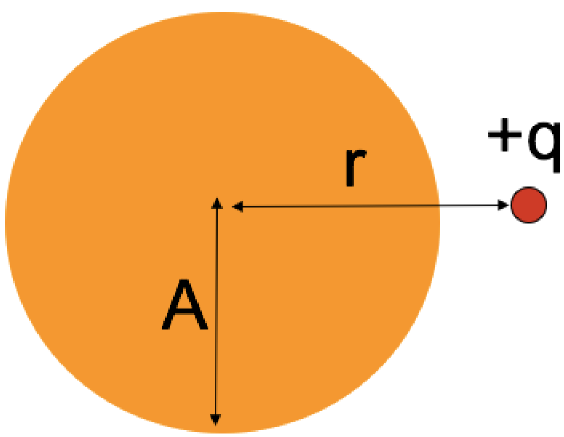
A point charge $+q$ sits outside a **solid neutral conducting copper sphere** of radius A. The charge q is a distance $r > A$ from the center, on the right side. What is the E-field at the center of the sphere? (Assume equilibrium situation).



A. $|E| = kq/r^2$, to left

B. $kq/r^2 > |E| > 0$, to left

C. $|E| > 0$, to right

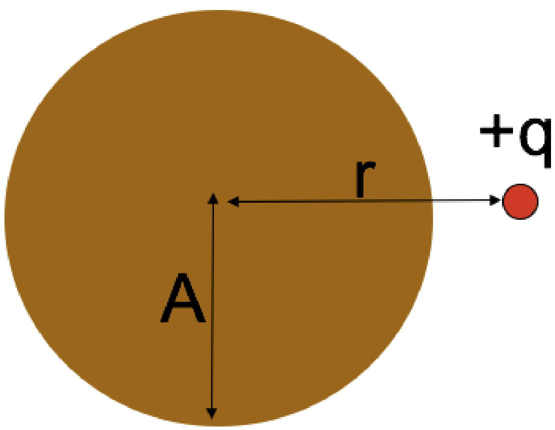
D. $E = 0$

E. None of these

ANNOUNCEMENTS

- Test on Wednesday (7-9pm)
  - All Homework solutions posted on Piazza
  - You may bring in one side of a piece of paper with your own notes
- Post your review problem by Tuesday at midnight for extra credit
  - 10 bonus points on HW 5

In the previous question, suppose **the copper sphere is charged**, total charge $+Q$. (We are still in static equilibrium.) What is now the magnitude of the E-field at the center of the sphere?



A. $|E| = kq/r^2$

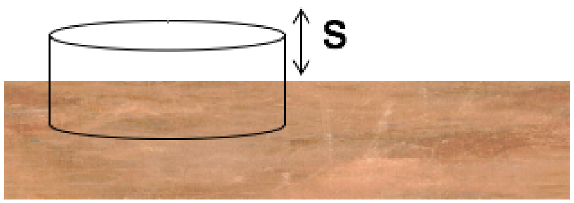
B. $|E| = kQ/A^2$

C. $|E| = k(q - Q)/r^2$

D. $|E| = 0$

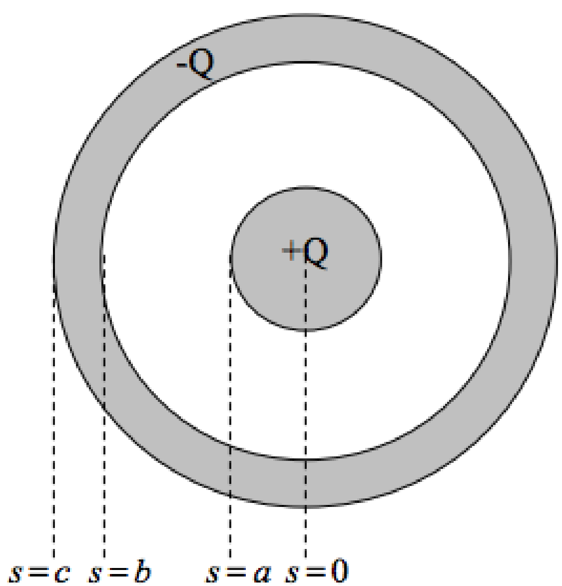
E. None of these! / it's hard to compute

We have a large copper plate with uniform surface charge density, σ. Imagine the Gaussian surface drawn below. Calculate the E-field a small distance s above the conductor surface.



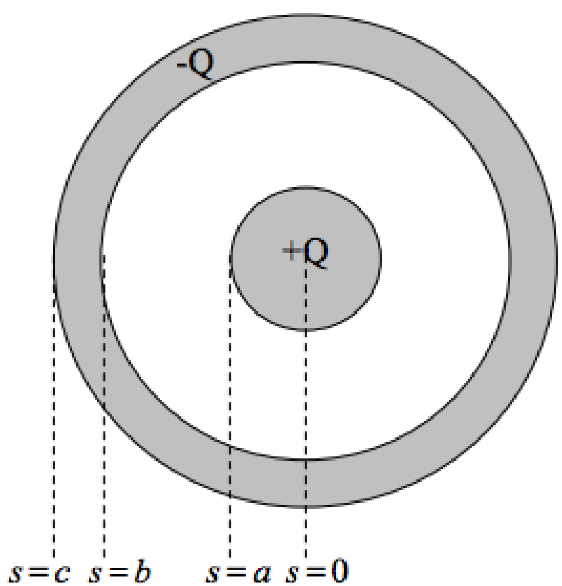
A. $|E| = \frac{\sigma}{\varepsilon_0}$
B. $|E| = \frac{\sigma}{2\varepsilon_0}$
C. $|E| = \frac{\sigma}{4\varepsilon_0}$
D. $|E| = \frac{1}{4\pi\varepsilon_0}\frac{\sigma}{s^2}$
E. $|E| = 0$

Consider a long coaxial with charge $+Q$ placed on the inside metal wire and $-Q$ outside metal sheath as shown.

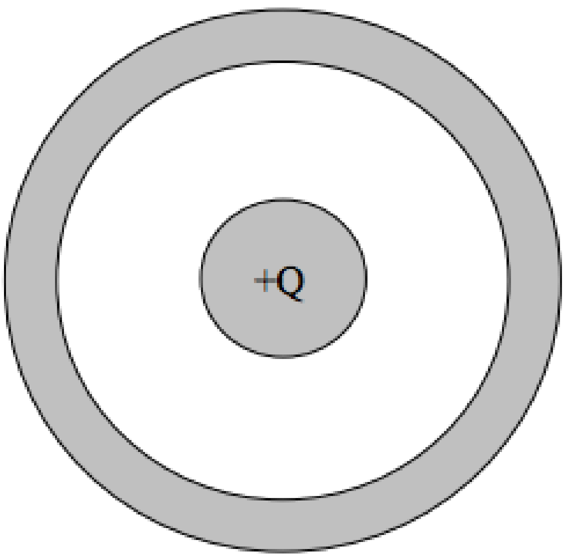


Sketch the distribution of charge in this situtation using plus signs to represent positive chages and minus signs to represent negative charges.

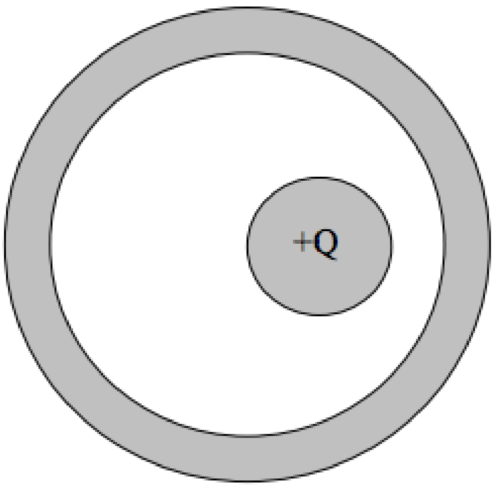
If you were calculating the potential difference, ΔV, between the center of the inner conductor ($s = 0$) and infinitely far away ($s \to \infty$), what regions of space would have a (non-zero) contribution to your calculation?



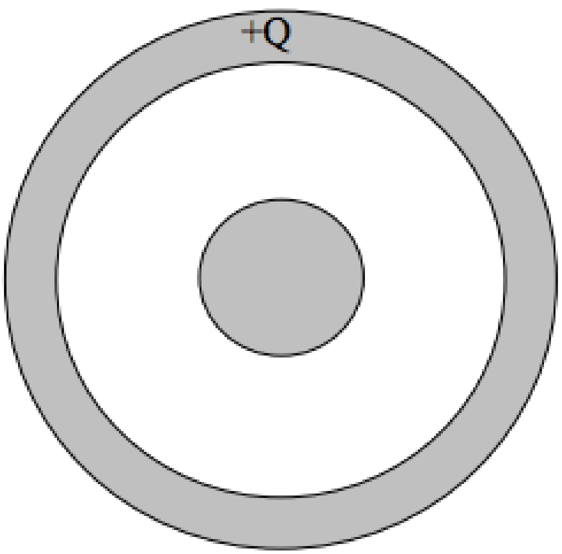
A. $s < a$
B. $a < s < b$
C. $b < s < c$
D. $s > c$
E. More than one of these



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.



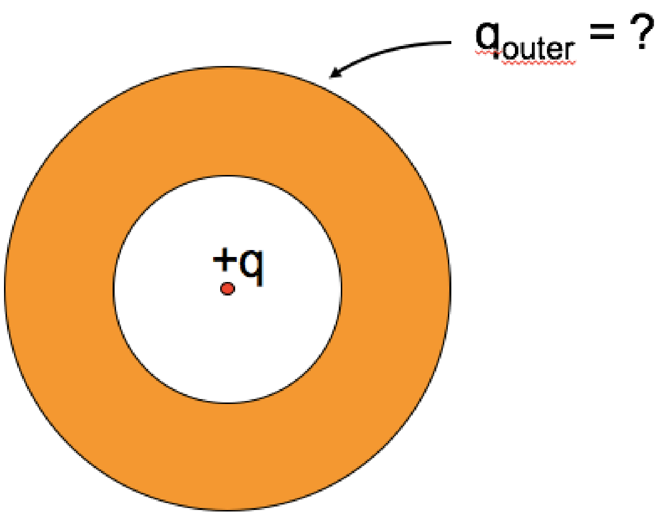
Consider how the charge distribution would change if the inner conductor is shifted off-center, but still has $+Q$ on it, and the outer conductor remains electrically neutral. Draw the new charge distribution (little + and – signs) and be precise about how you know.



Return the inner conductor to the center.

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

A neutral copper sphere has a spherical hollow in the center. A charge $+q$ is placed in the center of the hollow. What is the total charge on the outside surface of the copper sphere? (Assume Electrostatic equilibrium.)



A. Zero

B. $-q$

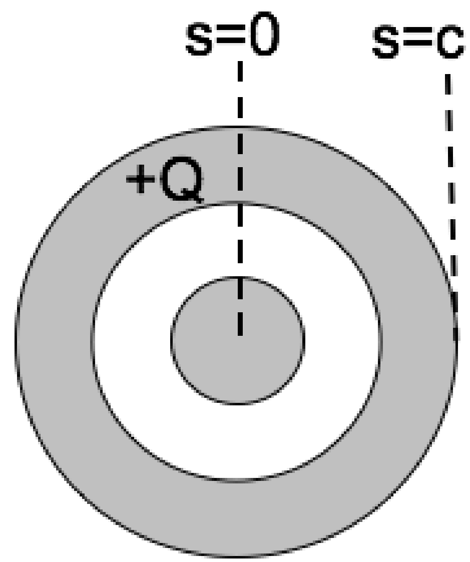
C. $+q$

D. $0 < q_{outer} < +q$

E. $-q < q_{outer} < 0$

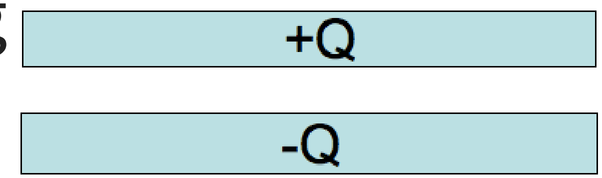
A long coax has total charge $+Q$ on the OUTER conductor. The INNER conductor is neutral.

What is the sign of the potential difference, $\Delta V = V(c) - V(0)$, between the center of the inner conductor ($s = 0$) and the outside of the outer conductor?



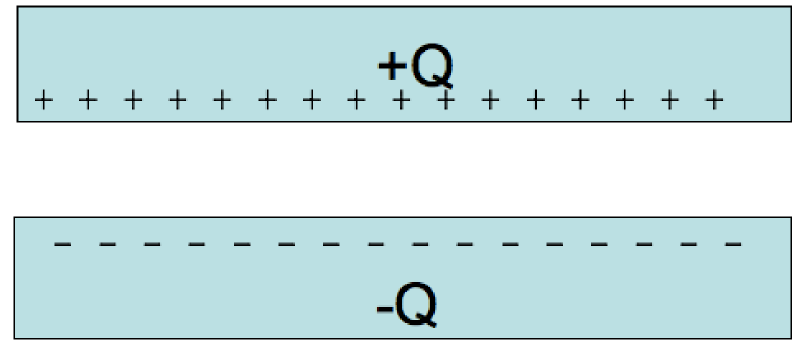
A. Positive
B. Negative
C. Zero

Given a pair of very large, flat, conducting capacitor plates with total charges $+Q$ and $-Q$. Ignoring edges, what is the equilibrium distribution of the charge?



A. Throughout each plate
B. Uniformly on both side of each plate
C. Uniformly on top of $+Q$ plate and bottom of $-Q$ plate
D. Uniformly on bottom of $+Q$ plate and top of $-Q$ plate
E. Something else

Given a pair of very large, flat, conducting capacitor plates with surface charge densities $+/-\sigma$, what is the E field in the region between the plates?



A. $\sigma/2\varepsilon_0$

B. σ/ε_0

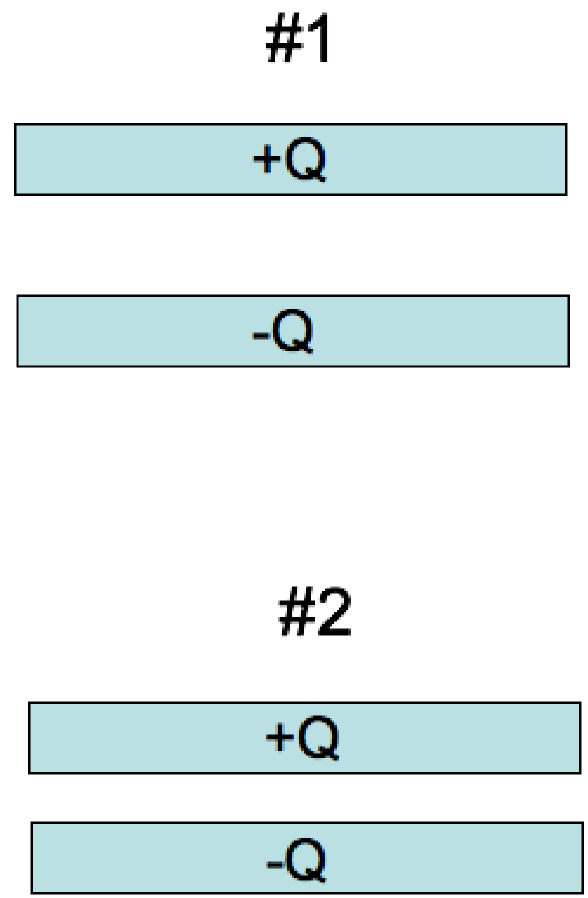
C. $2\sigma/\varepsilon_0$

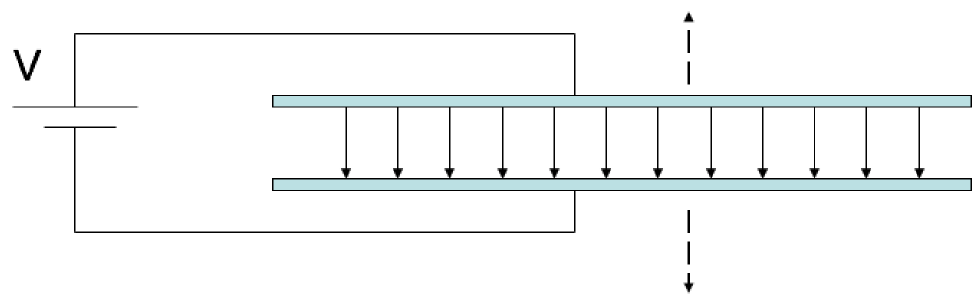
D. $4\sigma/\varepsilon_0$

E. Something else

You have two very large parallel plate capacitors, both with the same area and the same charge Q. Capacitor #1 has twice the gap of Capacitor #2. Which has more stored potential energy?

A. #1 has twice the stored energy
B. #1 has more than twice
C. They both have the same
D. #2 has twice the stored energy
E. #2 has more than twice.

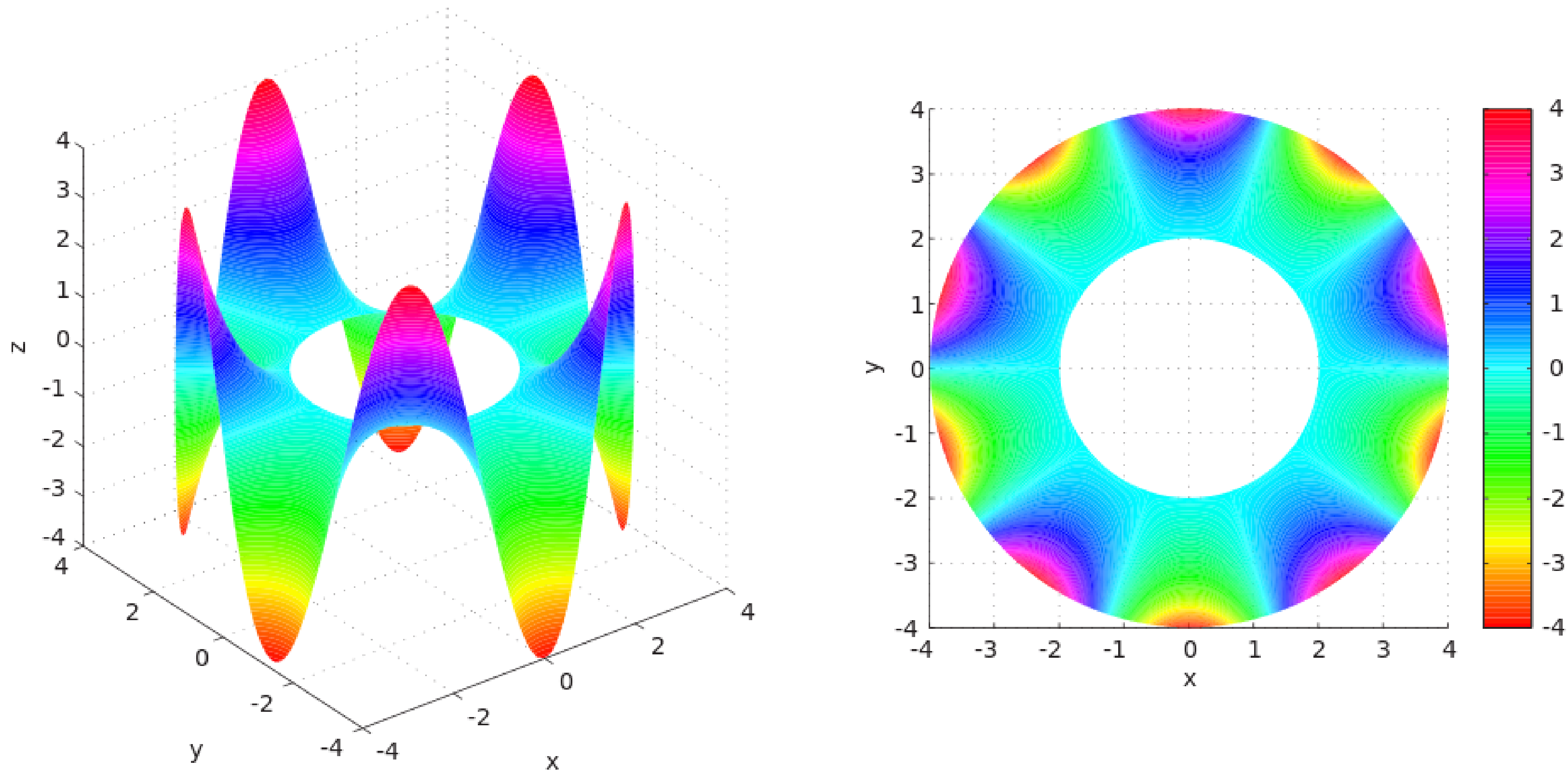




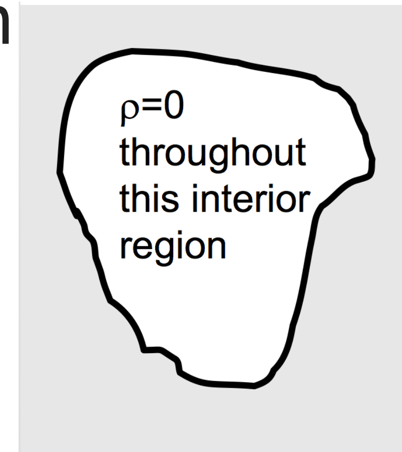
A parallel plate capacitor is attached to a battery which maintains a constant voltage difference V between the capacitor plates. While the battery is attached, the plates are pulled apart. The electrostatic energy stored in the capacitor

A. increases.
B. decreases.
C. stays constant.

LAPLACE'S EQUATION

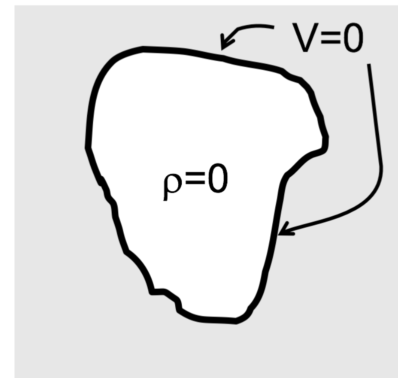


A region of space contains no charges. What can I say about V in the interior?



A. Not much, there are lots of possibilities for V(r) in there
B. V(r)=0 everywhere in the interior.
C. V(r)=constant everywhere in the interior

A region of space contains no charges. The boundary has V=0 everywhere. What can I say about V in the interior?



A. Not much, there are lots of possibilities for V(r) in there

B. V(r)=0 everywhere in the interior.

C. V(r)=constant everywhere in the interior