

Question 25 (6 marks)

A pair of parallel metal plates, placed in a vacuum, are separated by a distance of 5.00×10^{-3} m and have a potential difference of 1000 V applied to them.

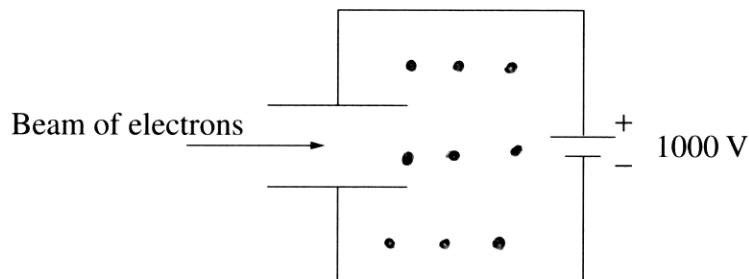
- (a) Calculate the magnitude of the electric field strength between the plates. 1

$$\frac{1000}{5.00 \times 10^{-3}} \times k = 0.04$$

- (b) Calculate the magnitude of the electrostatic force acting on an electron between the plates. 1

$$0.4$$

- (c) A beam of electrons is fired with a velocity of 3.00×10^6 m s⁻¹ between the plates as shown. A magnetic field is applied between the plates, sufficient to cancel the force on the electron beam due to the electric field. 4



Calculate the magnitude and direction of the magnetic field required between the plates to stop the deflection of the electron beam.

$$\frac{1000}{3.00 \times 10^6} \times k = 6.7 \times 10^{-11}$$

Direction is into the page.