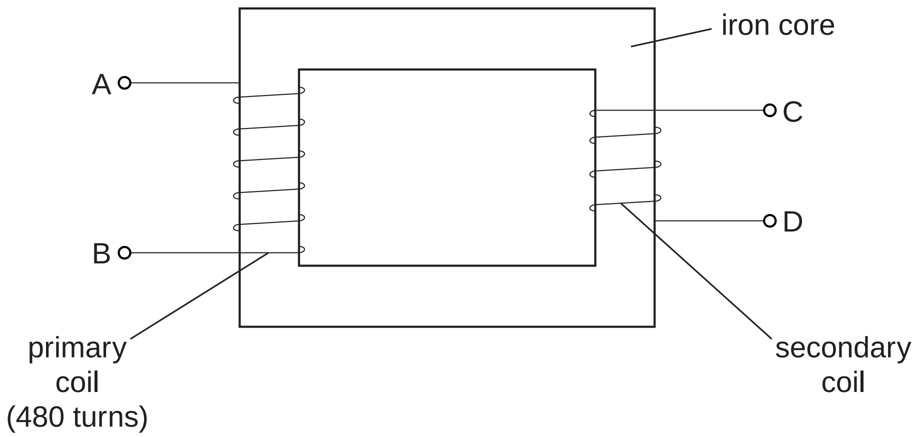


Fig. 8.1

(i) Using the information above, calculate the number of turns on the secondary coil.

number of turns = ... [2]

(ii) Describe how the transformer works.

....

....

....

....

.... [3]

(iii) State one way in which energy is lost from the transformer, and from which part it is lost.

.... [1]

(b) Fig. 8.2 shows a device labelled "IGCSE Transformer".

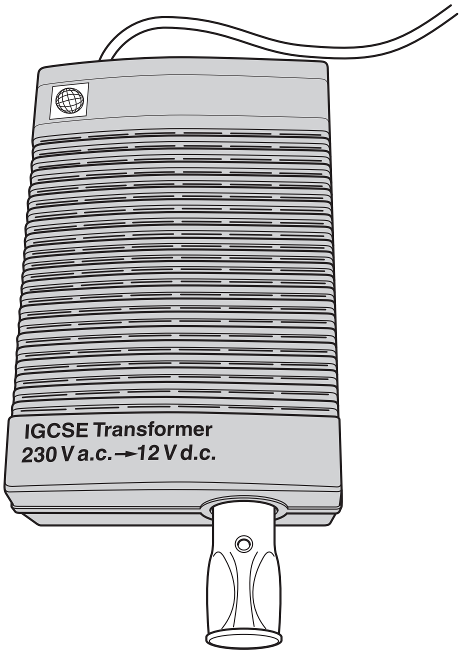


Fig. 8.2

Study the label on the case of the IGCSE Transformer.

(i) What is the output of the device? .... [1]

(ii) From the information on the case, deduce what other electrical component must be included within the case of the IGCSE Transformer, apart from a transformer.

.... [1]

(c) A transformer supplying electrical energy to a factory changes the 11 000 V a.c. supply to 440 V a.c. for use in the factory. The current in the secondary coil is 200 A.

Calculate the current in the primary coil, assuming no losses from the transformer.

current = ... [2]

[Total: 10]

2 Fig. 8.1 shows a simple transformer.

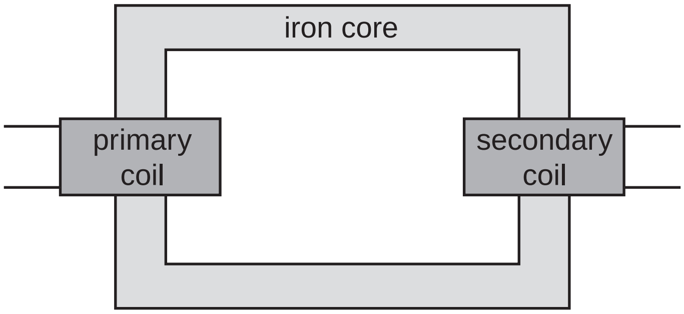


Fig. 8.1

(a) Describe how a voltage across the primary coil causes a voltage across the secondary coil.

....

....

....

....

....

.... [3]

(b) State what design feature would cause the voltage across the secondary coil to be larger than the voltage across the primary coil.

....

.... [1]

(c) The output of a power station is connected to a transformer, which you are to assume is 100% efficient.

The input to the primary coil is 24 000 V, 12 000 A.

The output from the secondary coil is 400 000 V. This is the voltage at which the electrical energy is transmitted through the transmission lines.

Calculate the current in the secondary coil.

current = ... [2]

(d) State two reasons why it is cheaper to transmit electrical energy at high voltage.

1. ....

....

2. ....

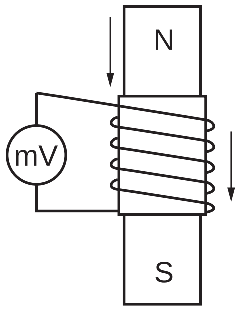
.... [2]

[Total: 8]

3 A coil is wound on a cylindrical cardboard tube and connected to a sensitive centre-zero millivoltmeter.

Figs. 8.1, 8.2 and 8.3 show three situations involving the coil and a magnet.

(a) On the lines alongside each situation, describe what, if anything, is seen happening on the millivoltmeter.



magnet inside coil, both moving at same speed

....

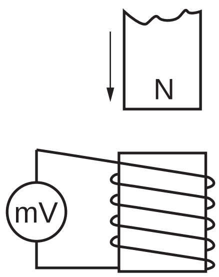
....

....

....

.... [1]

Fig. 8.1



magnet moving towards coil

coil stationary

....

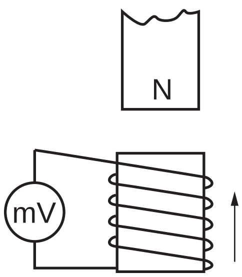
....

....

....

.... [1]

Fig. 8.2



magnet stationary

coil moving towards magnet

....

....

....

....

.... [2]

Fig. 8.3

(b) Choose one of the situations in **(a)** where something is seen happening to the millivoltmeter. For this situation, state three changes which could be made to increase the magnitude of what is seen.

1. ....

2. ....

3. .... [3]

[Total: 7]

4 Alternating current electricity is delivered at 22 000 V to a pair of transmission lines. The transmission lines carry the electricity to the customer at the receiving end, where the potential difference is *V*. This is shown in Fig. 10.1. Each transmission line has a resistance of 3 Ω.

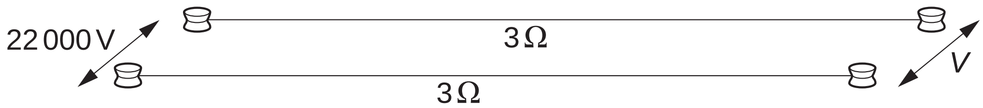


Fig. 10.1

(a) The a.c. generator actually generates at a much lower voltage than 22 000 V.

(i) Suggest how the voltage is increased to 22 000 V.

.... [1]

(ii) State one advantage of delivering electrical energy at high voltage.

.... [1]

(b) The power delivered by the generator is 55 kW. Calculate the current in the transmission lines.

current = ... [2]

(c) Calculate the rate of loss of energy from one of the 3 Ω transmission lines.

rate of energy loss = ... [2]

(d) Calculate the voltage drop across one of the transmission lines.

voltage drop = ... [2]

(e) Calculate the potential difference *V* at the receiving end of the transmission lines.

V = ... [2]

[Total: 10]

5 Fig. 9.1 shows apparatus used to investigate electromagnetic effects around straight wires.

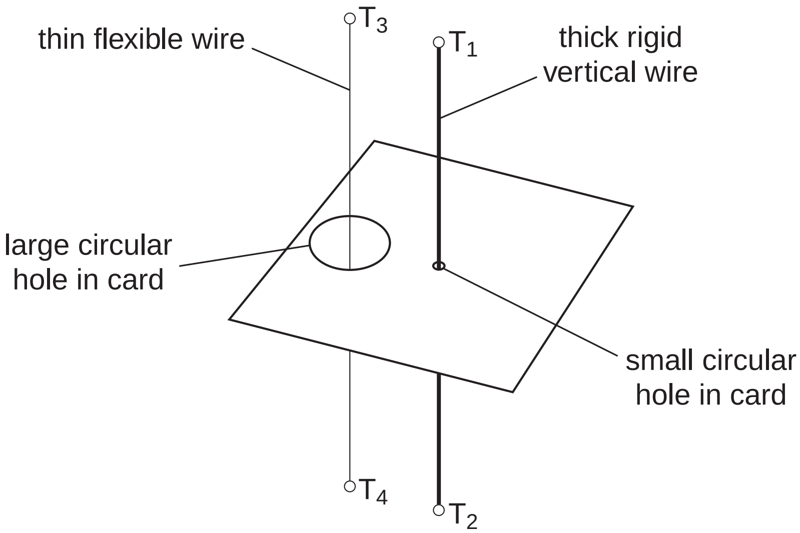


Fig. 9.1

Fig. 9.2 is a view looking down on the apparatus shown in Fig. 9.1.

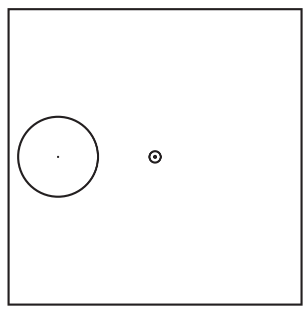


Fig. 9.2

(a) A battery is connected to T_1 and T_2 so that there is a current vertically down the thick wire.

On Fig. 9.2, draw three magnetic field lines and indicate, with arrows, the direction of all three. [2]

(b) Using a variable resistor, the p.d. between terminals T_1 and T_2 is gradually reduced.

State the effect, if any, that this will have on

(i) the strength of the magnetic field, ... [1]

(ii) the direction of the magnetic field. .... [1]

(c) The battery is now connected to terminals T_3 and T_4, as well as to terminals T_1 and T_2, so that there is a current down both wires. This causes the flexible wire to move.

(i) Explain why the flexible wire moves.

....

....

....

.... [2]

(ii) State the direction of the movement of the flexible wire.

.... [1]

(iii) The battery is replaced by one that delivers a smaller current.

State the effect that this will have on the force acting on the flexible wire.

....

.... [1]

[Total: 8]