

- 5 (a) State the relation between magnetic flux density  $B$  and magnetic flux  $\Phi$ , explaining any other symbols you use.

For  
Examiner's  
Use

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 .....[2]

- (b) A large horseshoe magnet has a uniform magnetic field between its poles. The magnetic field is zero outside the space between the poles.  
 A small Hall probe is moved at constant speed along a line XY that is midway between, and parallel to, the faces of the poles of the magnet, as shown in Fig. 5.1.

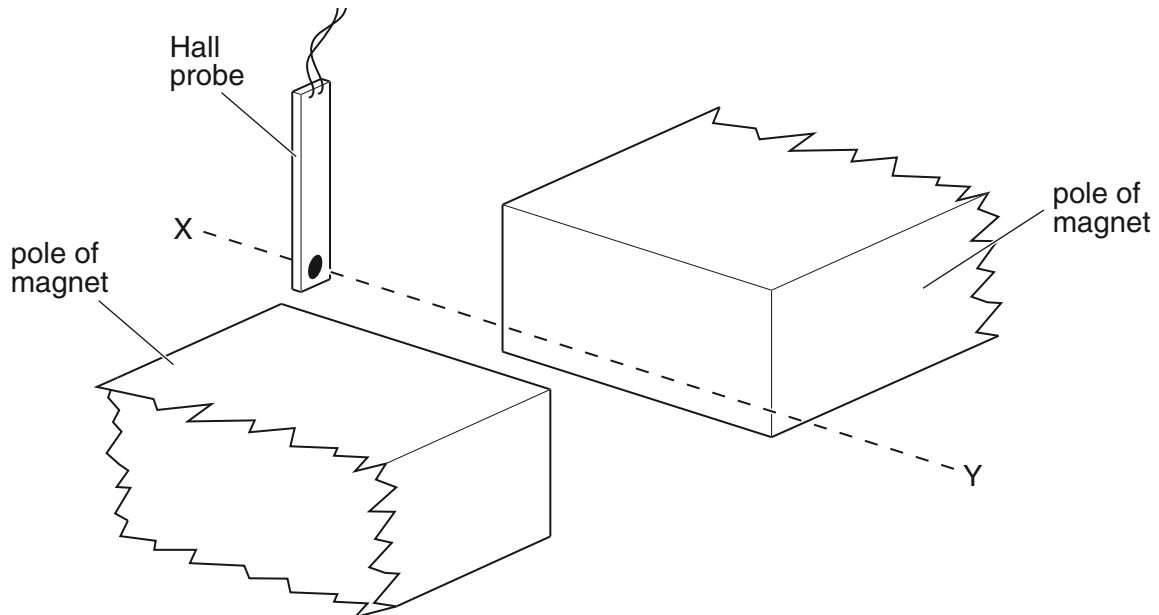


Fig. 5.1

An e.m.f. is produced by the Hall probe when it is in the magnetic field.  
The angle between the plane of the probe and the direction of the magnetic field is not varied.

For  
Examiner's  
Use

On the axes of Fig. 5.2, sketch a graph to show the variation with time  $t$  of the e.m.f.  $V_H$  produced by the Hall probe.

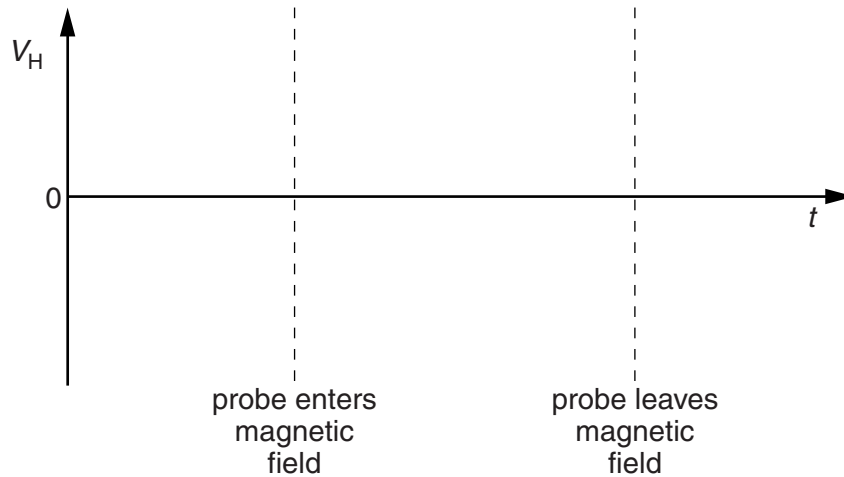


Fig. 5.2

[2]

- (c) (i) State Faraday's law of electromagnetic induction.

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- (ii) The Hall probe in (b) is replaced by a small flat coil of wire. The coil is moved at constant speed along the line XY. The plane of the coil is parallel to the faces of the poles of the magnet.

On the axes of Fig. 5.3, sketch a graph to show the variation with time  $t$  of the e.m.f.  $E$  induced in the coil.

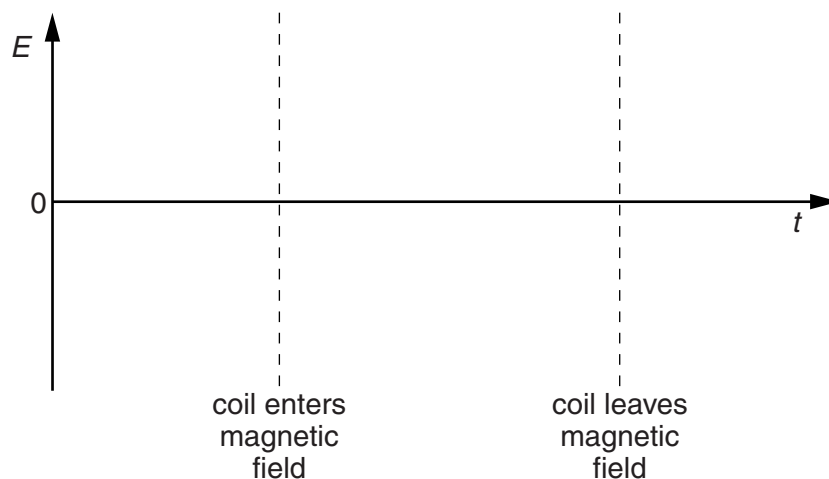


Fig. 5.3

[3]