2-40

Given
- $d = 3.8\text{cm} = .038\text{m}$
- $V_F = 1.2\times10^7 \frac{m}{s}$

Assume · $V_0 = 0\frac{m}{s}$

(a) Find acceleration.

(Eq 2-11) $V_F^2 = V_0^2 + 2a(x - x_0)$ Solve for a

$$a = \frac{V_F^2 - V_0^2}{2(x - x_0)}$$

$$a = \frac{(1.2\times10^7 \frac{m}{s})^2}{2\cdot(.038\text{m})} \Rightarrow \boxed{a = 1.89\times10^{15} \frac{m}{s^2}}$$

(b) (Eq 2-7) $V_F = V_0 + at$ solve for t, Know $V_0 = 0$

$$t = \frac{V_F}{a} = \frac{1.2\times10^7 m/s}{1.89\times10^{15} m/s^2} = 6.33\times10^{-9} s$$

$\boxed{t = 6.33\text{ns}}$

OR

Use (Eq 2-9) $x = x_0 + \frac{1}{2}(V_0 + V)t$ Solve for t, Know $x_0 = 0$

$$\frac{2x}{V_0 + V} = t$$

$$\frac{2\cdot(.038\text{m})}{0\frac{m}{s} + 1.2\times10^7 \frac{m}{s}} = t$$

$\boxed{t = 6.33\text{ns}}$