Physics: Electric Field and Electric Potential
Class Examples

Mass of a proton = 1.67×10^{-27} kg
Mass of an electron = 9.11×10^{-31} kg

Electric Potential

Example 5

A. Calculate the electric potential from a point source ($+4.65 \times 10^{-7}$ C) at a distance of 2.50 m away and 4.00 m away.
B. How far away from a point source (-4.65×10^{-7} C) would you have to be to have an electric potential of -550 v?

Positive Point Sources make 'peaks' of electric Potential

$V = \frac{k \cdot q}{r}$ at 2.50m

$V = \frac{(8.99 \times 10^9) \cdot (+4.65 \times 10^{-7})}{2.50}$

$V = 1672$ v

$V = \frac{k \cdot q}{r}$ at 4.00 m

$V = \frac{(8.99 \times 10^9)(+4.65 \times 10^{-7})}{(4.00)}$

$V = 1045$ v

C.) $V = \frac{k \cdot q}{r}$

$\frac{V}{1} \times \frac{r}{k \cdot q}$

$k \cdot q = V \cdot r$

$r = \frac{k \cdot q}{V} = \frac{(8.99 \times 10^9)(-4.65 \times 10^{-7})}{-550}$

$r = 7.60$m

Example 6:

Two point charges (q_1 and q_2) are located in the same plane. The first charge (q_1) has a charge of -1.00 μC and is located at point (0, 1.00). The second charge (q_2) has a charge of +1.00 μC and is located at point (2.00, 0).

A. What is the value of the electric potential at the origin from q_1?
B. What is the value of the electric potential at the origin from q_2?
C. What is the net electric potential at the origin?

A.) $V = \frac{k \cdot q}{r}$

$V = \frac{(8.99 \times 10^9)(-1.00 \times 10^{-6})}{(1)}$

$V = -8990$ V

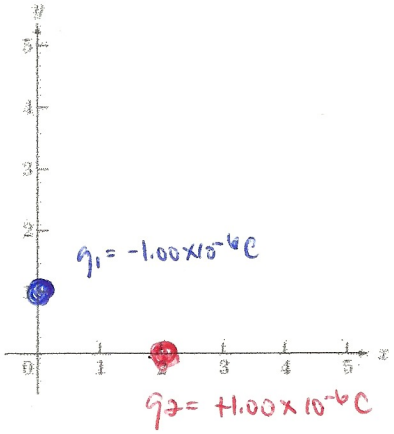
B.) $V = \frac{k \cdot q}{r}$

$V = \frac{(8.99 \times 10^9) \cdot (+1.00 \times 10^{-6})}{2}$

$V = +4495$ V

C.) $V_{net} = (-8990) + 4495$

$V_{net} = -4495$ V



Example 7:

A proton gains 3.50×10^{-12} J of electric potential energy in an electric field. What will be the velocity of the proton once it is free to move?

* A charge will turn EPE into KE.
* So if a proton has 3.50×10^{-12} J of EPE, that will become 3.50×10^{-12} J of KE

$EPE = 3.50 \times 10^{-12}$ J $\rightarrow$ $KE = 3.50 \times 10^{-12}$ J

$KE = \frac{1}{2} m v^2$

$3.50 \times 10^{-12} = \frac{1}{2}(1.67 \times 10^{-27}) \cdot v^2$

$3.50 \times 10^{-12} = 8.35 \times 10^{-28} \cdot v^2$

$v = 6.47 \times 10^7$ m/s