

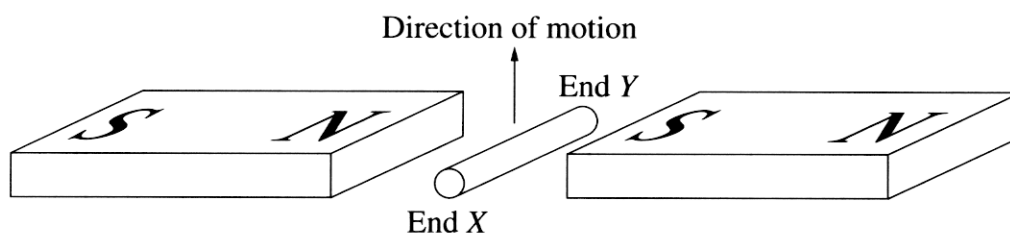
Question 23 (7 marks)

(a) State Lenz's law.

1

The direction of an induced current will be so it opposes the motion that causes it.

(b) When the metal rod is moved upwards through the magnetic field as shown in the diagram, an emf is induced between the two ends.



(i) Which end of the rod is negative?

1

End X

(ii) Explain how the emf is produced in the rod.

3

Charges in the rod are travelling through the magnetic field and hence experience the motor effect. By Fleming's Left Hand Rule, we can determine that positive charges experience a force towards Y (although they won't move) and electrons experience a force (by motor effect) towards X. This means that electrons collect at X, leaving positive ions behind at Y.

This difference in charge between the two ends produces an EMF between them.

(c) Explain how the principle of induction can be used to heat a conductor.

Alternating Current can be fed through a coil of wire to create a changing magnetic field. A nearby conductor will experience this change in flux and thus Eddy currents will be induced in the conductor to attempt to minimise the change (by Lenz's law). These Eddy currents will create heat in the conductor as electrons move and so will heat the conductor. This principle is utilised in induction cookers.