

Chapter 15
Short answer question

This question is about a student's investigation of the magnetic flux in an iron rod.

An iron rod is placed in the centre of a coil carrying alternating current as shown in Fig. 1. The student detects the flux by means of a probe coil wrapped around the rod. This coil is connected to an oscilloscope which displays the trace of amplitude 1 square shown in Fig. 2.

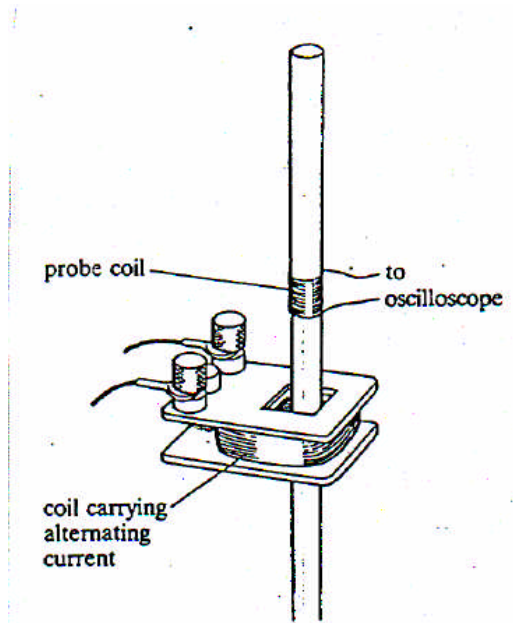


Fig. 1

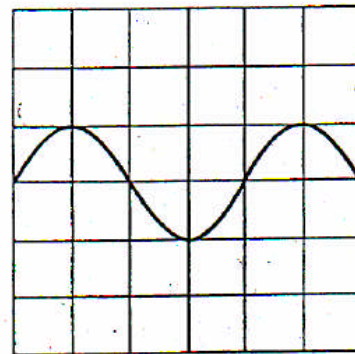
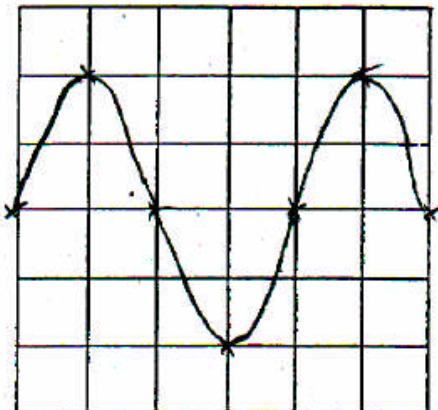


Fig. 2

Sketch and explain the effect on the oscilloscope trace of each of the following changes. Each change is made separately and starts from the situation shown above. Give quantitative answers wherever possible.

Use $e = -N \frac{d\mathbf{f}}{dt}$ where $\mathbf{f} = \mathbf{B} \times \mathbf{A}$

- (a) The number of turns on the probe coil is doubled.

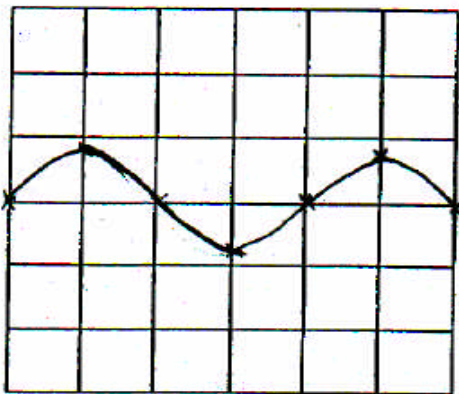


N doubles

e doubles

$$\left(\frac{df}{dt} \text{ constant}\right)$$

- (b) The probe coil is placed at the top of the rod.

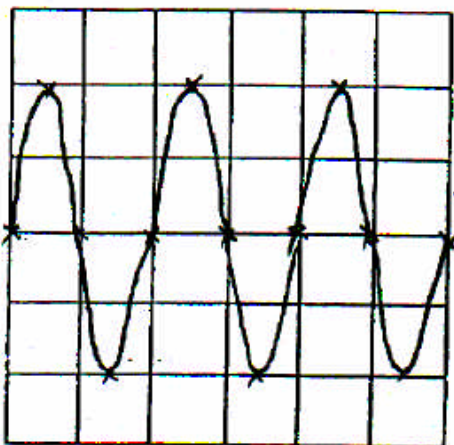


f escapes

df is less

e is less

- (c) The frequency of the supply to the magnetising coil is doubled, maintaining a constant amplitude alternating current from the supply.



Frequency doubles

$$\frac{df}{dt} \text{ doubles}$$

e doubles