5 **(a)** An incomplete diagram for the magnetic flux pattern due to a current-carrying solenoid is illustrated in Fig. 5.1.

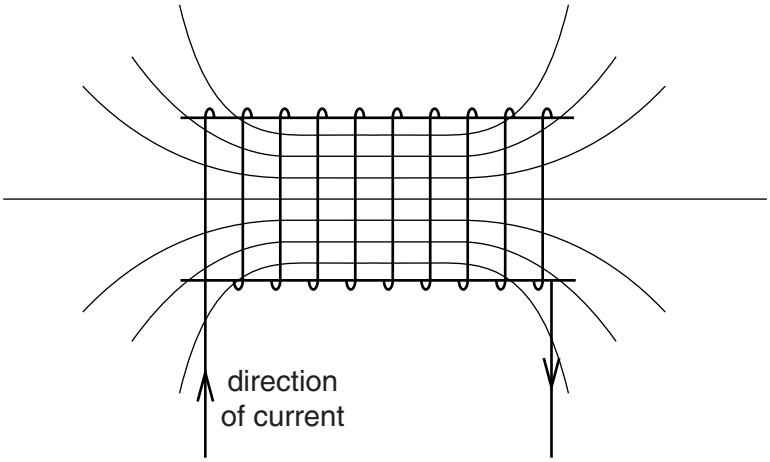

Fig. 5.1

(i) On Fig. 5.1, draw arrows on the field lines to show the direction of the magnetic field. [1]

(ii) State the feature of Fig. 5.1 that indicates that the magnetic field strength at each end of the solenoid is less than that at the centre.

.....[1]

(b) A Hall probe is placed near one end of the solenoid in **(a)**, as shown in Fig. 5.2.

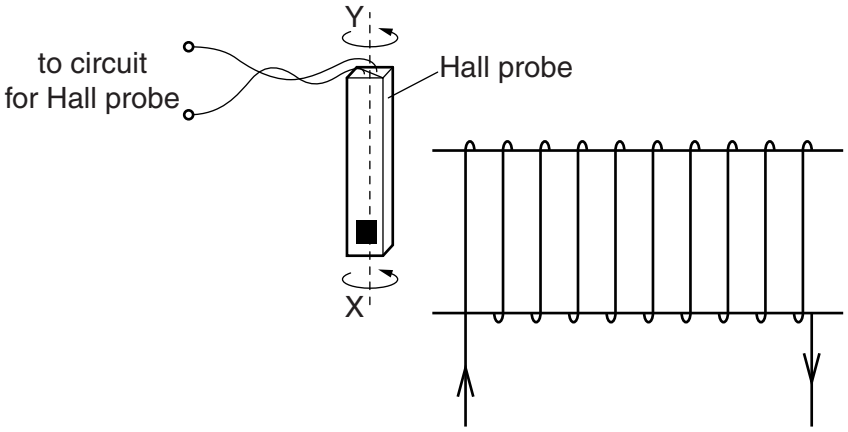

Fig. 5.2

The Hall probe is rotated about the axis XY. State and explain why the magnitude of the Hall voltage varies.

.....

.....

.....[2]

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

For Examiner's Use

.....

.....

.....[2]

(ii) The Hall probe in **(b)** is replaced by a small coil of wire connected to a sensitive voltmeter.
State three different ways in which an e.m.f. may be induced in the coil.

1. .....

.....

2. .....

.....

3. .....

.....
[3]