Does system energy "superpose"?

That is, if you have one system of charges with total stored energy W_1, and a second charge distribution with W_2...if you superpose these charge distributions, is the total energy of the new system simply $W_1 + W_2$?

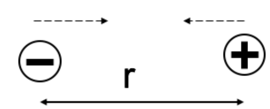
A. Yes
B. No

EXAM 1 INFORMATION

- Exam 1 on Wednesday, October 5th
- Arrive on time!
- We will provide Formula Sheets (posted on Piazza already)
- You can bring one-side of a sheet of paper with your own notes.
- 4 questions - True/False, Essay, Graphing, Calculations

WHAT'S ON EXAM 1?

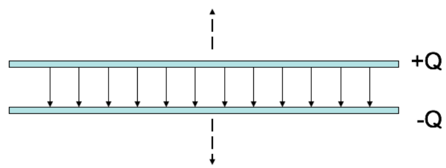
- Identify whether conceptual statements about $\mathbf{E}$, V, and/or ρ are true or false.
- Sketch and discuss delta functions in relation to charge density, ρ
- Calculate the electric potential, V, for a specific charge distribution and discuss what happens in limiting cases
- Calculate the electric field, $\mathbf{E}$, inside and outside a continuous distribution of charge and sketch the results



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

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

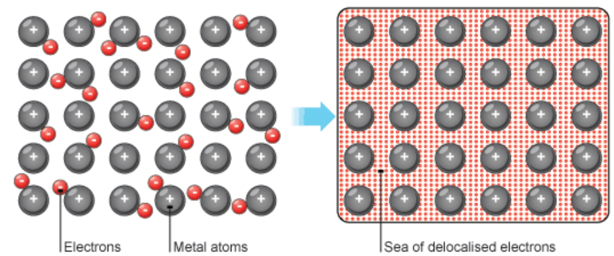
A. increases
B. decreases
C. remains constant



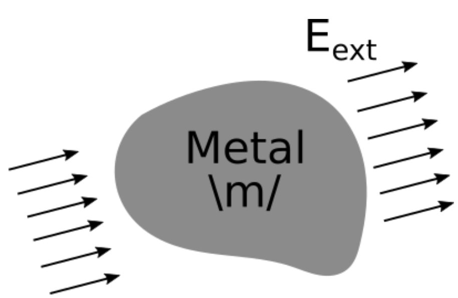
A parallel-plate capacitor has $+Q$ on one plate, $-Q$ on the other. The plates are isolated so the charge Q cannot change. As the plates are pulled apart, the total electrostatic energy stored in the capacitor:

A. increases
B. decreases
C. remains constant.

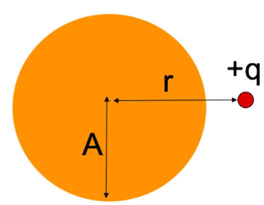
CONDUCTORS



THE CONDUCTOR PROBLEM

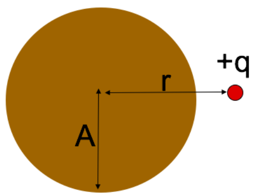


A point charge $+q$ sits outside a **solid neutral conducting copper sphere** of radius A. The charge q is a distance $r > A$ from the center, on the right side. What is the E-field at the center of the sphere? (Assume equilibrium situation).



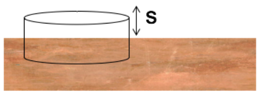
A. $|E| = kq/r^2$, to left
B. $kq/r^2 > |E| > 0$, to left
C. $|E| > 0$, to right
D. $E = 0$
E. None of these

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, 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. $|E| = 0$