Name_____

Physics 111 Quiz #1, January 10, 2025

Please show all work, thoughts and/or reasoning to receive partial credit. The quiz is worth 10 points total, and all parts may not be of equal weight.

I affirm that I have carried out my academic endeavors with full academic honesty.

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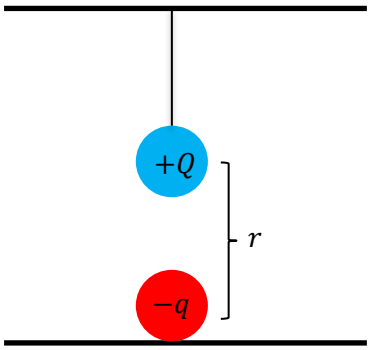
1. A point-charge $-q$ is placed at rest on a horizontal surface. A second point-charge $+Q$ is suspended from the ceiling by a light string directly above the first point-charge with a center-to-center separation of r between the point-charges. A sketch of the situation is shown below. What is the expression for the sum of the forces on point-charge $-q$? That is, write the symbolic equation for the forces that act on point-charge $-q$.



2. Due to the electrostatic attraction between point-charges $-q$ and Q, it is observed that point-charge $-q$ is just barely touching the horizontal surface for a certain value of $+Q$. What magnitude of the electric force on point-charge $-q$ would be required to just barely lift $-q$ from the horizontal surface? Assume the masses of point-charges $-q$ and $+Q$ are $m_{-q} = m_{+Q} = 25g$.

3. If the magnitude of point-charge $-q$ is $3nC$, what is the is the value of the point-charge $+Q$ that just lifts $-q$ from the table? Assume that the center-to-center separation between the two charges is $r = 10cm$.

4. What is the magnitude of the tension force in the string connection point-charge $+Q$ to the ceiling?

5. Suppose that the string holding point-charge to the ceiling is cut. What is the magnitude of the initial acceleration of $+Q$?