$E = \frac{kq}{r^2}$, $k = 9.0 \times 10^9 \ \frac{N \cdot m^2}{C^2}$

If you need a refresher on vectors, visit [http://hyperphysics.phy-astr.gsu.edu/hbase/vect.html](http://hyperphysics.phy-astr.gsu.edu/hbase/vect.html) or any other suitable resource.

1. Charge distribution.

A negative point charge is brought in proximity to a spherical conductor, as shown in Fig. 1.

![Figure 1](image)

a) Using plus and/or minus signs, draw the induced charge distribution on the sphere and schematically show the electric field (using arrows) between the charge and the sphere. [1pt]

b) Would there be any forces between the charge and the conductor sphere? [1pts]
2. Electric field from 2 point charges on a line
Two charges \( Q_1 \) and \( Q_2 \) are placed at the distance 50 cm from each other (Fig.2).

\[
Q_1 = -2.0 \times 10^{-5} \text{C} \quad Q_2 = 8.0 \times 10^{-6} \text{C}
\]

![Figure 2.](image)

a) What are the magnitude and direction of the electric field strength at point Z from the charge \( Q_1 \)? [2pt]

b) What are the magnitude and direction of the electric field strength at point Z from the charge \( Q_2 \)? [1pt]

c) What are the magnitude and direction of the total electric field strength at point Z? [1pt]

3. Decay of electric field. A negative point charge is alone in free space. The electric field at some given distance \( x \) from the charge is 7 N/C.

a) What would be the electric field at a distance 2\( x \)? [2pt]

b) How about 0.5\( x \)? [1pt]

4. Which of the following is going to be used to charge an Electroscope during Electrostatics lab? [1pt]

a) Soda straw
b) Polyethylene rod and cotton cloth
c) Another electroscope
d) Battery