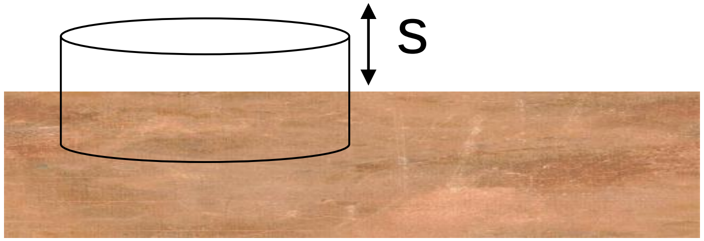
CONDUCTORS + CAPACITORS

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) $|E| = \sigma/\varepsilon_0$

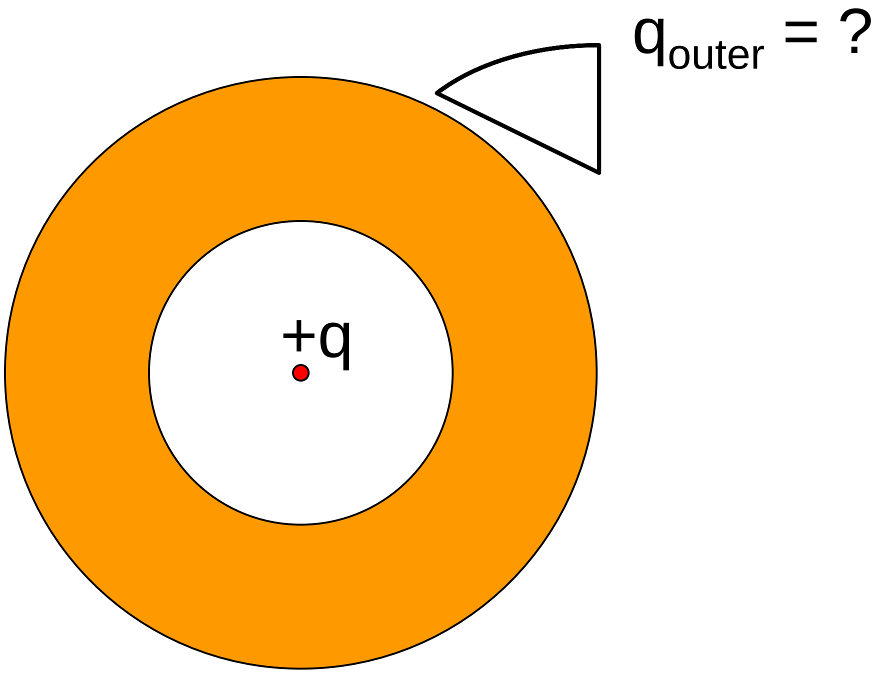
B) $|E| = \sigma/2\varepsilon_0$

C) $|E| = \sigma/4\varepsilon_0$

D) $|E| = (1/4\pi\varepsilon_0)(\sigma/s^2)$

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

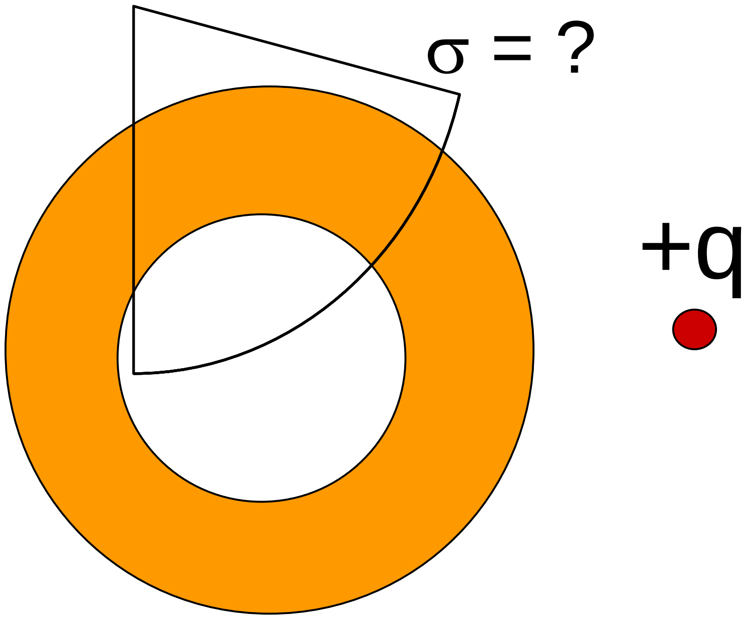
C) +q

D) $0 < q_{outter} < +q$

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

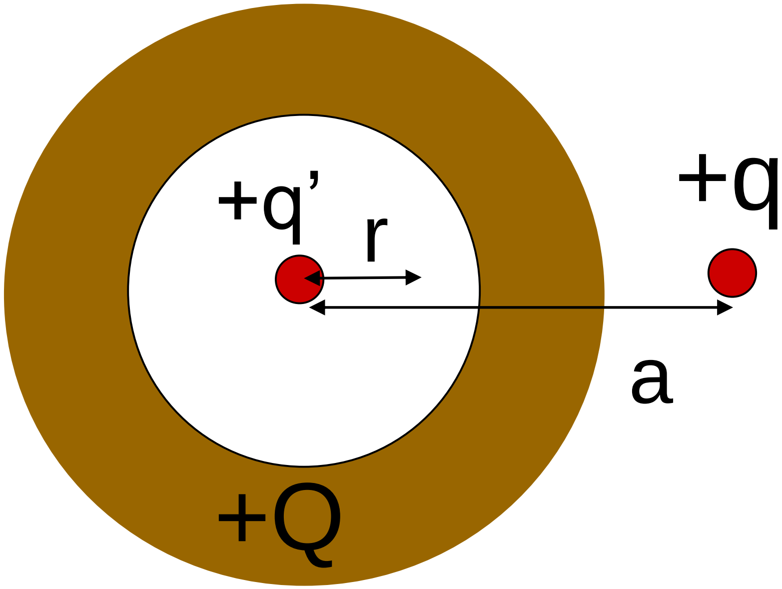
To think about: What about on the *inside* surface?

A point charge +q is near a neutral copper sphere with a hollow interior space. In equilibrium, the surface charge density σ on the interior of the hollow space is..



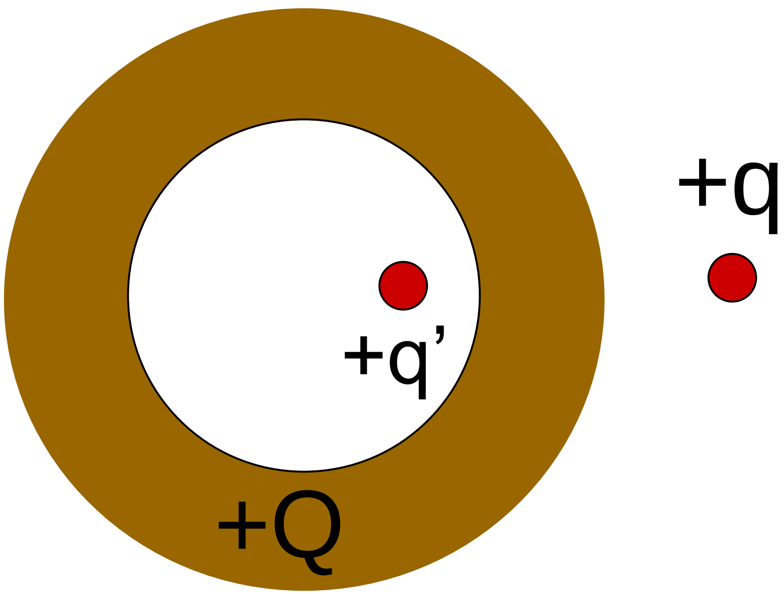
A) Zero everywhere
B) Non-zero, but with zero net total charge on interior surface
C) Non-zero with non-zero net total charge on interior surface.

A HOLLOW copper sphere has total charge +Q.
A point charge +q sits outside at distance a.
A charge, q', is in the hole, at the center.
(We are in static equilibrium.)
What is the magnitude of the E-field a distance r from q', (but, still in the "hole" region)



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

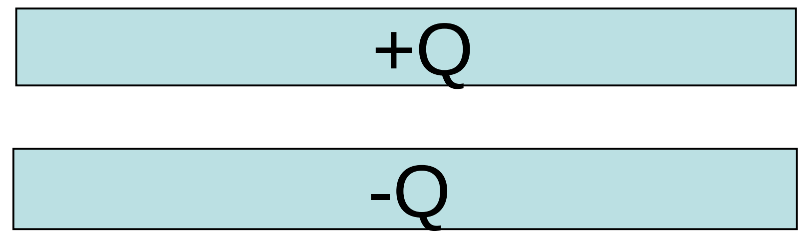
A HOLLOW copper sphere has total charge +Q.
A point charge +q sits outside.
A charge, q', is in the hole, SHIFTED right a bit.
(We are in static equilibrium.)
What does the E field look like in the "hole" region?



A) Simple Coulomb field (straight away from q', right up to the wall)
B) Complicated/ it's hard to compute

CAPACITORS

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

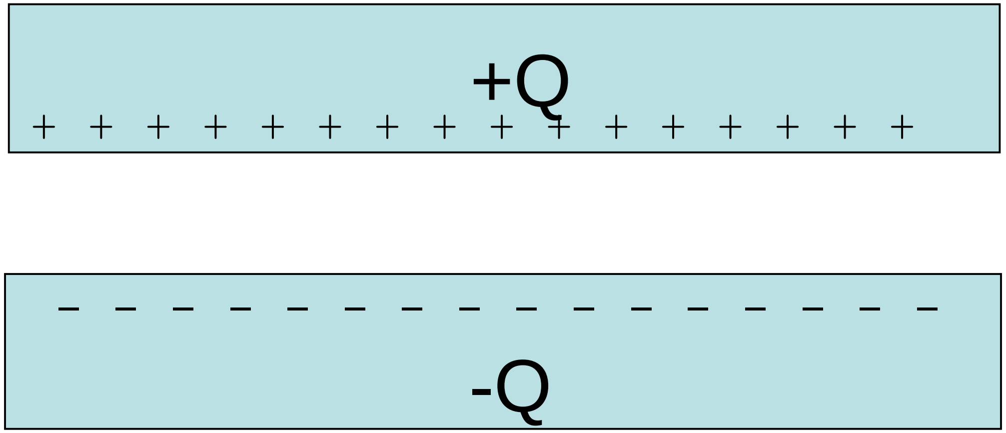
B) Uniformly on both side of each plate

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 +/- σ, 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 parallel plate capacitors, both with the same area and the same gap size.
Capacitor #1 has twice the charge of #2.
Which has more stored energy?
Which has more capacitance (charge stored per unit potential difference)?

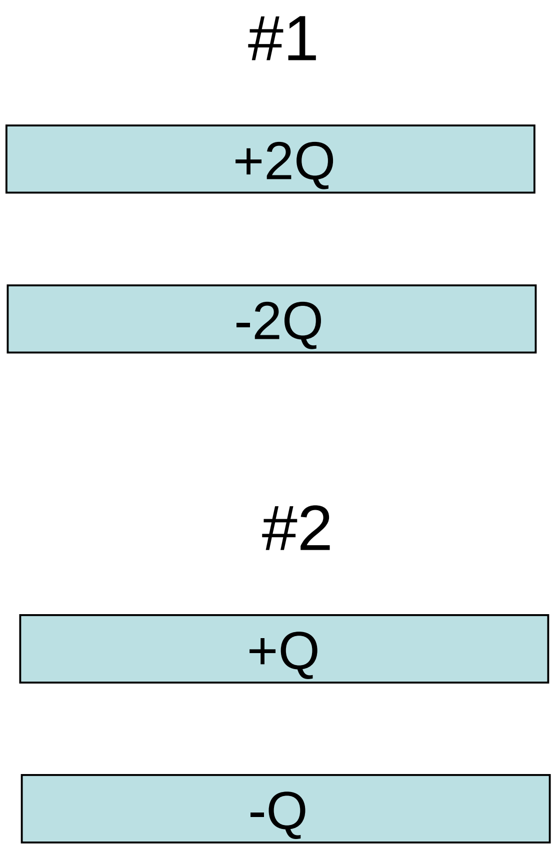
A) C1>C2, PE1>PE2

B) C1>C2, PE1=PE2

C) C1=C2, PE1=PE2

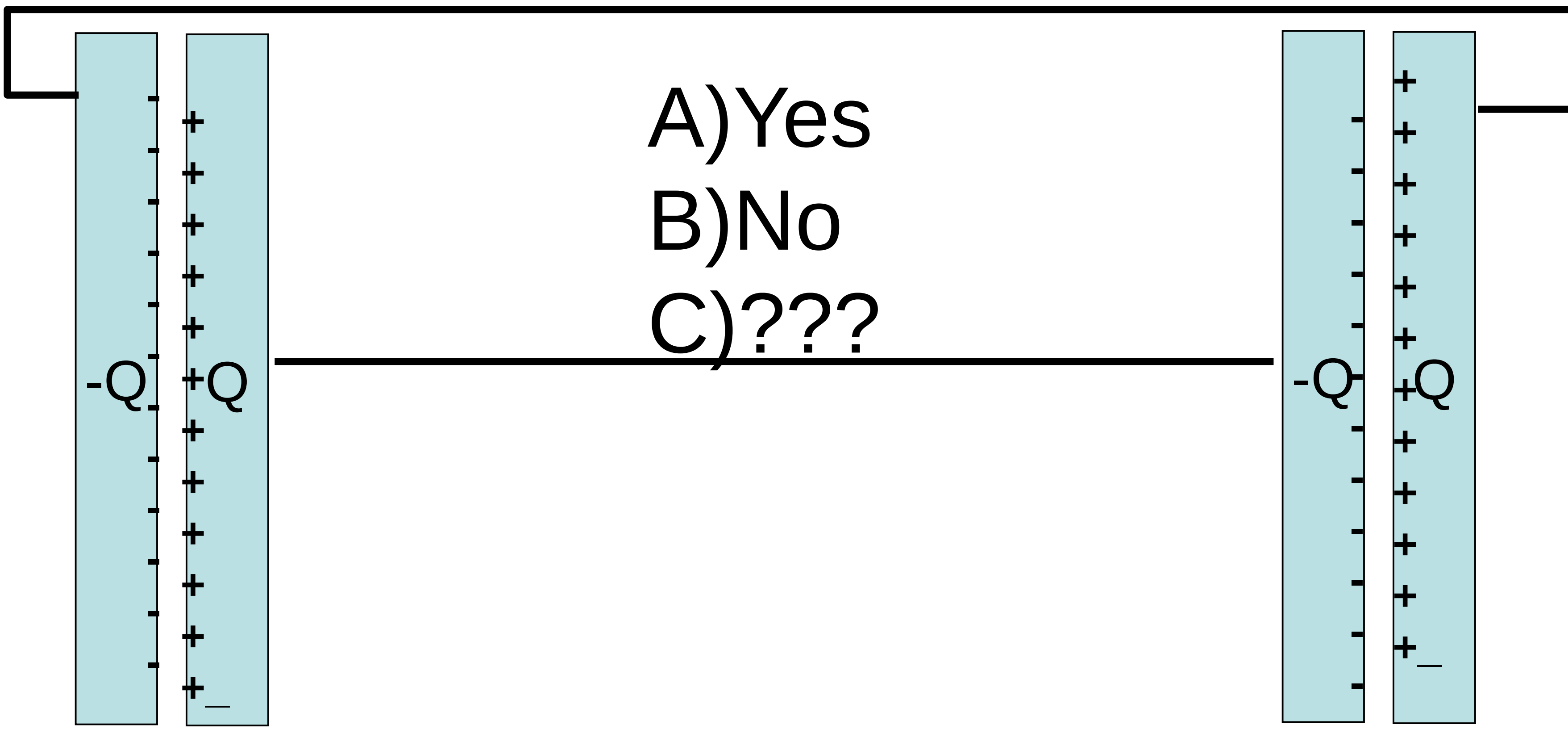
D) C1=C2, PE1>PE2

E) Some other combination!



Two very strong (big C) ideal capacitors are well separated.

If they are connected by 2 thin conducting wires, as shown, is this electrostatic situation physically stable?



A) Yes
B) No
C) ???

Two very strong (big C) ideal capacitors are well separated.

What if they are connected by one thin conducting wire, is this electrostatic situation physically stable?

A) Yes

B) No

C) ???