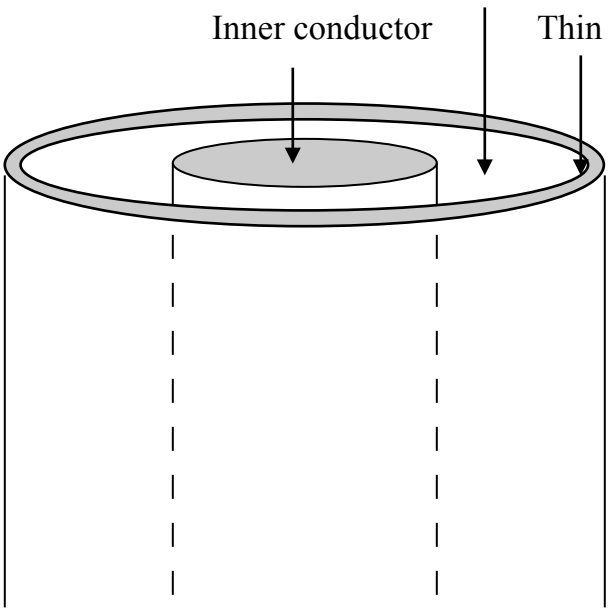
✯ TUTORIAL 4✯
CONCEPTUALLY UNDERSTANDING CONDUCTORS

Part 1 – Conceptually Understanding Conductors

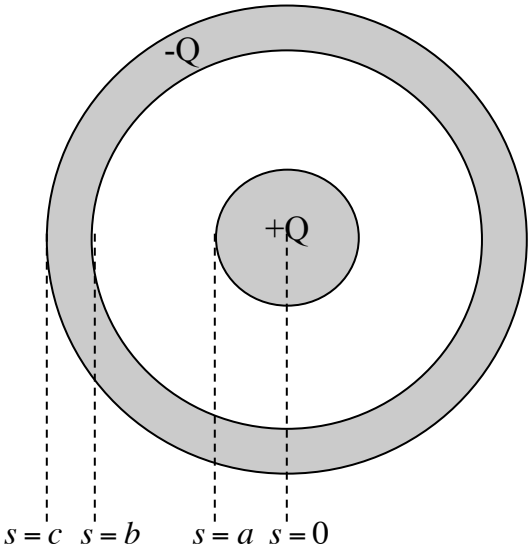
A coax cable is essentially one long conducting cylinder surrounded by a conducting cylindrical shell (the shell has some thickness). The two conductors are separated by a small distance. (Neglect all fringing fields near the cable's ends).

Draw the charge distribution (little + and – signs) if the inner conductor has a total charge +Q on it, and the outer conductor has a total charge –Q. Be precise about exactly where the charge will be on these conductors, and how you know.

Perspective view:



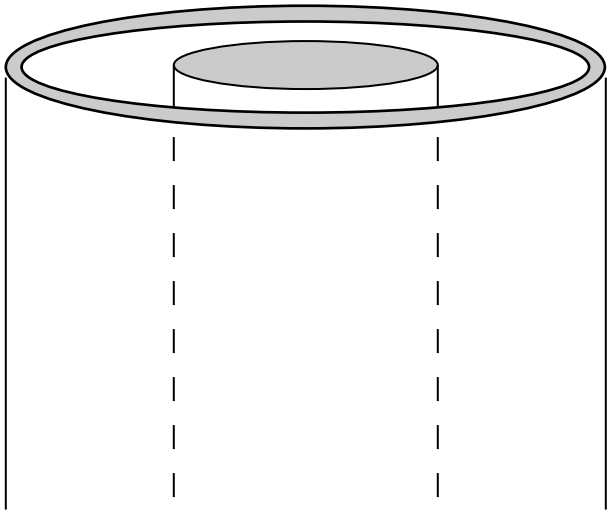
Top view:

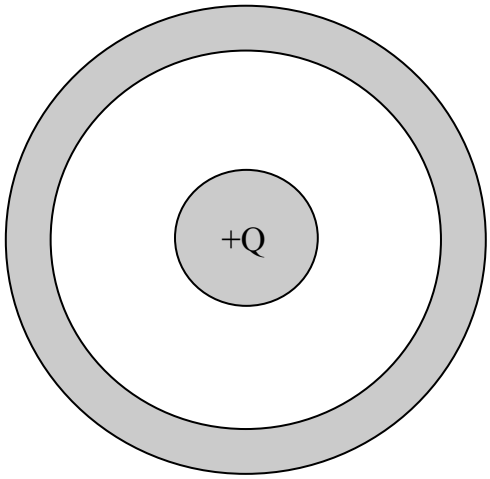


Contact: Steven.Pollock@Colorado.EDU

i. If you were calculating the potential difference, ΔV, (for the configuration in part (i.)) between the center of the inner conductor ($s = 0$) and infinitely far away ($s = \infty$), what regions of space would have a (non-zero) contribution to your calculation?

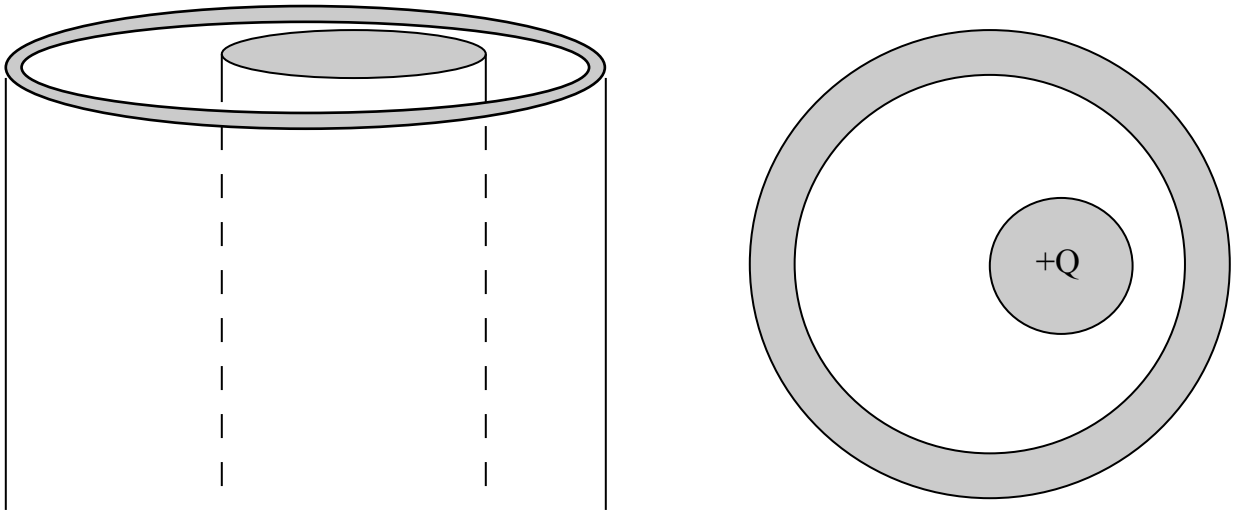
ii. Now, draw the charge distribution (little + and – signs) if the inner conductor has a total charge +Q on it, and the outer conductor is electrically neutral. Be precise about exactly where the charge will be on these conductors, and how you know.





Contact: Steven.Pollock@Colorado.EDU

iii. Consider how the charge distribution would change if the inner conductor is shifted off-center, but still has +Q on it, and the outer conductor remains electrically neutral. Draw the new charge distribution (little + and – signs) and be precise about how you know.



(When you are done, please click the answer to the clicker question that is up.

If you still have time – try to sketch the E field lines in the picture above, *everywhere* (inside, and outside)

Contact: Steven.Pollock@Colorado.EDU