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

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.....

.....[2]

(b) Two coils, P and S, are wound on an iron core, as shown in Fig. 5.1.

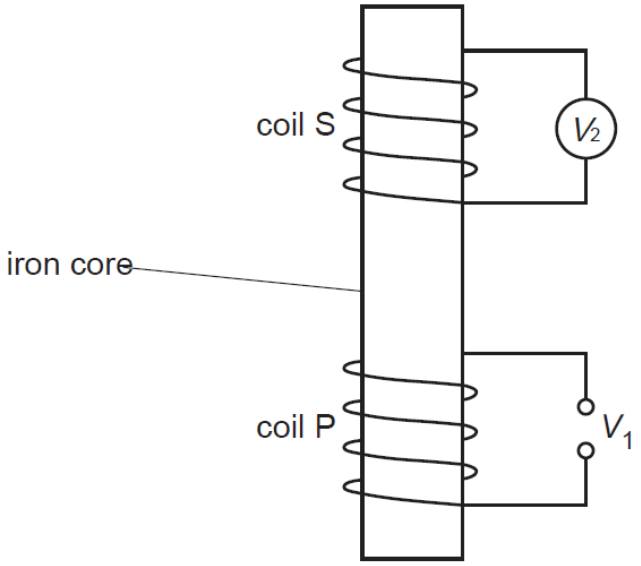

Fig. 5.1

Coil P is connected to a potential difference (p.d.) V_1 that gives rise to a magnetic field in the iron core.

Fig. 5.2 shows the variation with time t of the magnetic flux density B in the iron core.

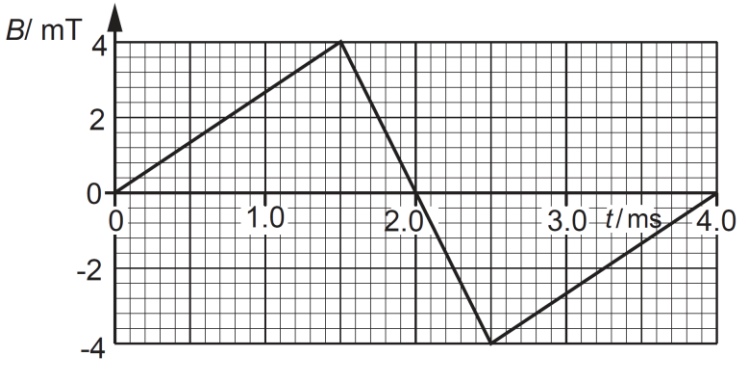

Fig. 5.2

Coil S contains 250 turns of wire. Each turn of wire has a diameter of 2.5 cm. A voltmeter measures the electromotive force (e.m.f.) V_2 that is induced across coil S.

Use data from Fig. 5.2 to determine the maximum electromotive force (e.m.f.) induced in coil S.

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

(c) On Fig. 5.3, sketch the variation with t of V_2 between t = 0 and t = 4.0 ms.

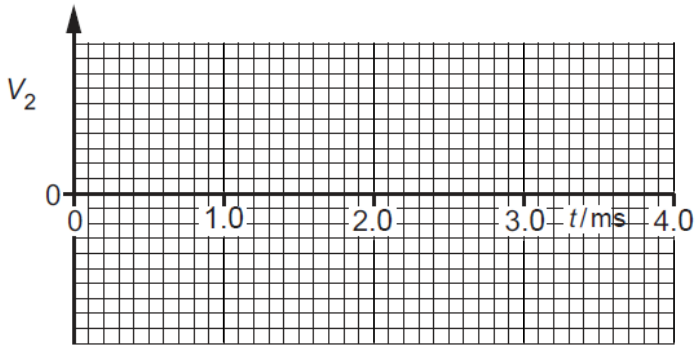

Fig. 5.3

[4]

(d) Coil S in **(b)** is now replaced with a copper ring that rests loosely on top of coil P. The supply to coil P is replaced with a cell and a switch that is initially open, as shown in Fig. 5.4.

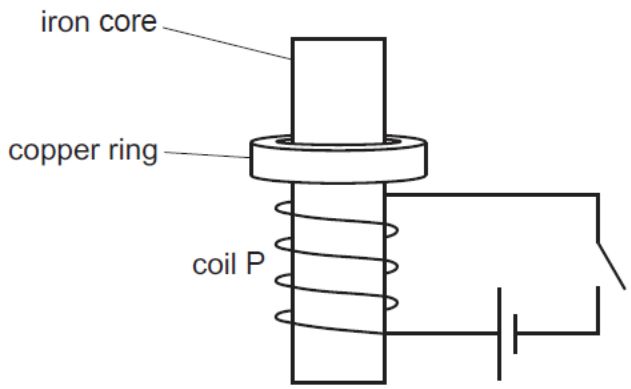

Fig. 5.4

(i) The switch is now closed. As it is closed, the copper ring is observed to move vertically upwards on the iron core.

Explain why this happens.

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……[4]

(ii) Suggest, with a reason, what would be the effect on the ring of repeating the procedure in **(d)(i)** with the terminals of the cell reversed.

……

……...[1]

[Total: 14]

[Turn over