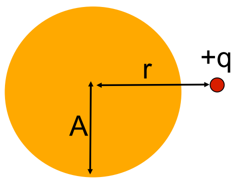
2.30

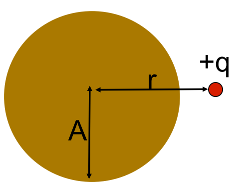
A point charge +q sits outside a solid *neutral conducting* copper sphere of radius A.
The charge q is a distance r > A from the center, on the right side.
What is the E-field at the center of the sphere?
(Assume equilibrium situation).



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

2.30

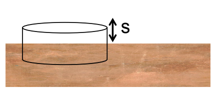
In the previous question, suppose the copper sphere is charged, total charge +Q.
(We are still in static equilibrium.)
What is now the magnitude of the E-field at the center of the sphere?



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

2.34

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) $|E| = 0$

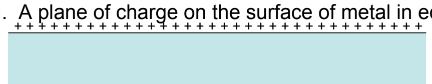
Boundary conditions

Consider two situations, both with very large (effectively infinite) planes of charge, with the <u>same</u> uniform charge per area σ

I. A plane of charge completely isolated in space:

\+ +

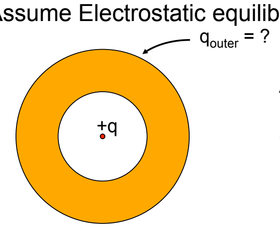
II. A plane of charge on the surface of metal in equilib:



Which situation has the larger electric field above the plane?

A) I B) II C) I and II have the same size E-field

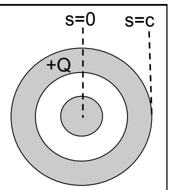
A **neutral** copper sphere has a spherical hollow in the center. A charge +q is placed in the center of the hollow. What is the total charge on the *outside* surface of the copper sphere? (Assume Electrostatic equilibrium.)



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?

Click A as soon as you start page 2!
Click B as soon as you START page 3!
When done, answer this:
A long coax has total charge +Q on the OUTER conductor.
The INNER conductor is neutral.

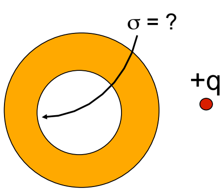


What is the sign of the potential difference, $\Delta V = V(c)-V(0)$, between the center of the inner conductor (s=0)
and the outside of the outer conductor?

C) Positive
D) Negative
E) Zero

(To think about: how and where do charges distribute on surfaces?)

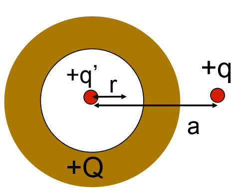
A point charge +q is near a neutral copper sphere with a hollow interior space. In equilibrium, the surface charge density σ on the interior of the hollow space is..



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.

2.30a

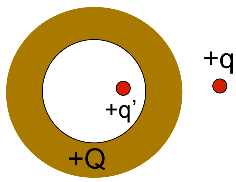
A HOLLOW copper sphere has total charge +Q.
A point charge +q sits outside at distance a.
A charge, q', is in the hole, at the center.
(We are in static equilibrium.)
What is the magnitude of the E-field a distance r from q', (but, still in the "hole" region)



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

2.3b

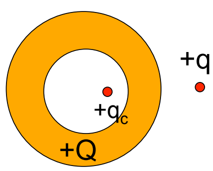
A HOLLOW copper sphere has total charge +Q.
A point charge +q sits outside.
A charge, q', is in the hole, SHIFTED right a bit.
(We are in static equilibrium.)
What does the E field look like in the "hole" region?



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

2.30c

A HOLLOW copper sphere has total charge +Q.
A point charge +q sits outside.
A charge, $+q_c$, is in the hole, SHIFTED right a bit.
(Assume static equilibrium.)
What does the charge distribution look like on the inner surface of the hole?



A) All minus charges, uniformly spread out
B) Minus charges close to q_c, plus charges opposite q_c
C) All minus but more close to q_c and fewer opposite
D) All plus but more opposite q_c and fewer close
E) Not enough information

2.49

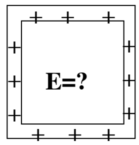
Given a pair of very large, flat, conducting capacitor plates (with surface charge densities +/- σ) what is the E field in the region between the plates?

A) $\sigma/2\varepsilon_0$
B) σ/ε_0
C) $2\sigma/\varepsilon_0$
D) $4\sigma/\varepsilon_0$
E) Something else/ not determined

2.27

A cubical non-conducting *shell* has a ***uniform*** positive charge density on its surface. (There are no other charges around)

What is the field inside the box?



A: **E**=0 everywhere inside

B: **E** is non-zero everywhere inside

C: **E**=0 only at the very center, but non-zero elsewhere inside.

D: Not enough info given

E-field inside a cubical box with a **uniform** surface charge.

The E-field lines sneak out the corners!