10 A small coil of wire is situated in a non-uniform magnetic field, as shown in Fig. 10.1.

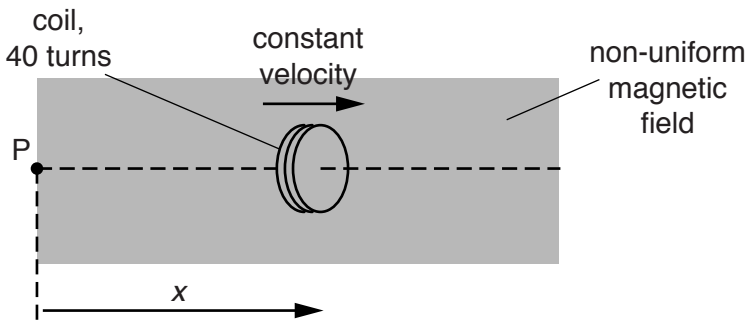

Fig. 10.1

The coil consists of 40 turns of wire and moves with a constant speed in a straight line. The coil has displacement x from a fixed point P.

The variation with x of the magnetic flux Φ in the coil is shown in Fig. 10.2.

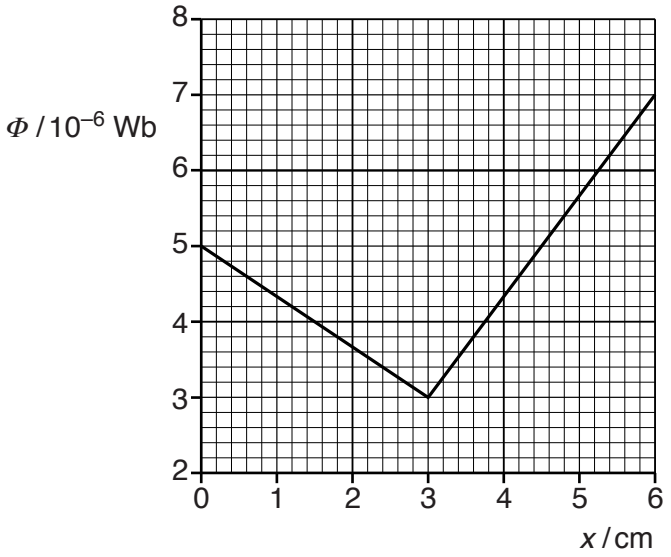

Fig. 10.2

(a) The coil is moved at constant speed between point P and the point where $x = 3.0\,\text{cm}$.

(i) Calculate the change in magnetic flux linkage of the coil.

change in flux linkage = ... Wb [1]

(ii) The e.m.f. induced in the coil is 5.0×10^{-4} V. Determine the speed of the coil.

speed = ... $m\,s^{-1}$ [2]

(b) On Fig. 10.3, sketch the variation with x of the e.m.f. E induced in the coil for values of x from $x = 0$ to $x = 6.0$ cm.

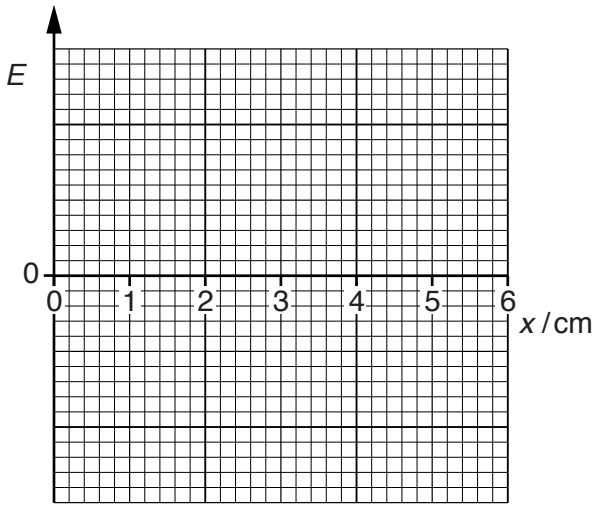

Fig. 10.3

[2]

[Total: 5]