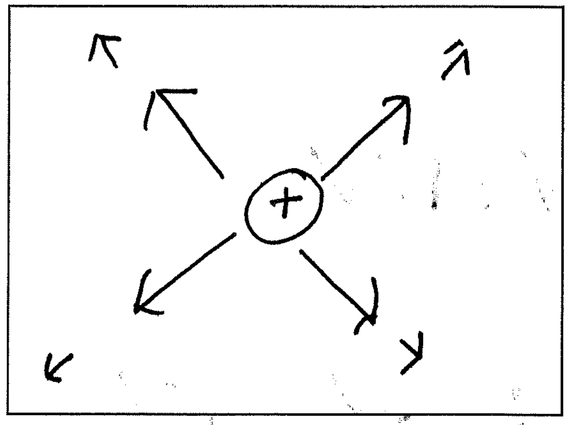
Uniform Fields

The electric field surrounding a point charge will vary considerably in strength and ~~magnitude~~. direction



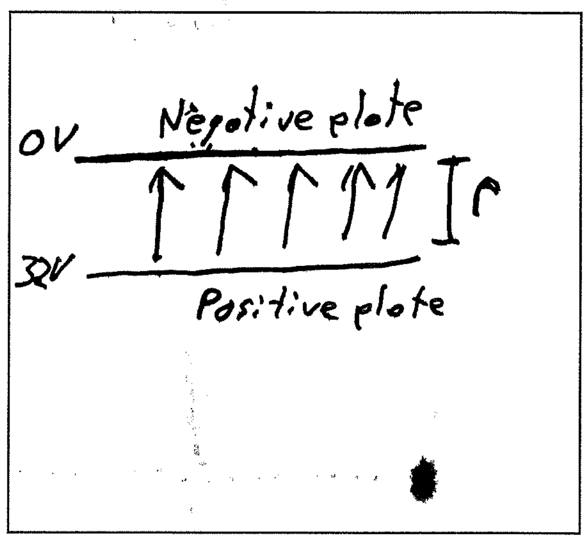
It is possible to set up a uniform electric field using charged plates.

The negative charge on the top plate causes the field to be pointed up.

The positive charge on the bottom plate causes the field to be pointed up.

Near the top plate the strength of the field is based mostly on the top plate.

But as an object moves from the top to the bottom, the strength of the top plate's field decreases exactly by the same amount that the strength of the bottom plate's field increases.



We need a new formula for this situation:

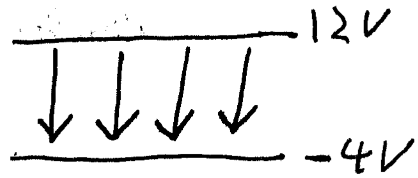
$$E = \frac{\Delta V}{r}$$

ΔV ← potential difference

r ← distance between plates

Example: Two plates are 0.15 metres apart. The top plate has an electric potential of 12 V and the bottom plate has an electric potential of −4 V. What is the strength and direction of the electric field between the plates?

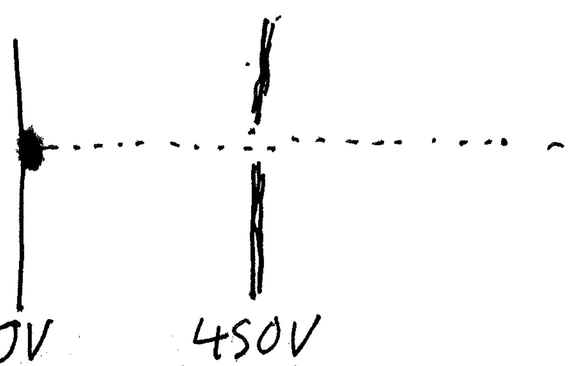
$\Delta V = 16V$



$E = \frac{\Delta V}{r} = \frac{16V}{0.15m} = 107 \,N/C$

$\approx 110 \,N/C$

Example: An electron with charge of -1.6×10^{-19}C is accelerated from rest through a potential difference of 450 V. What is the kinetic energy gained by the electron?



$\Delta E_p = q\Delta V = -1.6\times10^{-19}C \times 450V$

$= -7.2\times10^{-17}J$

E_p lost $= E_K$ gained

$E_K = 7.2\times10^{-17}J$