

- 5 (a) A solenoid is connected to a d.c. supply as shown in Fig. 5.1.

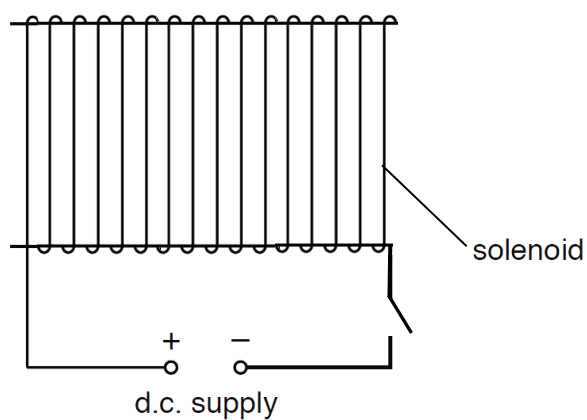


Fig. 5.1 (not drawn to scale)

Use laws of electromagnetic induction to explain why, when the switch is closed, the current increases **gradually** to its maximum value.

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.....[3]

- (b) The solenoid from part (a) has a coil C of wire wound tightly about its centre, as shown in Fig. 5.2.

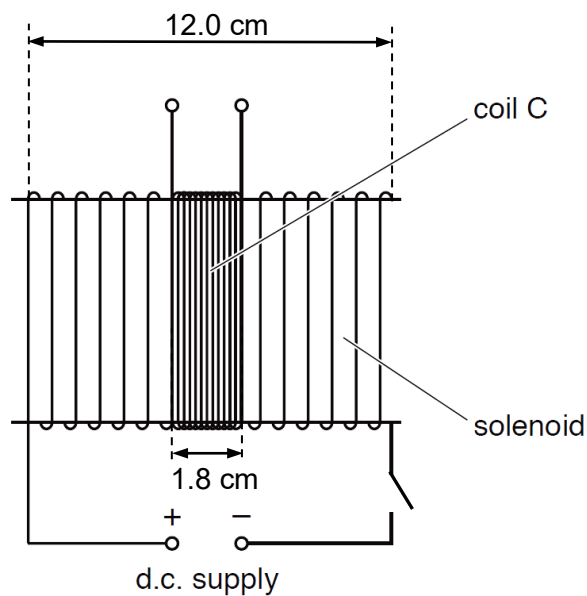


Fig. 5.2 (not drawn to scale)

The solenoid has length 12.0 cm and circumference 8.8 cm, and consists of 360 turns.
The coil C has length 1.8 cm and consists of 96 turns.

- (i) Define *magnetic flux*.

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- (ii) When the switch is closed, the current in the solenoid is 2.5 A.

Show that the magnetic flux in coil C is 5.8×10^{-6} Wb.

- (iii) Calculate the average electromotive force (e.m.f.) induced in coil C when the current in (b)(ii) is reversed in the solenoid in a time of 2.4 ms.

e.m.f =V [2]

- (iv) The d.c. supply in Fig. 5.1 is now replaced with a sinusoidal alternating supply.

Describe qualitatively the e.m.f. that is now induced in coil C.

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[Total: 11]

