

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

$F = BIL \sin \theta$

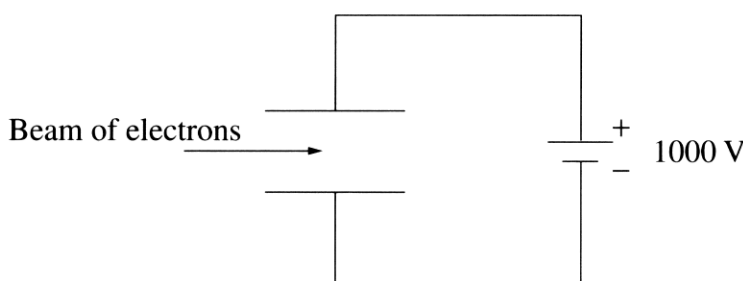
 $F =$

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

9.109×10^{-31}

 $M = m - 5 \log \left(\frac{d}{10} \right) = 16.5 \text{ N}$

- (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.

into the page is the direction

$\Sigma F = ma$

 $\Sigma F = 9.109 \times 10^{-31} \times 3 \times 10^6$

magnetic field of 2.7×10^{-24} into the page
