1 Fig. 9.1 is a block diagram of an electrical energy supply system, using the output of a coal-fired power station.

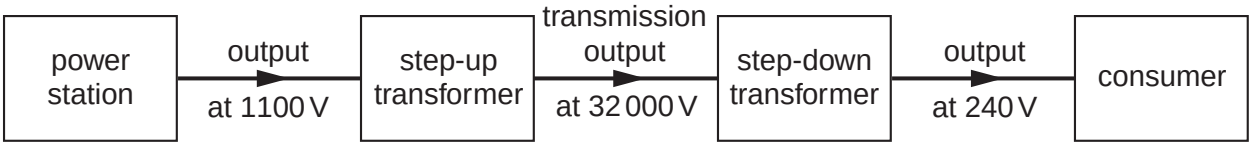

Fig. 9.1

(a) Suggest **one** possible way of storing surplus energy when the demand from the consumers falls below the output of the power station.

.....

..... [1]

(b) State why electrical energy is transmitted at high voltage.

..... [1]

(c) A transmission cable of resistance *R* carries a current I. Write down a formula that gives the power loss in the cable in terms of *R* and I.

..... [1]

(d) The step-up transformer has 1200 turns on the primary coil. Using the values in Fig. 9.1, calculate the number of turns on its secondary coil. Assume that the transformer has no energy losses.

number of turns = ... [2]

(e) The input to the step-up transformer is 800 kW.

Using the values in Fig. 9.1, calculate the current in the transmission cables, assuming that the transformer is 100% efficient.

current = ... [3]

[Total: 8]

2 Fig. 9.1 is a sketch of some apparatus, found in a Science museum, which was once used to show how electrical energy can be converted into kinetic energy.

When the switch is closed the wheel starts to turn.

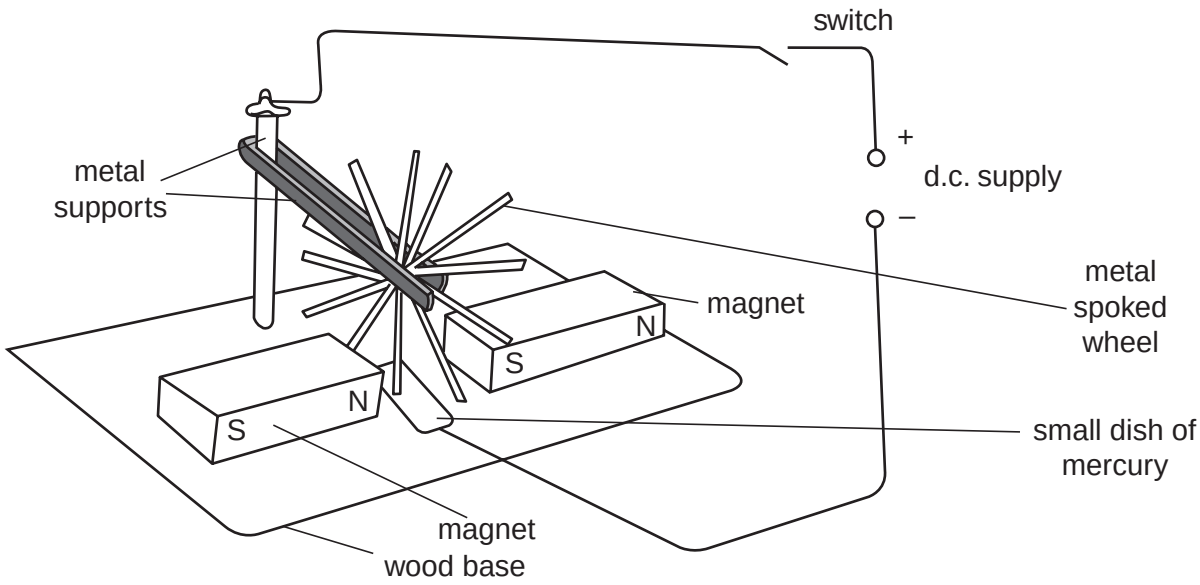

Fig. 9.1

(a) Explain why the wheel turns when the switch is closed.

.....

.....

.....

..... [2]

(b) On Fig. 9.1, draw an arrow to show the direction of rotation of the wheel. [1]

(c) The d.c. motor is another way to convert electrical energy into kinetic energy.

In the space below, draw a labelled diagram of a d.c. motor.

[3]

(d) Describe how the split-ring commutator on an electric motor works.

.....

.....

.....

..... [2]

[Total: 8]

3 Electromagnetic induction may be demonstrated using a magnet, a solenoid and other necessary apparatus.

(a) Explain what is meant by *electromagnetic induction*.

.....

.....

.....

..... [2]

(b) In the space below, draw a labelled diagram of the apparatus set up so that electromagnetic induction may be demonstrated. [2]

(c) Describe how you would use the apparatus to demonstrate electromagnetic induction.

.....

.....

.....

..... [2]

(d) State two ways of increasing the magnitude of the induced e.m.f. in this experiment.

1. .....

.....

2. .....

..... [2]

[Total: 8]

4 A transformer is needed to step down a 240 V a.c. supply to a 12 V a.c. output.

(a) In the space below, draw a labelled diagram of a suitable transformer. [3]

(b) Explain

(i) why the transformer only works on a.c.,

.....

.....[1]

(ii) how the input voltage is changed to an output voltage.

.....

.....

.....[2]

(c) The output current is 1.5 A.

Calculate

(i) the power output,

power = ...[1]

(ii) the energy output in 30 s.

energy = ...[1]

[Total : 8]