6. (a) The net force on the proton is given by

$$\begin{aligned}\vec{F} &= \vec{F}_E + \vec{F}_B = q\vec{E} + q\vec{v} \times \vec{B} \\ &= (1.6 \times 10^{-19}\,\mathrm{C})[(4.0\,\mathrm{V/m})\hat{\mathrm{k}} + (2000\,\mathrm{m/s})\hat{\mathrm{j}} \times (-2.5\,\mathrm{mT})\hat{\mathrm{i}}] \\ &= (1.4 \times 10^{-18}\ \mathrm{N})\ \hat{\mathrm{k}}\ .\end{aligned}$$

(b) In this case

$$\begin{aligned}\vec{F} &= \vec{F}_E + \vec{F}_B = q\vec{E} + q\vec{v} \times \vec{B} \\ &= (1.6 \times 10^{-19}\,\mathrm{C})[(-4.0\,\mathrm{V/m})\hat{\mathrm{k}} + (2000\,\mathrm{m/s})\hat{\mathrm{j}} \times (-2.5\,\mathrm{mT})\hat{\mathrm{i}}] \\ &= (1.6 \times 10^{-19}\ \mathrm{N})\ \hat{\mathrm{k}}\ .\end{aligned}$$

(c) In the final case,

$$\begin{aligned}\vec{F} &= \vec{F}_E + \vec{F}_B = q\vec{E} + q\vec{v} \times \vec{B} \\ &= (1.6 \times 10^{-19}\,\mathrm{C})[(4.0\,\mathrm{V/m})\hat{\mathrm{i}} + (2000\,\mathrm{m/s})\hat{\mathrm{j}} \times (-2.5\,\mathrm{mT})\hat{\mathrm{i}}] \\ &= (6.4 \times 10^{-19}\,\mathrm{N})\,\hat{\mathrm{i}} + (8.0 \times 10^{-19}\ \mathrm{N})\,\hat{\mathrm{k}}\ .\end{aligned}$$

The magnitude of the force is now

$$\sqrt{F_x^2 + F_y^2 + F_z^2} = \sqrt{(6.4 \times 10^{-19}\,\mathrm{N})^2 + 0 + (8.0 \times 10^{-19}\,\mathrm{N})^2} = 1.0 \times 10^{-18}\ \mathrm{N}\ .$$