9 **(a)** State Faraday's law of electromagnetic induction.

.....

.....

.....

..... [2]

(b) The diameter of the cross-section of a long solenoid is 3.2 cm, as shown in Fig. 9.1.

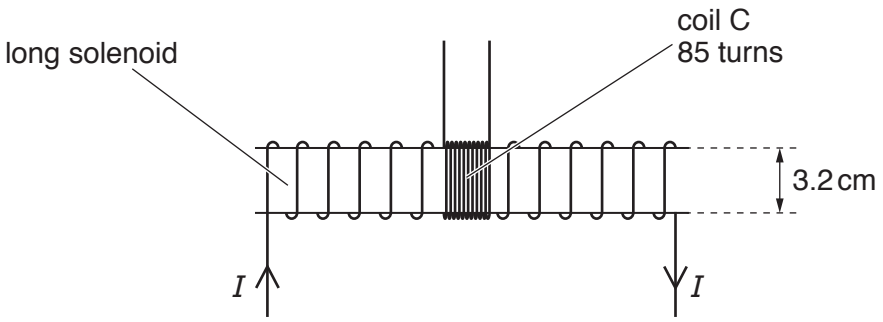

Fig. 9.1

A coil C, with 85 turns of wire, is wound tightly around the centre region of the solenoid.

The magnetic flux density B, in tesla, at the centre of the solenoid is given by the expression

$$B = \pi \times 10^{-3} \times I$$

where I is the current in the solenoid in ampere.

Show that, for a current I of 2.8 A in the solenoid, the magnetic flux linkage of the coil C is 6.0×10^{-4} Wb.

[1]

(c) The current I in the solenoid in **(b)** is reversed in 0.30 s.

Calculate the mean e.m.f. induced in coil C.

e.m.f. = ... mV [2]

(d) The current I in the solenoid in **(b)** is now varied with time t as shown in Fig. 9.2.

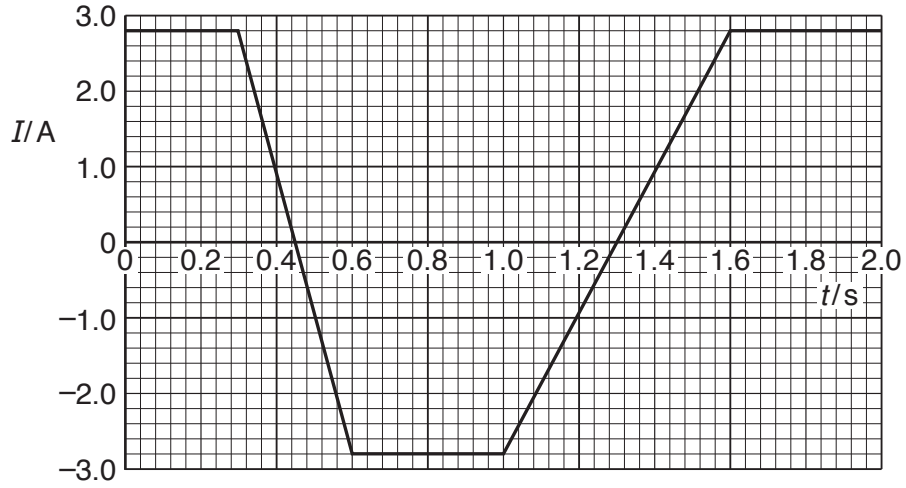

Fig. 9.2

Use your answer to **(c)** to show, on Fig. 9.3, the variation with time t of the e.m.f. E induced in coil C.

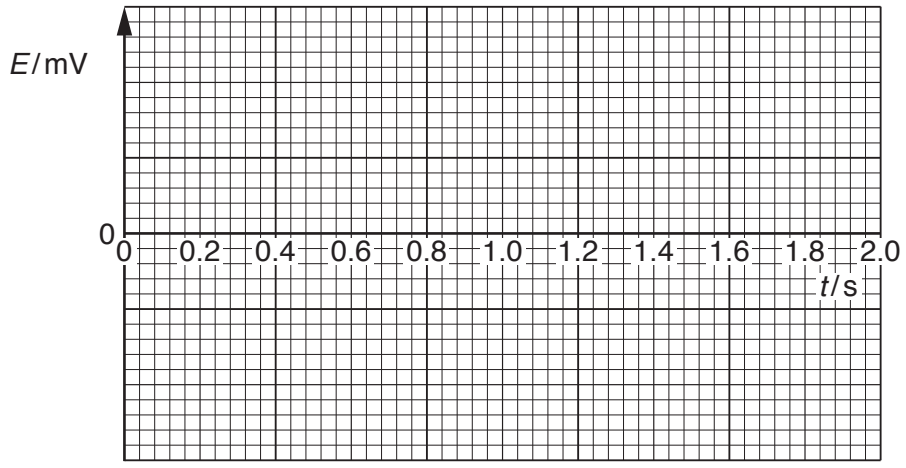

Fig. 9.3

[4]

[Total: 9]