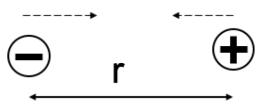
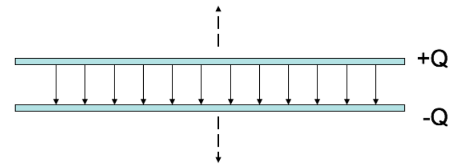


Two charges, $+q$ and $-q$, are a distance r apart. As the charges are slowly moved together, the total field energy

$$\frac{\varepsilon_0}{2}\int E^2 d\tau$$

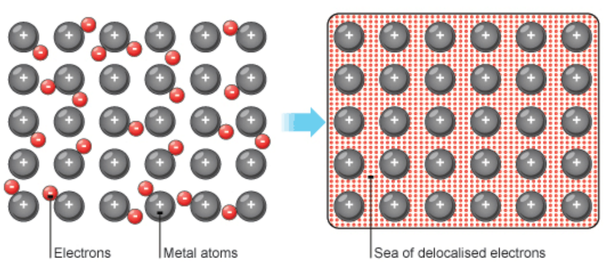
A. increases
B. decreases
C. remains constant



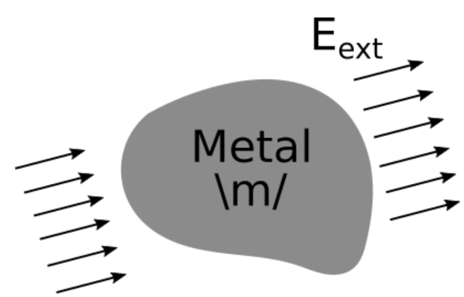
A parallel-plate capacitor has $+Q$ on one plate, $-Q$ on the other. The plates are isolated so the charge Q cannot change. As the plates are pulled apart, the total electrostatic energy stored in the capacitor:

A. increases
B. decreases
C. remains constant.

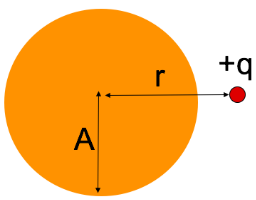
CONDUCTORS



THE CONDUCTOR PROBLEM

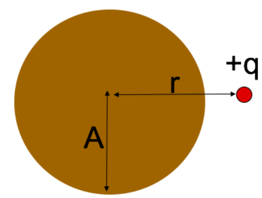


A point charge $+q$ sits outside a **solid neutral conducting copper sphere** of radius A. The charge q is a distance $r > A$ from the center, on the right side. What is the E-field at the center of the sphere? (Assume equilibrium situation).



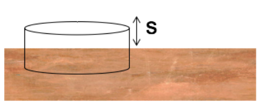
A. $|E| = kq/r^2$, to left
B. $kq/r^2 > |E| > 0$, to left
C. $|E| > 0$, to right
D. $E = 0$
E. None of these

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?



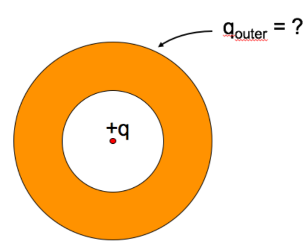
A. $|E| = kq/r^2$
B. $|E| = kQ/A^2$
C. $|E| = k(q - Q)/r^2$
D. $|E| = 0$
E. None of these! / it's hard to compute

We have a large copper plate with uniform surface charge density 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. $|E| = 0$

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.)

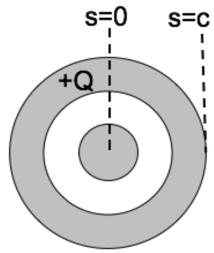


A. Zero
B. $-q$
C. $+q$
D. $0 < q_{outer} < +q$
E. $-q < q_{outer} < 0$

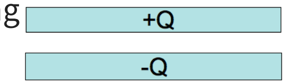
A long coax has total charge $+Q$ on the OUTER conductor. The INNER conductor is neutral.

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

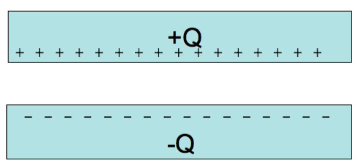


Given a pair of very large, flat, conducting capacitor plates with total charges $+Q$ and $-Q$. Ignoring edges, what is the equilibrium distribution of the charge?



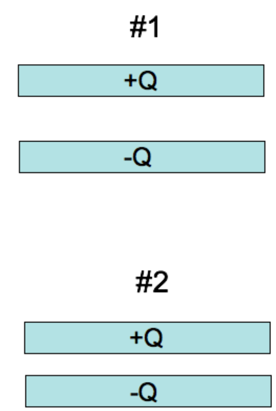
A. Throughout each plate
B. Uniformly on both side of each plate
C. Uniformly on top of $+Q$ plate and bottom of $-Q$ plate
D. Uniformly on bottom of $+Q$ plate and top of $-Q$ plate
E. Something else

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?

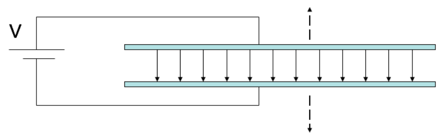


A. $\sigma/2\varepsilon_0$
B. σ/ε_0
C. $2\sigma/\varepsilon_0$
D. $4\sigma/\varepsilon_0$
E. Something else

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.