6 A solenoid of length 15 cm, cross-sectional area $2.5 \times 10^{-4}\,\text{m}^2$, and 3000 turns is placed in the middle of a coil of 1500 turns as shown in Fig. 6.1. The solenoid is connected to a battery, a rheostat and an ammeter. The coil is connected to a galvanometer.
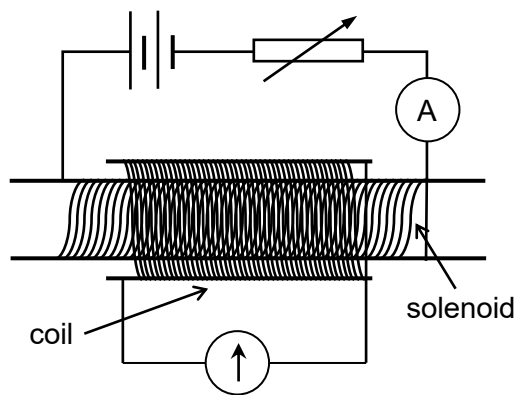

Fig. 6.1

[Turn over

Fig. 6.2 shows the variation with time t of the current I through the solenoid as the resistance of the rheostat is varied.

I / A

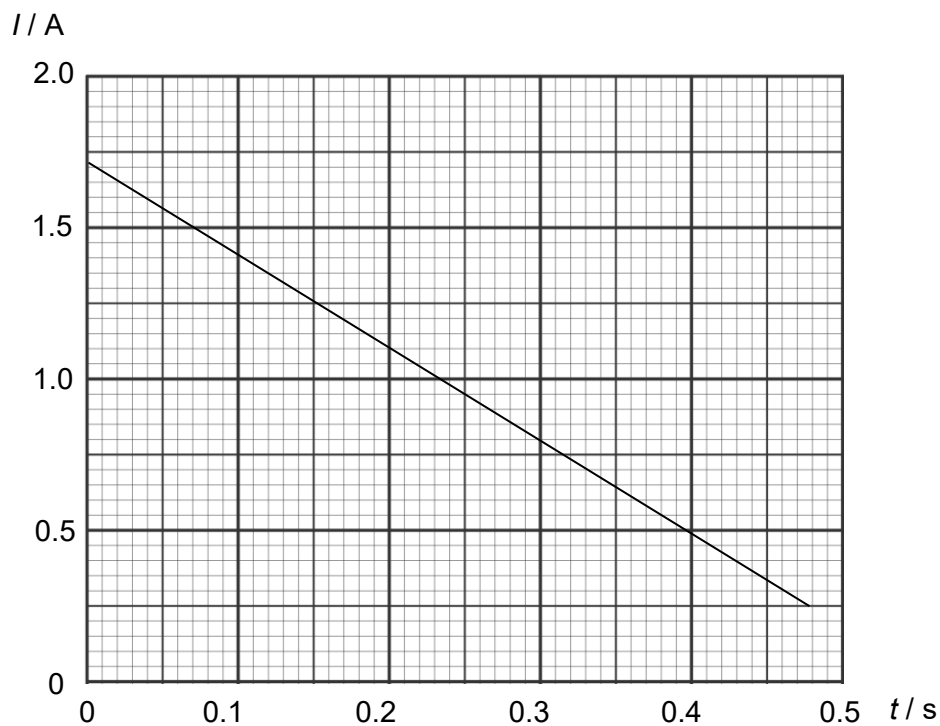**Fig. 6.2**

(i) Show that the magnetic flux density produced in the solenoid at $t = 0.070$ s is 3.77×10^{-2} T .

[2]

(ii) Calculate the e.m.f. induced in the coil.

emf = ... V   [3]

(iii) State and explain the direction of the current through the galvanometer.

....

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....

....

....

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.... [3]

[Total :8]