

Ex 11.1

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$$\underline{B} = B \cos 70^\circ \underline{j} - B \sin 70^\circ \underline{k}$$

$$(B = 5 \times 10^{-5} \text{ T})$$

$$\underline{v} = 10^7 \underline{j} \text{ m s}^{-1}$$

$$q = +e.$$

$$\underline{F}_m = +e \underline{v} \wedge \underline{B}$$

$$= 1.6 \times 10^{-19} \times 10^7 \begin{vmatrix} \underline{i} & \underline{j} & \underline{k} \\ 0 & 1 & 0 \\ 0 & B_y & B_z \end{vmatrix}$$

$$= 1.6 \times 10^{-12} \left\{ \underline{i} (B_z - 0) - \underline{j} (0 - 0) + \underline{k} (0 - 0) \right\}$$

$$= 1.6 \times 10^{-12} B_z \underline{i}$$

$$= 1.6 \times 10^{-12} \times 5 \times 10^{-5} \sin 70^\circ \underline{i}$$

$$= 7.5 \times 10^{-17} \underline{i} \text{ N}$$

(1)

$$\boxed{\text{Em 1 Ex 11.2}}$$

electron: $q = -1.6 \times 10^{-19} \text{ C}$

$$\underline{v} : (2\underline{i} - 3\underline{j}) \times 10^6 \text{ ms}^{-1}$$

$$\underline{B} : (0.8\underline{i} + 0.6\underline{j} - 0.4\underline{k}) \text{ T}$$

$$\begin{aligned} \underline{F}_m &= -1.6 \times 10^{-19} \times 10^6 \begin{vmatrix} \underline{i} & \underline{j} & \underline{k} \\ 2 & -3 & 0 \\ 0.8 & 0.6 & -0.4 \end{vmatrix} \\ &= -1.6 \times 10^{-13} \left[\underline{i}(1.2 - 0) - \underline{j}(-0.8 - 0) \right. \\ &\quad \left. + \underline{k}(1.2 + 2.4) \right] \\ &= -1.6 \times 10^{-13} \left[1.2\underline{i} + 0.8\underline{j} + 3.6\underline{k} \right] \\ &= (-1.92\underline{i} - 1.28\underline{j} - 5.76\underline{k}) \times 10^{-13} \text{ N} \end{aligned}$$

$$\begin{aligned} |\underline{F}_m| &= \sqrt{F_x^2 + F_y^2 + F_z^2} \\ &= 6.2 \times 10^{-13} \text{ N} = 0.62 \text{ pN} \quad (2) \end{aligned}$$