

Quiz 1B

PHYSICS 208, WINTER 2016

SECTION:

NAME:

Directions: Consider the following scenarios and *carefully* read each question. You are encouraged to write legible and organized solutions on a clean sheet of paper. Note that *vectors must have a direction and all answers must have appropriate units* and $\frac{1}{4\pi\epsilon_0} \approx 9 \times 10^9 \text{ Nm}^2/\text{C}^2$.

Consider two point charges q_1 and q_2 of unknown charges separated by a distance of three centimeters in vacuum along the x-axis.

(3 points) Suppose the two point charges are two electrons subject to an electrostatic force and a gravitational force between them. Show that the electrostatic force is much more powerful by considering their ratio. Note: $G \approx 6.67 \times 10^{-11} \text{ N} \times \text{m}^2/\text{kg}^2$, $m_e \approx 9 \times 10^{-31} \text{ kg}$, and $q_{\text{electron}} = e \approx 1.6 \times 10^{-19} \text{ C}$.

(3 points) Suppose $|q_1| = |q_2| = |q|$. What is $|q|$ if the electric force on q_1 is 16 Newtons, directed *away* from q_2 ?

(2 points) Suppose $q_1 = -q_2 = 10 \text{ C}$. What is the net torque on the dipole if it were perpendicular to a uniform electric field of magnitude $E = 5.0 \times 10^5 \text{ N/C}$?

Conceptual Question (2 points) How can I charge a metal (conducting) ball by induction?