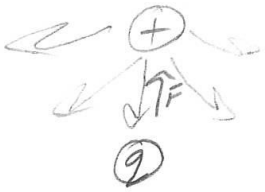
Name: Answers



Practice – 18.4 Electric Field

1. What is the magnitude and direction of an electric field that exerts a 2.00×10^{-5} N upward force on a –1.75 μC charge?

$$E = \frac{F}{q} = \frac{2\times10^{-5}N}{-1.75\times10^{-6}C} = 11.4\times10\ \frac{N}{C}\ \text{Downward}$$

2. What is the magnitude and direction of the force exerted on a 3.50 μC charge by a 250 N/C electric field that points due east?

$$F = qE = 3.5\times10^{-6}C\left(250\frac{N}{C}\right) = 8.75\times10^{-4}N\ \text{Eastward}$$

3. Calculate the magnitude of the electric field 2.00 m from a point charge of 5.00 mC (such as found on the terminal of a Van de Graaff).

$$E = \frac{kQ}{r^2} = 8.99\times10^{9}\frac{N\cdot m^2}{C^2}\left(\frac{5\times10^{-3}C}{(2.00\,m)^2}\right) = 1.12\times10^{7}\frac{N}{C}$$

4. What magnitude point charge creates a 10,000 N/C electric field at a distance of 0.250 m?

$$Q = \frac{Er^2}{k} = \frac{10{,}000\frac{N}{C}(0.250\,m)^2}{8.99\times10^{9}\frac{N\cdot m^2}{C^2}} = 6.95\times10^{-8}C$$

5. Calculate the initial (from rest) acceleration of a proton in a 5.00×10^{6} N/C electric field. $m_p = 1.67 \times 10^{-27}$ kg

$$F = qE = 1.6\times10^{-19}C\left(5\times10^{6}\frac{N}{C}\right) = 8\times10^{-13}N$$

$$F = ma \Rightarrow 8\times10^{-13}N = 1.67\times10^{-27}kg\,(a)$$

$$a = 4.79\times10^{14}\,m/s^2$$

Solutions:

1. 11.4 N/C downward
2. 8.75×10^{-4} N east
3. 1.12×10^{7} N/C
4. 6.95×10^{-8} C
5. 4.79×10^{14} m/s^2