

7 (a) State Faraday's law of electromagnetic induction.

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 [2]

(b) A metal rod is accelerated uniformly from rest in a uniform magnetic field as shown in Fig. 7.1.

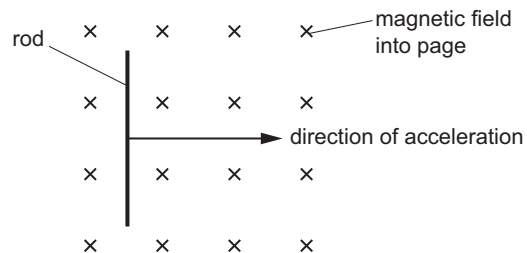


Fig. 7.1

The rod has length l and the flux density of the magnetic field is B .

An electromotive force (e.m.f.) is induced in the rod. The variation with time t of the induced e.m.f. E is shown in Fig. 7.2.

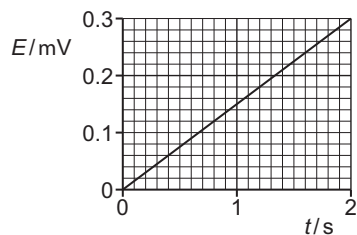


Fig. 7.2

(i) Explain how Fig. 7.2 shows that E is proportional to the velocity v of the rod.

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 [2]

(ii) Use Faraday's law to show that the variation of E with time t is given by

$$E = Blat$$

where a is the acceleration of the rod.

[3]

(iii) The length of the rod is 0.45 m. The acceleration a of the rod is 7.8 ms^{-2} .

Determine the value of B .

$B = \dots\dots\dots \text{ T}$ [2]

[Total: 9]