5 Fig. 5.1 shows the view along the axis of a solenoid. The solenoid is 0.30 m in length and has 50 turns. It has a current of 2.0 A flowing through it.

An electron located at the centre of the solenoid is moving to the right.

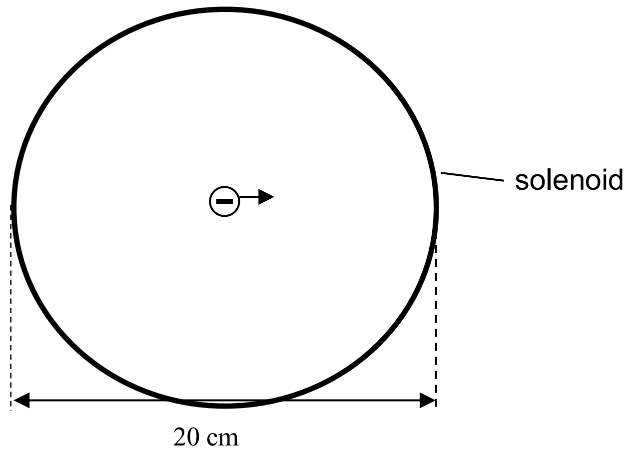

Fig. 5.1

(a) **(i)** State what is meant by *magnetic flux density*.

……………………………………………………………………………………………..

……………………………………………………………………………………………..

……………………………………………………………………………………… [1]

(ii) Indicate on Fig. 5.1, the direction of current flowing through the solenoid for the electron to experience a downward force.

[1]

(iii) Calculate the magnetic flux density B at centre of solenoid.

magnetic flux density = …………………….. T [1]

(iv) Hence, determine the magnetic force acting on the electron if it is moving with a speed of 10 m s^{-1}.

force = …………………….. N [2]

(v) Explain why the force experienced by the electron due to the magnetic force does not change the speed of the electron.

……………………………………………………….…………………………..

……………………………………………………….…………………………..

……………………………………………………….…………………… [2]

(b) A uniform electric field is now applied in the region of magnetic field within the solenoid so that the electron can move to the right undeflected.

(i) Calculate the magnitude of the electric field strength *E*.

electric field strength = ……………… V m^{-1} [2]

(ii) Indicate on Fig. 5.1 with an arrow, the direction of the electric field. [1]