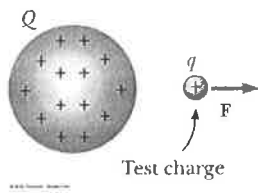
Electric Field Strength

Electric Field Strength (Intensity): Electric force per unit charge exerted on a small positive test charge.

Formula: $\vec{F}_e = q\vec{E}$

$$\vec{E} = \frac{\vec{F}_e}{q}$$



Alternate Formula for point charges:

$$\vec{E} = \frac{F_e}{q_1} = \frac{\frac{Kq_1q_2}{r^2}}{q_1} = \frac{Kq}{r^2}$$

Variable:	Fe	E	Q, q
Quantity:	electrostatic force	Electric field strength	electric charge
Units:	N	N/C	C
Type:	vector	vector	scalar

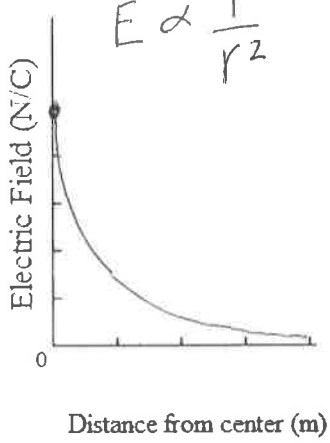
1. What is the magnitude and direction of the electric field at a distance of 7.00 nm from a proton? ~~Sketch a graph of the relationship between electric field strength and distance from the proton~~.

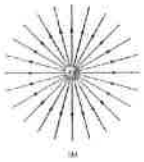
$$\vec{E} = \frac{F_e}{q} = \frac{Kq}{r^2}$$

$$\frac{(8.99\times10^9 \frac{Nm^2}{C^2})(1.6\times10^{-19}C)}{(7.00\times10^{-9}m)^2}$$

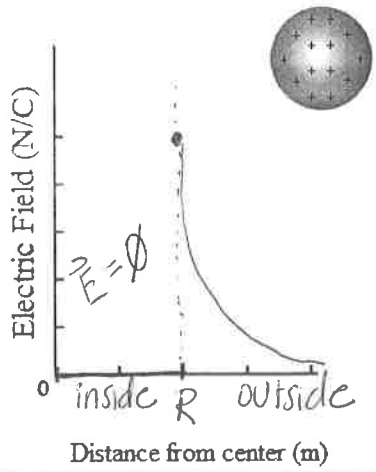
$= 2.9\times10^7$ N/C away from proton

$\vec{E} \propto \frac{1}{r^2}$





inside any conductor $\vec{E} = \emptyset$



2. What is the magnitude and direction of the electric field at a point where an electron experiences a force of 3.1 pN? → 1×10^{-12} N

$$\vec{E} = \frac{\vec{F}_e}{q} = \frac{3.1\times10^{-12}N}{1.6\times10^{-19}C} = 1.9\times10^7 \frac{N}{C}$$

electron is going opposite direction of $\vec{E}$