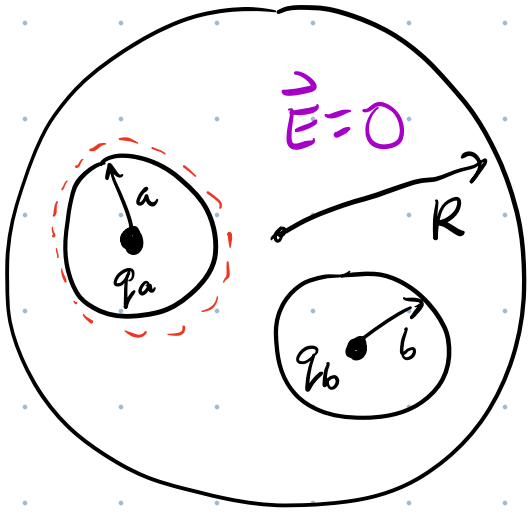
PHYS 301 Tutorial 5 Quiz Sol'ns 20241005



1. The red Gaussian surface around cavity-a must have $Q_{encl} = q_a + Q_a = 0$ since $\vec{E}=0$ inside conductor.

Q_a: charge on cavity wall.

$\therefore Q_a = -q_a$.

By the same logic $Q_b = -q_b$

Net charge on conductor is

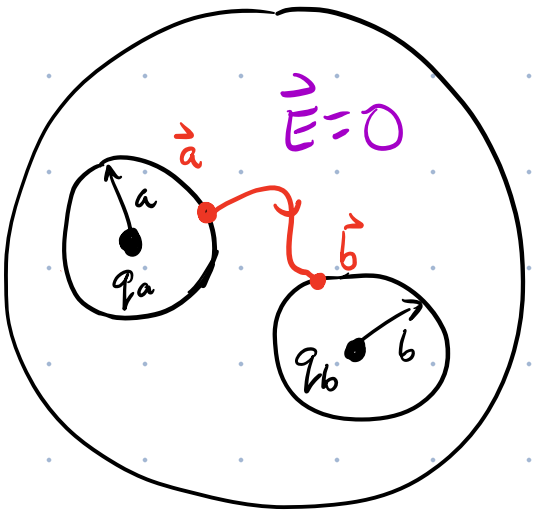
$$Q = Q_a + Q_b + Q_{outer}$$

$$\therefore Q_{outer} = Q - Q_a - Q_b$$
$$= Q - (-q_a) - (-q_b)$$

$$\therefore Q_{outer} = Q + q_a + q_b$$

2. Conductors in equilibrium have a uniform (i.e. const.) potential. $\therefore V_a = V_b$

Alternatively, know $V(\vec{b}) - V(\vec{a}) = -\int_{\vec{a}}^{\vec{b}} \vec{E} \cdot d\vec{a}$



But $\vec{E} = 0$

$\therefore V(\vec{b}) - V(\vec{a}) = 0$

$\therefore V(\vec{b}) = V(\vec{a})$

$V_b \quad V_a$

$\therefore V_b = V_a$ as above.