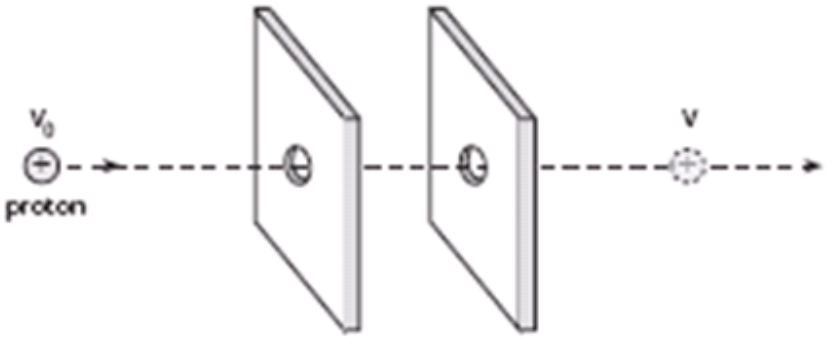
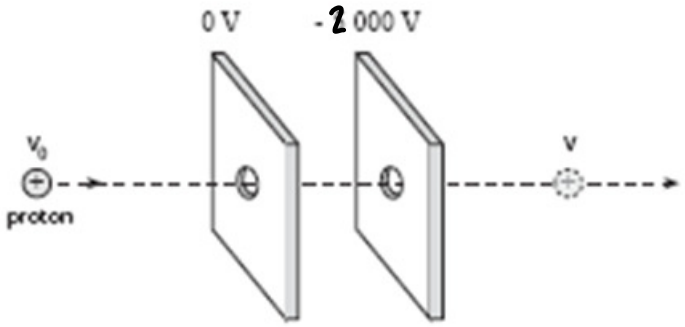
Note Title 05/04/2011

A proton is traveling at a speed of 6.4×10^5 m/s when it is accelerated through a potential difference of 2000 V. What is its final speed?

0 V -2000 V





$\Delta E_p = \Delta V q$ ✓

$= (-2000\ V)(1.6 \times 10^{-19}\ C)$

$= -3.2 \times 10^{-16}\ J$ ✓

↑ loss of E_p as it accelerates

$\Delta E_K = -\Delta E_p = 3.2 \times 10^{-16}\ J$ ✓

$\Delta E_K = E_{Kf} - E_{Ki}$ $\quad E_{Kf} = E_{Ki} + \Delta E_K = \frac{1}{2} m v_i^2 + \Delta E_K$

$= \frac{1}{2}(1.67 \times 10^{-27})(6.4 \times 10^5)^2 + 3.2 \times 10^{-16}$

$= 6.62 \times 10^{-16}\ J$

$E_K = \frac{1}{2} m v^2$ ✓ $\quad v = \sqrt{\frac{2E_K}{m}} = \sqrt{\frac{2(6.62 \times 10^{-16})}{1.67 \times 10^{-27}}}$

$= 8.90 \times 10^5\ m/s$ ✓