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

....

....

[2]

....

....

(b) The diameter of the cross-section of a long solenoid is 3.2 cm. The solenoid has 2500 turns per metre length as shown in Fig. 5.1.

long solenoid with turns per metre length = 2500
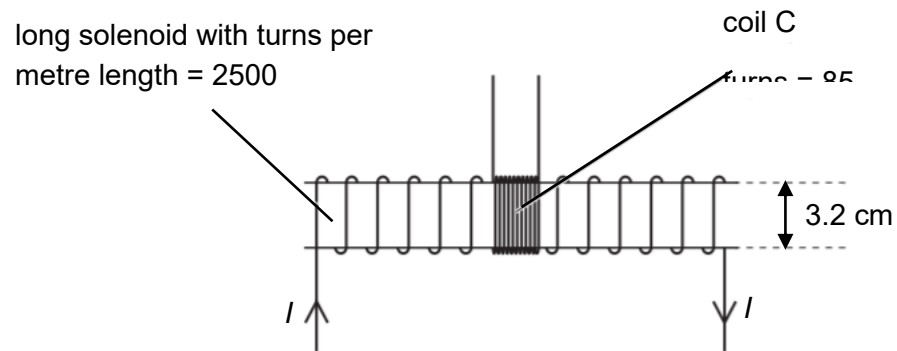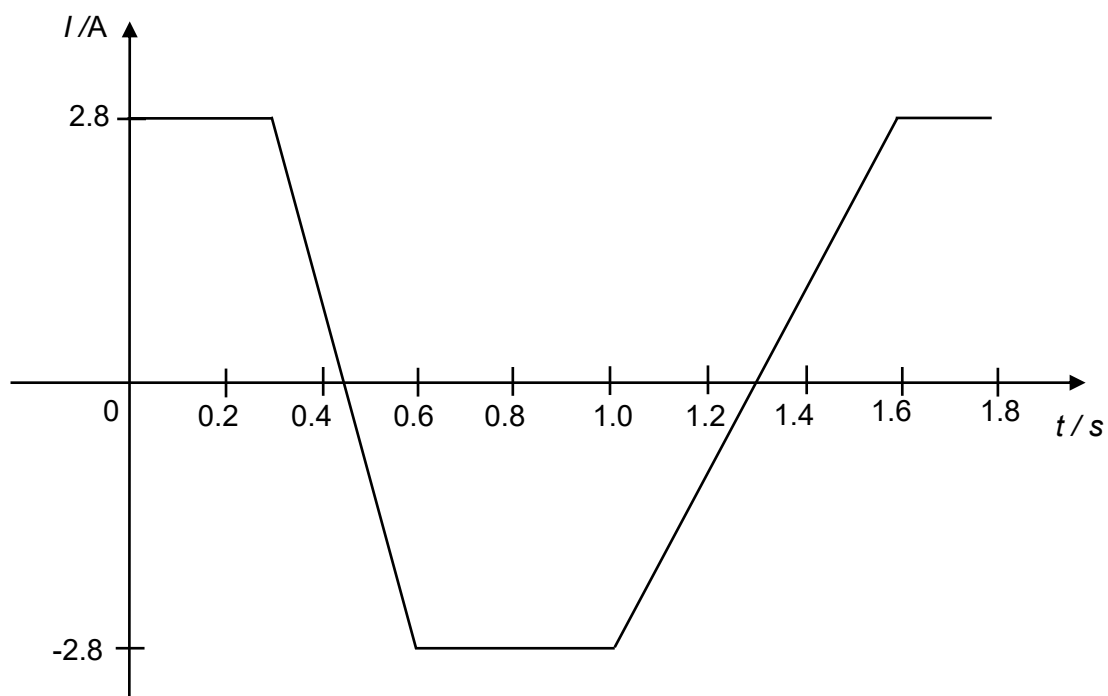
coil C

turns = 85

3.2 cm

I

I

Fig. 5.1

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

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.

[2]

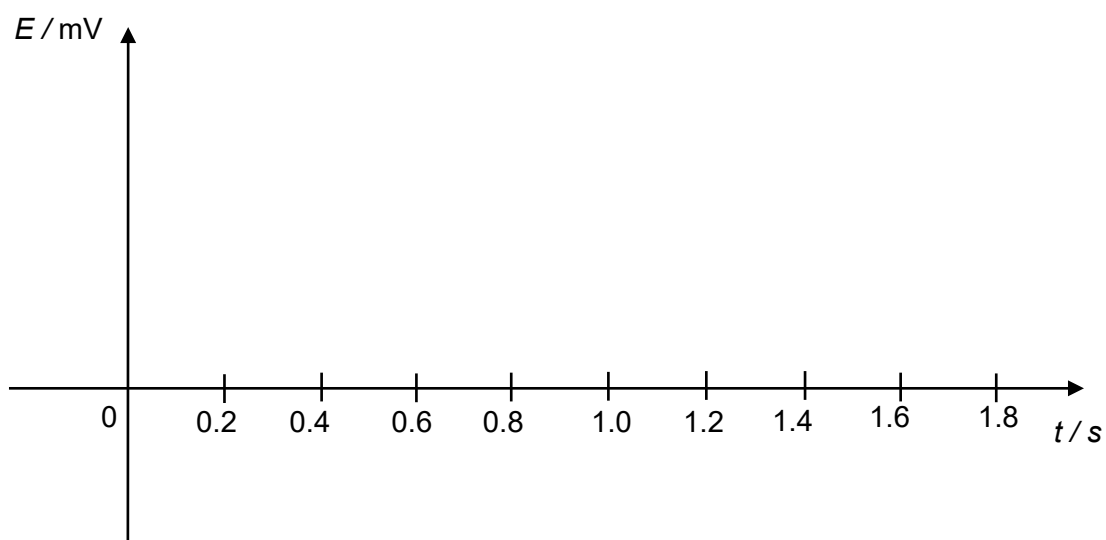(c)   Fig. 5.2 shows the variation with time *t* of current *I* in the solenoid in (b).

Fig. 5.2

Calculate the mean e.m.f. induced in coil C between t = 0.3 s and t = 0.6 s.

[2]

e.m.f. = ……………..……………. mV

(d) Use your answer to **(c)** to sketch on Fig. 5.3, the variation with time t of the e.m.f. E induced in coil C.

E / mV

0   0.2   0.4   0.6   0.8   1.0   1.2   1.4   1.6   1.8 t / s

[4]

Fig. 5.3