

4 (a) State what is meant by *magnetic flux linkage*.

.....

.....

..... [2]

(b) Two coils, P and Q are wound onto an iron core, as shown in Fig. 4.1.

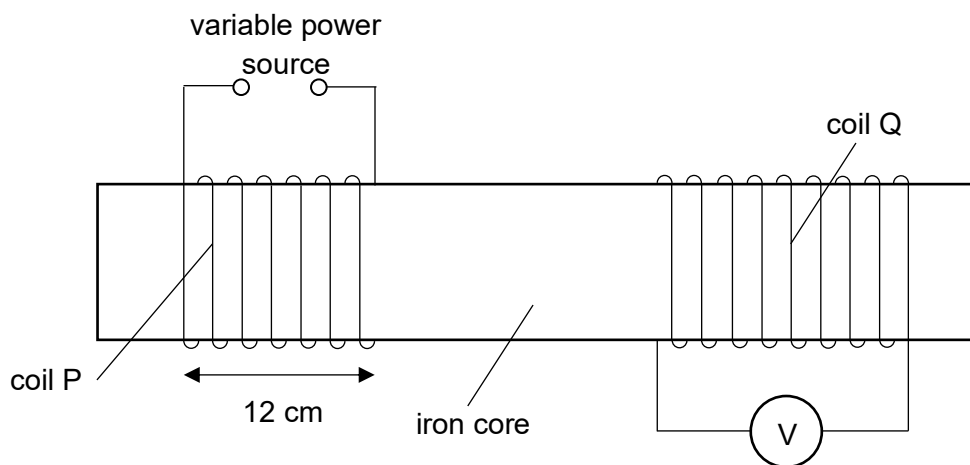


Fig. 4.1

Coil P contains 1800 turns of wire, has a length of 12 cm, and is connected to a variable power supply. Coil Q contains 2400 turns of wire and is connected to a voltmeter. The diameter of each turn of wire for both coils is 3.6 cm.

The variation with t of the current I in coil P is shown in Fig. 4.2.

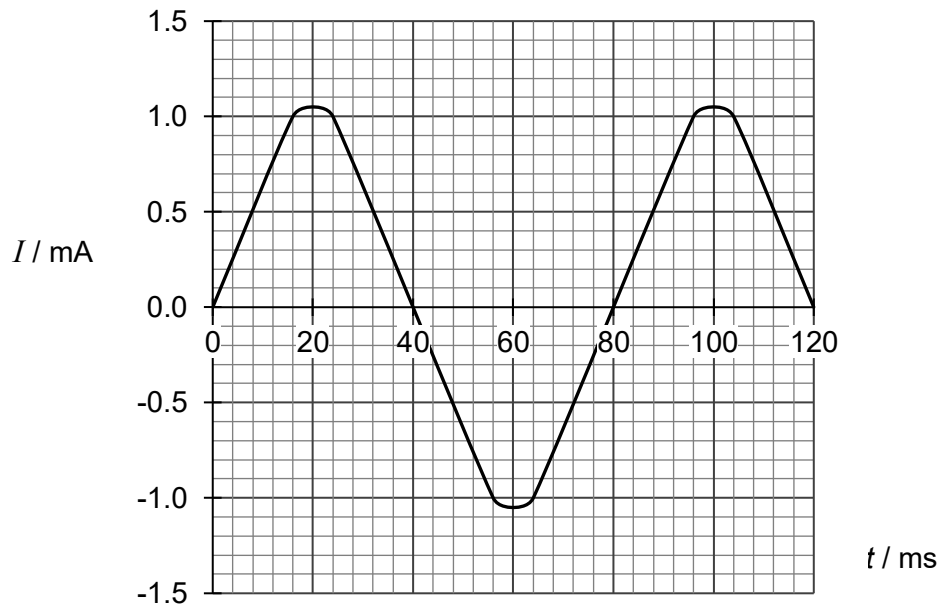


Fig. 4.2

(i) The permeability of the iron core is $1.0 \times 10^3 \mu_0$.

Show that the maximum magnetic flux ϕ in the iron core is $2.0 \times 10^{-5} \text{ Wb}$.

[2]

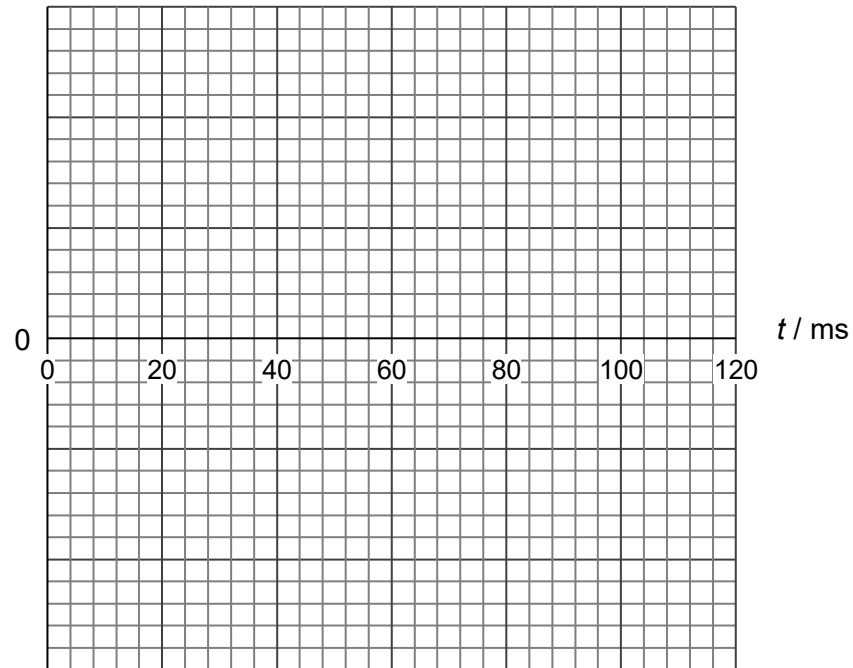
(ii) Determine the maximum reading recorded in the voltmeter.

reading = V [4]

(iii) Using your answers in **(i)** and **(ii)**, draw in Fig. 4.3 the variations with time t of the flux ϕ in the iron core and the reading V in the voltmeter.

Add a suitable scale to the vertical axis.

$\phi / \times 10^{-5} \text{ Wb}$



V / V

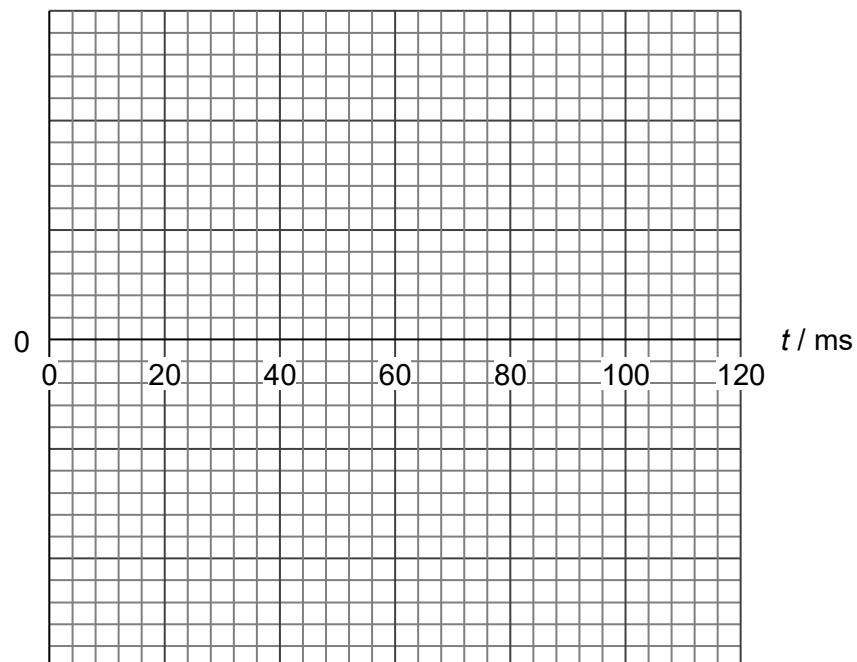


Fig. 4.3

[3]

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