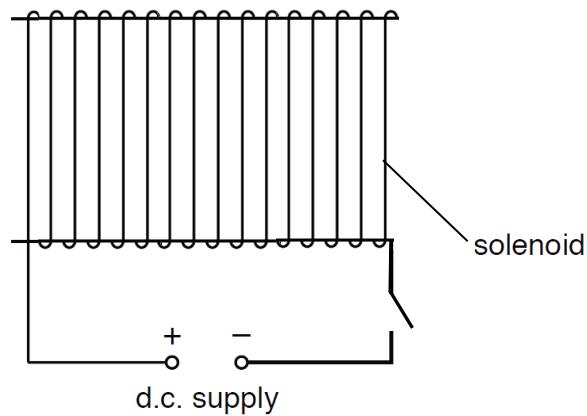


- 5 (a) A solenoid is connected to a d.c. supply as shown in Fig. 5.1.



**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.

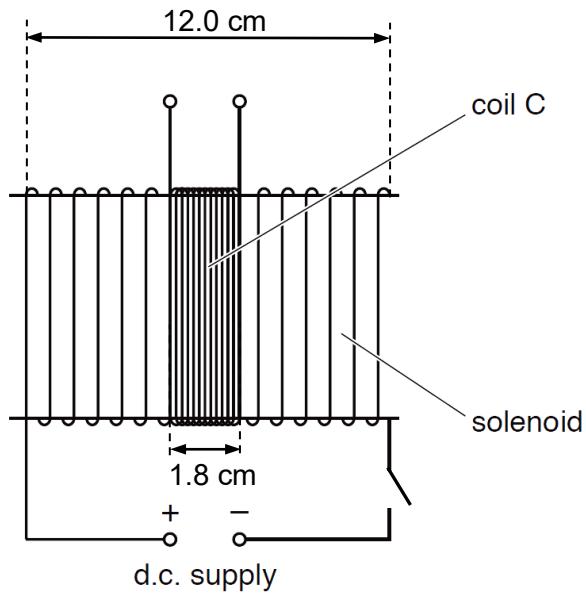
.....

.....

.....

..... [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*.

..... [1]

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

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

[3]

- (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.

$$\text{e.m.f} = \dots \text{V} [2]$$

- (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.

.....  
.....

..... [2]

[Total: 11]



