AP Physics Electrostatics Quiz Review   Baden

Name __Key__   Date _____

$k = 9 * 10^9$ N m^2 /C^2 $q_e = 1.6 * 10^{-19}$ C

$\varepsilon_0 = 8.85 * 10^{-12}$ C^2 / Nm^2 $m_e = 9.11 * 10^{-31}$ kg $m_p = 1.67 * 10^{-27}$ kg
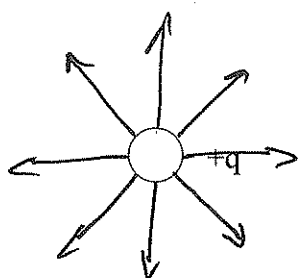
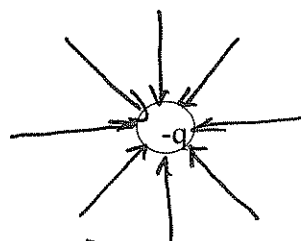1) What is the strength of the electric field 7 mm from a -2.5 µC charge?

$$|\vec{E}| = \frac{kq_o}{r^2} = \frac{(9\times10^9)(-2.5\times10^{-6})}{(.007)^2} = \boxed{4.59\times10^8 \frac{N}{C}}$$

2) Draw the electric field around
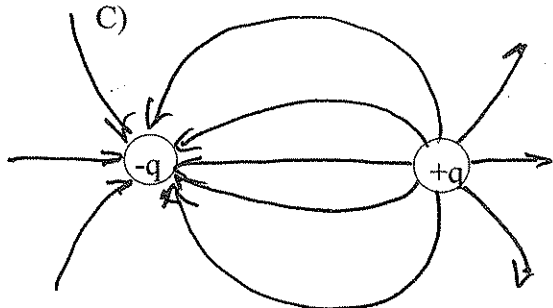
A)

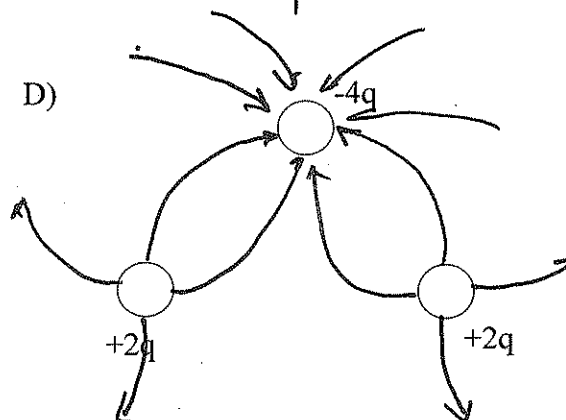

B)

C)

D)

3) What is the electric potential 4 cm away from a -36 µC Charge?

$$V = \frac{kq}{r} = \frac{(9\times10^9)(-36\times10^{-6})}{(0.04)} = \boxed{-8.1\times10^6 \text{ V}}$$

4) Your answer to 3 should have been negative....does this indicate a direction? HINT: how are **E** and V diffrent?

No, V is a scalar.

5) How much work is done in bringing a +76 µC from infinity to within 3 cm of an identical +76 µC Charge located at the origin?

$$W = \Delta E = q(V_f - V_i)$$
$$= (76\times10^{-6}C)(\frac{9\times10^9(76\times10^{-6})}{.03} - \underset{\underset{V_\infty}{\downarrow}}{0}) = \boxed{1732.8 \text{ J}}$$

6) How much potential energy does a +21 mC Charge have when it is 5 m away from a +720 mC charge?

$$U_e = \frac{kq_1 q_2}{r^2} = \frac{(9\times10^9)(21\times10^{-3})(720\times10^{-3})}{5} \quad \boxed{= 2.72\times10^7 \text{ J}}$$

7) What is the magnitude of the force that an electron experiences when it is 9 nm from a proton?

$$F = \frac{(k)q_1 q_2}{r^2} = \frac{(9\times10^9)(-1.6\times10^{-19})(1.6\times10^{-19})}{(9\times10^{-9})^2} \quad \boxed{2.8\times10^{-12} \text{ N}}$$

8) Is the force in #7 ⟨attractive⟩ or repulsive?

9) A +65 μC charge is located at x = 0 and a -27 μC charge is located at x = 4. What is the electric potential at x = 2?

$$V_{net} = \Sigma V = \frac{kq_1}{r} + \frac{kq_2}{r}$$

$$= \frac{(9\times10^9)(-27\times10^{-6})}{2} + \frac{(9\times10^9)(65\times10^{-6})}{2}$$

$$= 171000 \text{ V}$$

10) How many electrons have to be removed from a neutral conducting sphere to give it a charge of +76 μC?

$$q_s = 76\,\mu C = 76\times10^{-6} C$$

$$q_e = 1.6\times10^{-19} \, C/e$$

$$\frac{q_s}{q_e} = \#\,electrons \quad \boxed{= 4.75\times10^{14}\, electrons}$$

11) What is the magnitude of the electric field inside a conductor?

$$O$$

12) Electric field lines always enter and exit a charged particle or a conductor at __right (90°)__ angles.

13) The plates of a parallel plate capacitor have a surface area of 0.5 m². When this capacitor has 120μC of charge on each plate what is the strength of the electric field inside the capacitor?

$$\sigma = \frac{q}{A} = \frac{120\times10^{-6}}{.5} = 2.4\times10^{-4} \frac{C}{m^2}$$

$$E = \frac{\sigma}{\varepsilon_0} = \frac{2.4\times10^{-4}\frac{C}{m^2}}{8.85\times10^{-12}\frac{C^2}{Nm^2}} \quad \boxed{2.71\times10^7 \frac{N}{C}}$$