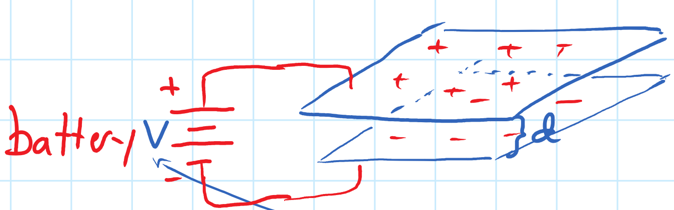
Parallel Plates

Monday, May 7, 2018 9:19 AM

When 2 metal plates are given a voltage, a static charge is created on the plates, producing an electric field between the plates

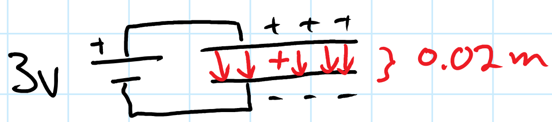


← Voltage on the plates from the source

d is the seperation distance

Electric field = $E = \frac{\Delta V}{d}$ — Voltage

The direction of the $\vec{E}$ field is determined by the direction a positive charge would move



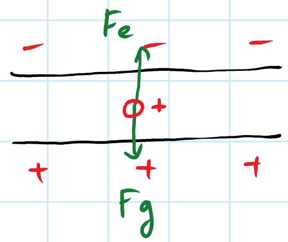
$E = \frac{\Delta V}{d} = \frac{3V}{.02m} =$

$= 150 \, V/m \, , \, 150 \, N/C$

Force: the force produced on a object inside the plates is similar to a point charge equation

$F = E \cdot Q \rightarrow \boxed{E = \frac{F}{Q}}$

Ex A proton is held stationary between parallel plates that are 0.05 m apart. What voltage plates that are 0.05 m apart. What voltage is on the plates?



$F_g = F_e$

$mg = EQ$

$(1.67\times10^{-27}\,kg)(9.8) = E\,(1.6\times10^{-19}\,C)$

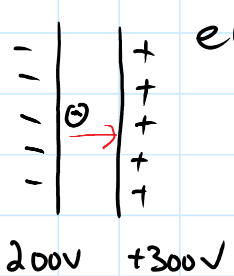
$E = 1.022\times10^{-7}\ V/m = \frac{\Delta V}{d}$

$V = 5.11\times10^{-9}\ V$

Energy: If a charged particle is placed on a similarly charged plate, it will want to move to the other plate. The stored energy (E_p) can be converted into kinetic (E_k)

$\Delta E_p = \Delta V \cdot Q$, $\Delta V = \frac{\Delta E_p}{Q}$

electron in plates



$E_p + E_k = E_p + E_k + E_H$

$E_p = \Delta V \cdot Q$

$= (V_f - V_o)$

$= (300 - {}^-200\,V)$

$= (500\,V)(1.6\times10^{-19}\,C)$

$= 8.0\times10^{-17}\ J$

How fast will it be travelling as it hits the positive plate

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$E_p = E_k$

$8.0 \times 10^{-17}\,J = \frac{1}{2}(9.11 \times 10^{-31}\,kg)\,v^2$, $v = 1.3 \times 10^{7}\,m/s$