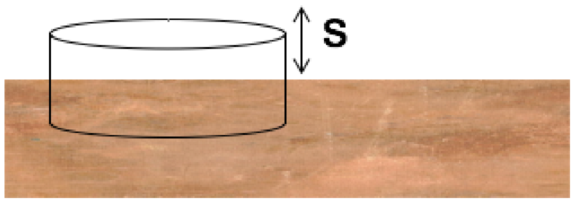
We have a large copper plate with uniform surface charge density, $\sigma$. Imagine the Gaussian surface drawn below. Calculate the E-field a small distance $s$ above the conductor surface.




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. $|E| = 0$

# ANNOUNCEMENTS

- Exam 1 TONIGHT (7pm-9pm)
  - 101 BCH
  - Help session tonight: 5-6:30 (1300 BPS)
- DC out of town next Wed night - Friday
  - Help session in limbo at the moment
  - Class on Friday - Dr. Rachel Henderson

A positive charge ($q$) is outside a metal conductor with a hole cut out of it at a distance $a$ from the center of the hole. What is the *net* electric field at center of the hole?

A. $\frac{1}{4\pi\varepsilon_0}\frac{q}{a^2}$

B. $\frac{-1}{4\pi\varepsilon_0}\frac{q}{a^2}$

C. $\frac{1}{4\pi\varepsilon_0}\frac{2q}{a^2}$

D. $\frac{-1}{4\pi\varepsilon_0}\frac{2q}{a^2}$

E. Zero

With $\nabla \times \mathbf{E} = 0$, we know that,

$$\oint \mathbf{E} \cdot d\mathbf{l} = 0$$

If we choose a loop that includes a metal and interior vacuum (i.e., both in and **inside the hole**), we know that the contribution to this integral in the metal vanishes. What can we say about the contribution in the hole?

A. It vanishes also
B. $\mathbf{E}$ must be zero in there
C. $\mathbf{E}$ must be perpendicular to d$\mathbf{l}$ everywhere
D. $\mathbf{E}$ is perpendicular to the metal surface
E. More than one of these

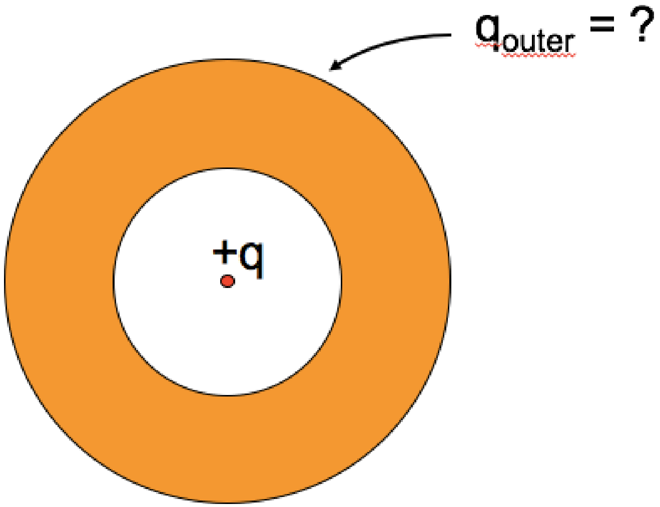
With $\nabla \times \mathbf{E} = 0$, we know that,

$$\oint \mathbf{E} \cdot d\mathbf{l} = 0$$

If we choose a loop that includes a metal and vacuum (i.e., both in and **just outside of the metal**), we know that the contribution to this integral in the metal vanishes. What can we say about the contribution just outside the metal?

A. It vanishes also
B. $\mathbf{E}$ must be zero out there
C. $\mathbf{E}$ must be perpendicular to d$\mathbf{l}$ everywhere
D. $\mathbf{E}$ is perpendicular to the metal surface
E. More than one of these

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. $-q$

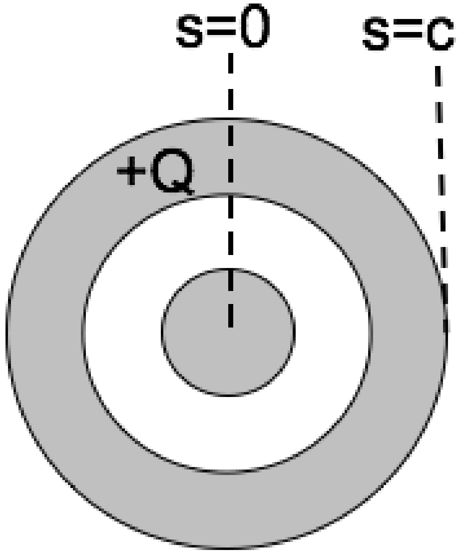
C. $+q$

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

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

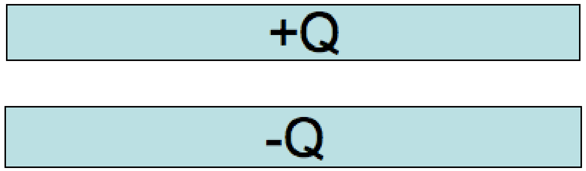
A long coax has total charge $+Q$ on the OUTER conductor. The INNER conductor is neutral.

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

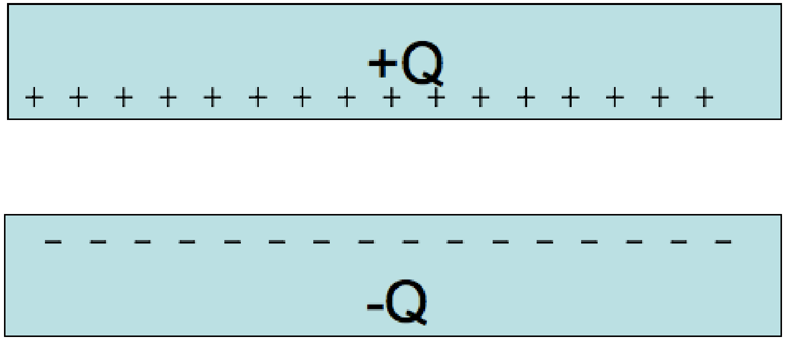
B. Uniformly on both side of each plate

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. $\sigma/\varepsilon_0$
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.