

9 (a) Define *magnetic flux linkage*.

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..... [2]

(b) A solenoid of diameter 6.0 cm and 540 turns is placed in a uniform magnetic field as shown in Fig. 9.1.

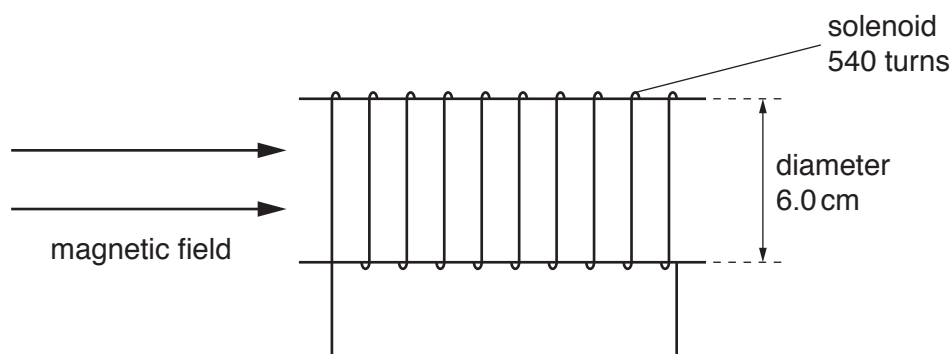


Fig. 9.1

The variation with time  $t$  of the magnetic flux density is shown in Fig. 9.2.

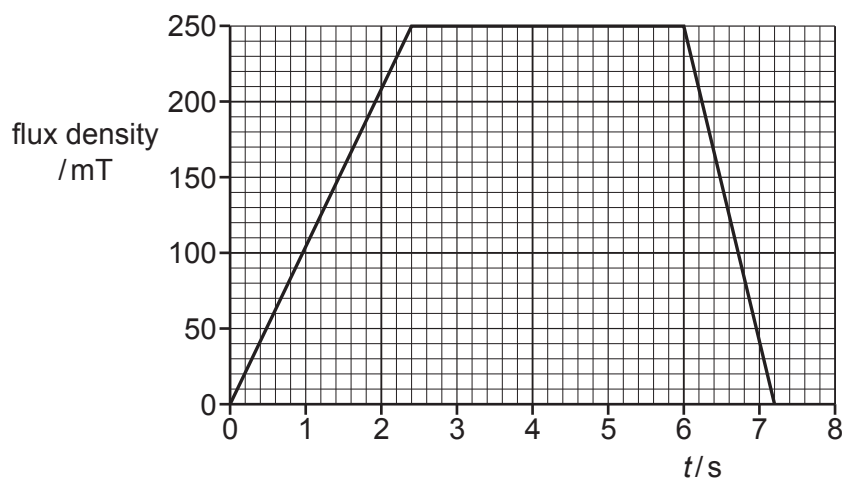
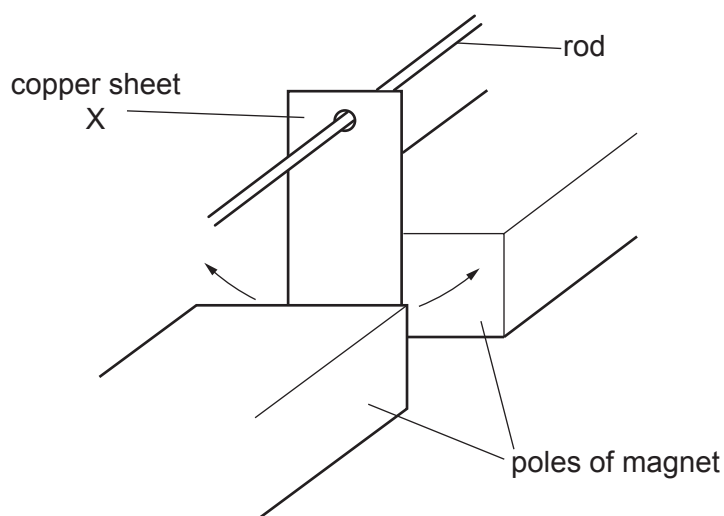


Fig. 9.2

Calculate the maximum magnitude of the induced electromotive force (e.m.f.) in the solenoid.

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

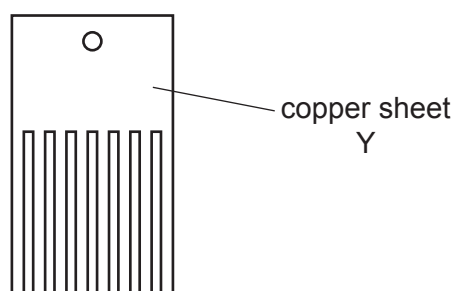
- (c) A thin copper sheet X is supported on a rigid rod so that it hangs between the poles of a magnet as shown in Fig. 9.3.



**Fig. 9.3**

Sheet X is displaced to one side and then released so that it oscillates. A motion sensor is used to record the displacement of X.

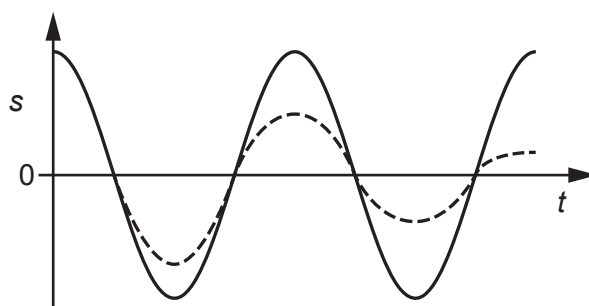
A second thin copper sheet Y replaces sheet X. Sheet Y has the same overall dimensions as X but is cut into the shape shown in Fig. 9.4.



**Fig. 9.4**

The motion sensor is again used to record the displacement.

The graph in Fig. 9.5 shows the variation with time  $t$  of the displacement  $s$  of each copper sheet.



**Fig. 9.5**

- (i) State the name of the phenomenon illustrated by the gradual reduction in the amplitude of the dashed line.

..... [1]

- (ii) Deduce which copper sheet is represented by the dashed line. Explain your answer using the principles of electromagnetic induction.

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..... [4]