8.6 – Field Strength

* review – compare electric field map to magnetic (charge), iron filings and compass (directional arrows). If you let a +ve test charge go, it will travel along the field lines.

Field Strength (ε)

ε = force available to influence (act on) a charge. It is summative (ie: Fnet). It is the result of all charges in the area.

This field of force can be a result of a point charge or many charges (charge distribution)

- any charge (+ve or –ve) of any magnitude can be put into a field. So we standardize.

$\varepsilon = Fe / qt$ unit = N/C We assume the test charge is positive.

So… $Fe = (qt)(\varepsilon)$ If you know the field strength and the charge within the field, you can determine the force it experiences.

Compare… Fg = (m)(g) similar idea! Gravity is force/kg. Field strength is force / coulomb

Both 'fields' weaken as you move away from influencing object.

……..

Coulomb's Law → $Fe = k q_1 q_2 / r^2$

…or… q_1 is qt and q_2 is qm (master charge – pt. charge creating a field)

Plug $Fe = k q_{1t} q_m / r^2$ into $\varepsilon = Fe / qt$ …and….

You get $\varepsilon = kqm / r^2$ This is for force field exerted by a **master charge only**!!!

$\varepsilon = Fe / qt$ This is for a force field exerted by a **master charge** or a **charge distribution**.

……..

Which Formula do I use?

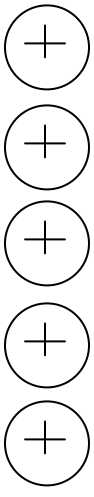
Fe, qt, qm, r

- Fe , qt → $\varepsilon = Fe / qt$
- qm, r → $\varepsilon = kqm / r^2$

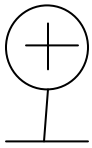
charge distribution or point charge

**Must be point charge creating field.

…or….



..or…



..or..same in negative charge

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