

**Question #81847, Physics / Other**

Two protons are released from rest when they are 0.750 mm apart (a) what is the maximum speed they will reach? (b) what is the maximum acceleration they will achieve? when does this acceleration occur?

**Solution**

a)

$$\frac{ke^2}{d} = \frac{1}{2}mv^2$$
$$v = e \sqrt{\frac{2k}{md}} = (1.6 \cdot 10^{-19}) \sqrt{\frac{2(8.99 \cdot 10^9)}{(1.673 \cdot 10^{-27})(0.75 \cdot 10^{-3})}} = 6.06 \cdot 10^4 \frac{m}{s}$$

b)

$$F = \frac{ke^2}{d^2}$$
$$a = \frac{ke^2}{d^2m} = \frac{(8.99 \cdot 10^9)(1.6 \cdot 10^{-19})^2}{(0.75 \cdot 10^{-3})^2(1.673 \cdot 10^{-27})} = 2.45 \cdot 10^5 \frac{m}{s^2}$$

This acceleration occurs when they are 0.750 mm apart.

Answer provided by <https://www.AssignmentExpert.com>