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

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..... [2]

(b) Two coils are wound on an iron bar, as shown in Fig. 7.1.

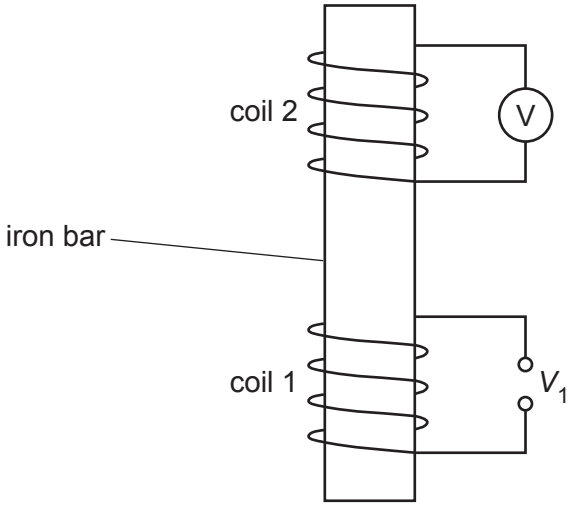

Fig. 7.1

Coil 1 is connected to a potential difference (p.d.) V_1 that gives rise to a magnetic field in the iron bar.

Fig. 7.2 shows the variation with time t of the magnetic flux density B in the iron bar.

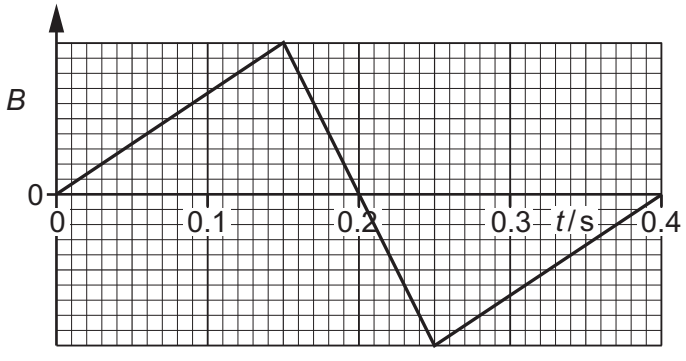

Fig. 7.2

A voltmeter measures the electromotive force (e.m.f.) V_2 that is induced across coil 2.

On Fig. 7.3, sketch the variation with t of V_2 between $t = 0$ and $t = 0.40\,s$.

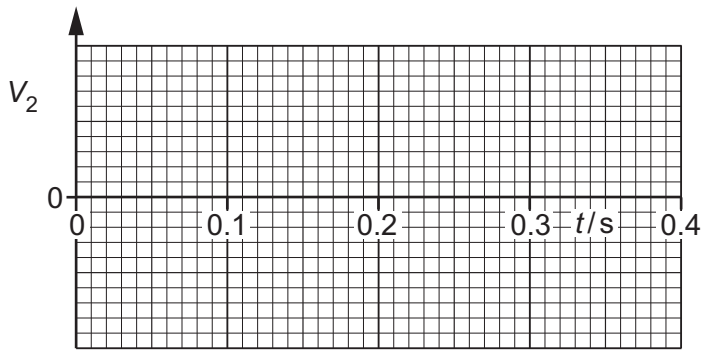

Fig. 7.3

[4]

(c) Coil 2 in **(b)** is now replaced with a copper ring that rests loosely on top of coil 1. The supply to coil 1 is replaced with a cell and a switch that is initially open, as shown in Fig. 7.4.

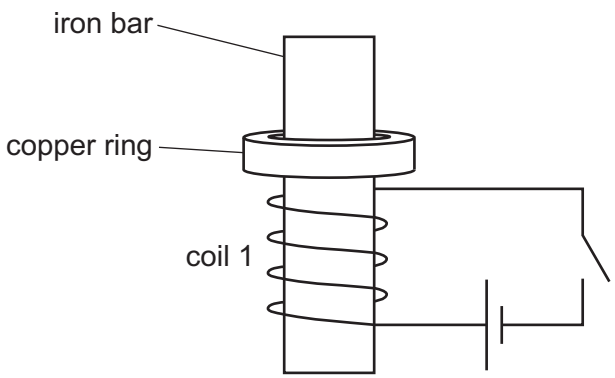

Fig. 7.4

(i) The switch is now closed. As it is closed, the copper ring is observed to jump upwards.

Explain why this happens.

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..... [3]

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

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..... [1]

[Total: 10]