4

(a)

A coil of wire is situated in a uniform magnetic field of flux density *B*.

The coil has diameter 3.6 cm and consists of 350 turns of wire, as illustrated in Fig. 4.1.

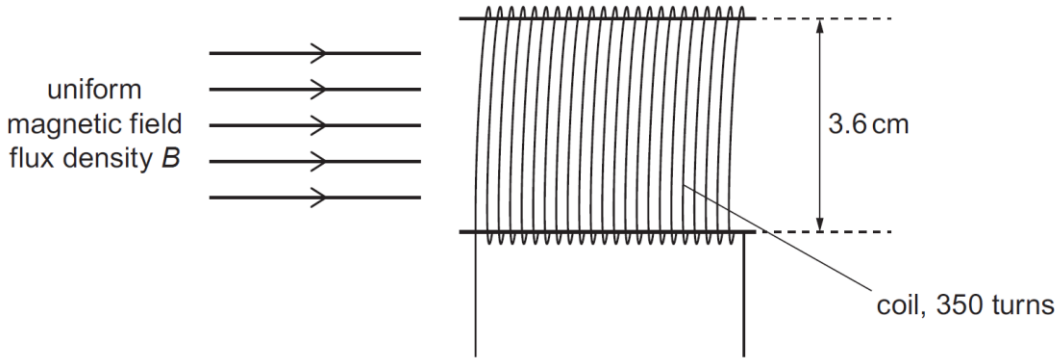

Fig. 4.1

The variation with time *t* of *B* is shown in Fig. 4.2.

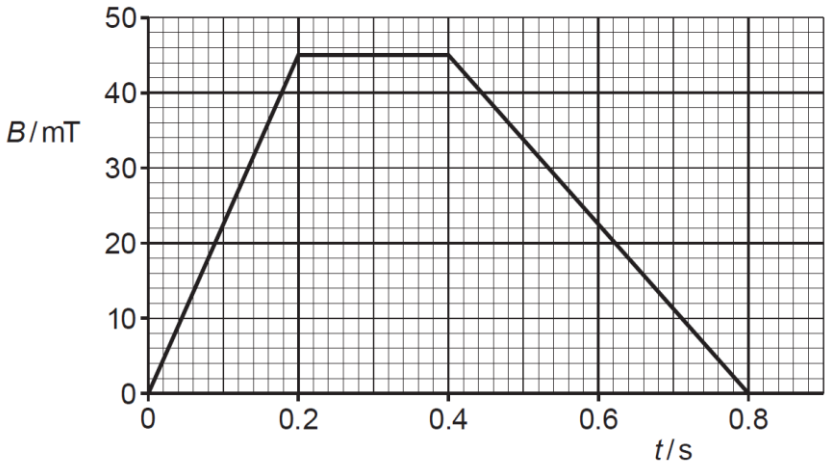

Fig. 4.2

(i)

Show that, for the time $t = 0$ to time $t = 0.20$ s, the electromotive force (e.m.f.) induced in the coil is 0.080 V.

[2]

(ii)

On the axes of Fig. 4.3, show the variation with time t of the induced e.m.f. E for time $t = 0$ to time $t = 0.80$ s.

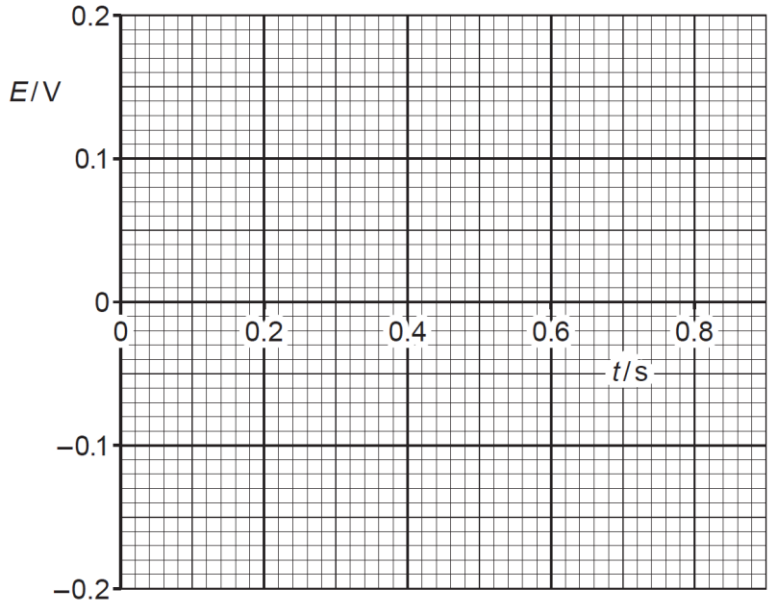

Fig. 4.3

[4]

(b)

A bar magnet is held a small distance above the surface of an aluminium disc by means of a rod, as illustrated in Fig. 4.4.

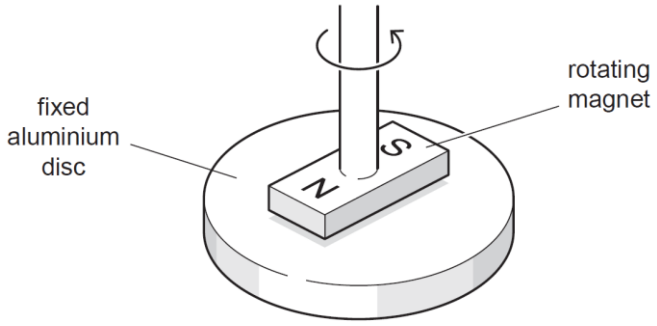

Fig. 4.4

The aluminium disc is supported horizontally and held stationary.

The magnet is rotated about a vertical axis at constant speed.

Use Faraday's law to explain why there is a force acting on the aluminium disc.

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