

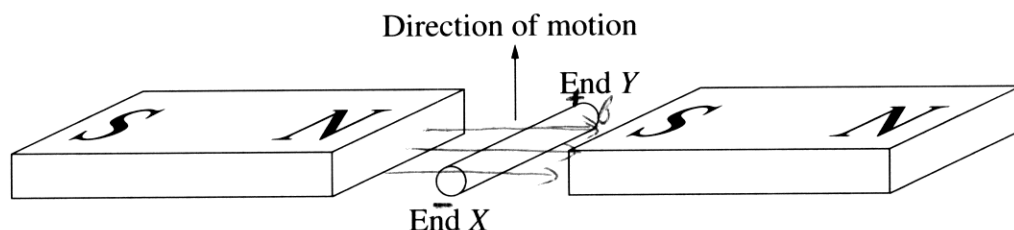
Question 23 (7 marks)

(a) State Lenz's law.

1

The movement of a conductor in an external magnetic field ~~will~~ will induce a current. This induced current produces a magnetic field which opposes the motion which caused 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

The movement of <sup>the</sup> a metal rod (conductor) in an external magnetic field moving to the right (N → S) induces a current - or in this case charge separation occurs. The current separation in a moving rod would thus induce the production of a magnetic field that opposes the external magnetic field.

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

2

When a metal is moved through a magnetic field, <sup>the induced current results in</sup> an eddy current ~~is~~ <sup>being</sup> produced (circular whorls of current). This eddy current causes the electrons to collide with the imperfections in the metal lattice and the collisions result in the production of heat - thus heating the conductor.