6 **(a)** A solenoid is connected in series with a battery and a switch, as illustrated in Fig. 6.1.
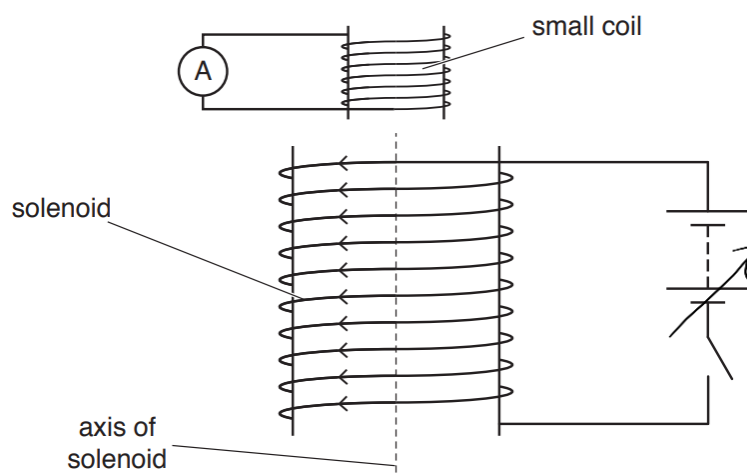

Fig. 6.1

A small coil, connected to a sensitive ammeter, is situated near one end of the solenoid. As the current in the solenoid is switched on, there is a deflection in the ammeter.

(i) State *Lenz's law*.

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…...…………………………………………………………………………………………………

…...……………………………………………………………………………………………… [1]

(ii) Use Lenz's law to state and explain the direction of the magnetic field in the small coil.

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…...…………………………………………………………………………………………………

…...……………………………………………………………………………………………… [3]

(iii) On Fig. 6.1, mark the direction of the induced current in the small coil. [1]

(b) The small coil has an area of cross-section $7.0 \times 10^{-4}\,\text{m}^2$ and contains 75 turns of wire. A constant current in the solenoid produces a uniform magnetic flux of flux density 1.4mT throughout the small coil. The current is switched off in a time of 0.12s.

Calculate the average e.m.f. induced in the small coil.

e.m.f. = ...V [3]

[Total: 8]