Review

Coulomb's Law

$$F_e = \frac{k q_1 q_2}{r^2}$$

q_1 q_2

r

Coulomb's constant

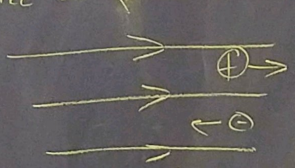
$k = 8.99 \times 10^9 \frac{Nm^2}{C^2}$

Fundamental electric charge

$e = 1.6 \times 10^{-19}$ Coulombs

Electric field

Shows the direction of electric force on positive test charge



$\vec{E}$ field

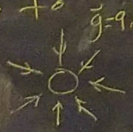
Positive charges are pushed in same direction as $\vec{E}$ field

Negative charges are pushed the other way.

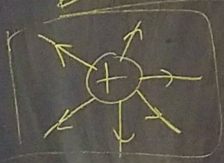
Force on charge

$$\vec{F} = \vec{E} \cdot q$$

Charges have an $\vec{E}$ field that surround them. Similar to gravitational field



Electric fields



$\vec{E}$ field around positive charge

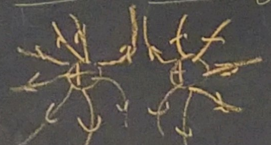
$\vec{E}$ field around negative charge

$$\vec{E} = \frac{kq}{r^2}$$

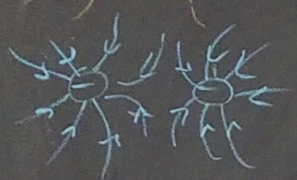
$\vec{E}$ field around charge

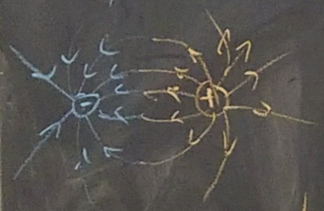
Measured in N/C

E field two charges



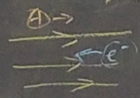
Like charges repel





Opposites attract

ex) What is the force on an electron in an Electric field of $10\ N/C$ to the right?

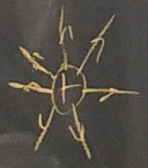


$\vec{F} = \vec{E} \cdot q$

$= (10\ N/C)(-1.6\times10^{-19}\ C)$

$= 1.6\times10^{-18}\ N$ to the left

ex) What is the strength of Electric field 10×10^{-10} m away from a proton?



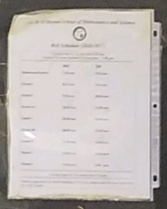
$\vec{E} = \frac{kq}{r^2} = \frac{(8.99\times10^{9}\ \frac{N\cdot m^2}{C^2})(1.6\times10^{-19}\ C)}{(10\times10^{-10}\ m)^2} = 1.4\times10^{9}\ N/C$

CW 5-15

1. What is the strength of electric field around an alpha particle ($q = 3.2\times10^{-19}\ C$), 2.0×10^{-9} m away?

$\vec{E} = \frac{kq}{r^2}$

2. Say we placed an electron the same distance away (2.0×10^{-9} m) from the alpha particle. What is the force on the electron? Is it attracted to the alpha particle?



$\vec{F} = \vec{E} \cdot q$