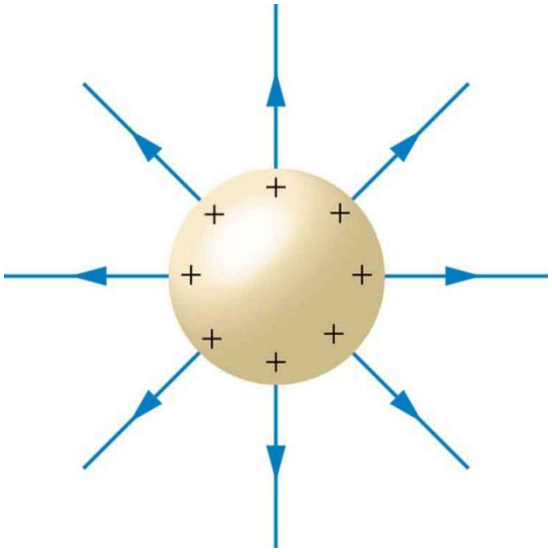
Electric Field: Examples

• Electric field determines the electric force acting on a charge q:

$$\vec{F}_{elect} = q\vec{E}$$

• Electric field of a point charge **Q** or a sphere with the same charge (**outside**), at distance **R**:

$$E = \frac{kQ}{R^2}$$

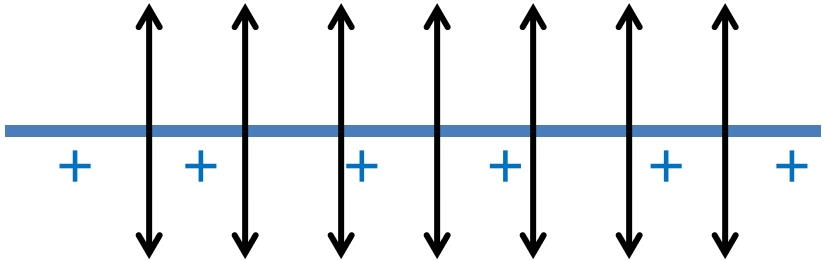


• Electric field **inside** the **hollow** charged sphere is ZERO!

$$E = 0$$

•Electric field of a plate with total charge Q, and area A:

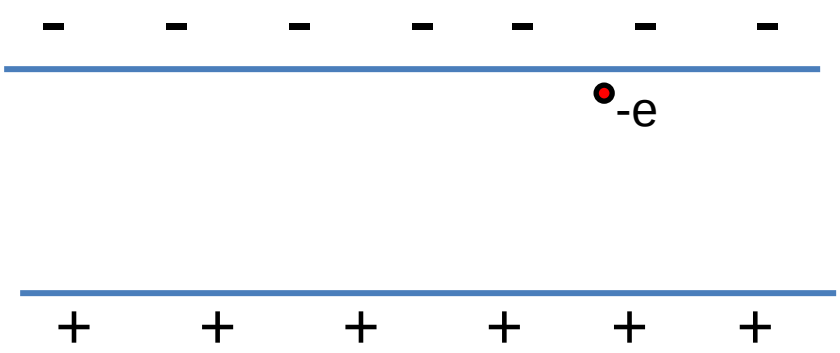
$$E = \frac{2\pi kQ}{A}$$



Homework

Problem 1:

An electric capacitor is made of two parallel metallic plates that are oppositely charged. Sketch the field lines inside and outside the capacitor, and find the magnitude of the field E in both cases. Charge of the two plates are +Q and –Q, respectively, and area of each one is A.



Problem 2:

Electric field inside the capacitor is **E=1000 N/C** (Newton per Coulomb). When the negative plate is illuminated with UV light, electrons may escape the metal. At moment **t=0s** one such electron appears right near the negative surface, with no initial velocity.

a) Find its acceleration a. You may google charge and mass of an electron.

b) Calculate the time it will take for the electron to reach the positive plate, due to electric force. Distance between the plates is **h=1mm**.