

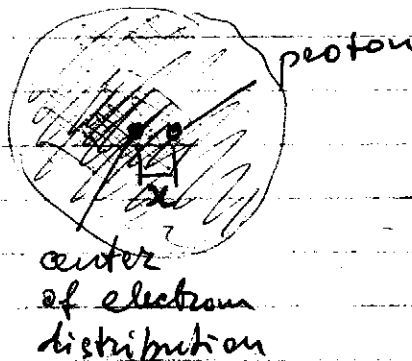
# Assignments - Electrostatics II (due Jan 24) @ 1pm

- ① Show that the force acting on a proton as a result of its displacement  $x$  from the central position is proportional to  $x$ . Treat proton as a point charge  $+e$ , while the electron's charge is distributed spherically and it decays exponentially

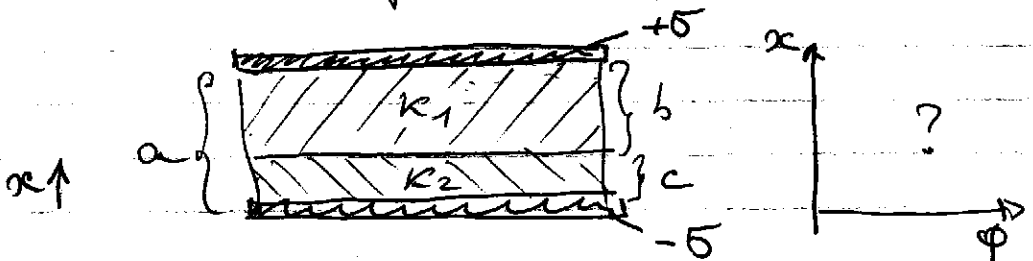
$$\rho_e(r) = \frac{-e}{\pi a^3} e^{-2r/a}$$

$a$  is the Bohr radius

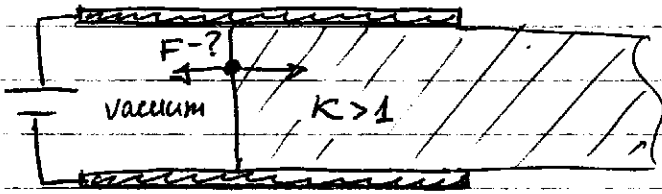
Assume  $x \ll a$



- ② Find a potential distribution inside two dielectric materials sandwiched between electrodes with the surface charge  $\pm \sigma$



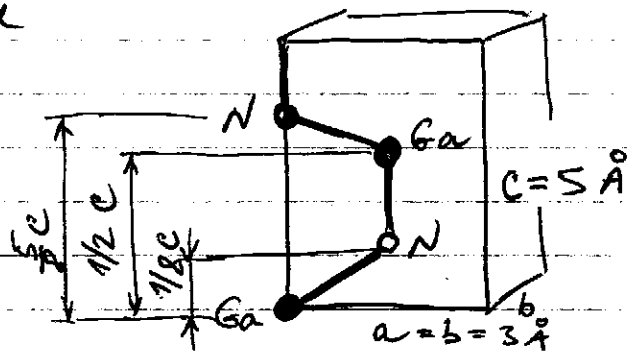
③



A dielectric material is inserted into the capacitor. Will the capacitor expel or attract the dielectric material inside? How the force will depend on the dielectric constant  $K$ ?

④

Determine the electric field resulted from a uniform strain (1%) along c-axis applied to



GaN - crystal shown on the figure. What will be the associated potential difference measured on the opposite sides of 1 mm thick layer of GaN?

Gallium and nitrogen atoms carry the effective charge of  $\pm 2.5e$ , respectively.