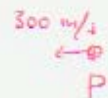Instructor: Dr. A. Mekki

Name: Key Id:

Two protons are initially far way. Each proton is moving toward the other one with a speed of 300 m/s each. Find the closest distance they can get to each other.

$\oplus \rightarrow$ 300 m/s $initial$ 300 m/s $\leftarrow \oplus$

P   P

$v = 0$ $v = 0$

$\ominus$ $\oplus$ $final$

$\leftarrow$ d $\rightarrow$
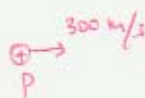
$$\Delta K + \Delta U = 0$$

$$\Delta K = -\Delta U$$

$$K_f - K_i = -(U_f - U_i)$$

$$0 - 2\left(\frac{1}{2}mv^2\right) = -\left(\frac{kq^2}{d} - 0\right)$$

$$mv^2 = \frac{kq^2}{d}$$

$$\Rightarrow d = \frac{kq^2}{mv^2} = \frac{9\times10^9 \times (1.6\times10^{-19})^2}{1.67\times10^{-27} \times (300)^2}$$

$$\boxed{d = 1.5\times10^{-6} \, m}$$

$$\boxed{d = 1.5 \, \mu m}$$