

76. (a) From $m = B^2 q x^2 / 8V$ we have $\Delta m = (B^2 q / 8V)(2x \Delta x)$. Here $x = \sqrt{8Vm / B^2 q}$, which we substitute into the expression for Δm to obtain

$$\Delta m = \left(\frac{B^2 q}{8V} \right) 2 \sqrt{\frac{8mV}{B^2 q}} \Delta x = B \sqrt{\frac{mq}{2V}} \Delta x .$$

- (b) The distance between the spots made on the photographic plate is

$$\begin{aligned} \Delta x &= \frac{\Delta m}{B} \sqrt{\frac{2V}{mq}} \\ &= \frac{(37 \text{ u} - 35 \text{ u})(1.66 \times 10^{-27} \text{ kg/u})}{0.50 \text{ T}} \sqrt{\frac{2(7.3 \times 10^3 \text{ V})}{(36 \text{ u})(1.66 \times 10^{-27} \text{ kg/u})(1.60 \times 10^{-19} \text{ C})}} \\ &= 8.2 \times 10^{-3} \text{ m} . \end{aligned}$$