| | Physics 220: Practice Test1 | Name _____ |
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(1) Suppose you have the following charge configuration: (x,,y,q): (-a,0,-q),(a,0,+q), (-b,0,+q),(b,0,-q). Find (1) **E** at points along the y-axis and (2) how **E** behaves as $\mathbf{y} \to \infty$. Here, b<a.

(2) Suppose you have the following charge configuration: (x,y,q): (-a,0,-q), (a,0,+q) where a=0.1 m and q=1μC. Find (1) The magnitude and sign of the electric field at x=+1.0 m. (2) Suppose a charge $q_1$=3μC is placed at x=+1.0 m. Find the force on the charge. (3) Suppose the charge was attached to a mass m=1x$10^{-20}$kg. Find the acceleration of the mass. Note: k=8.987x$10^9$ N $m^2/C^2$=1/($4\pi\varepsilon_0$)

(3) A sphere of radius a has a total charge +Q uniformly distributed over its volume so that $\rho$=Q/( (4/3)$\pi a^3$). Use Gauss's law to find the vector **E** inside the sphere and outside the sphere.

(4) You have a parallel plate capacitor with plates of area A and separation d. Suppose one of the plates has a charge Q while the other plate has a charge -Q. (1) If A=1.0 $m^2$, d=0.5 m and Q=1.0 μC, provide numerical answers (together with correct SI units) for the following: $C_{geo}$, E, ΔV, U (the work required to charge this capacitor) and u (the energy density). (2) Now, suppose a material of dielectric constant k=100 were inserted into the space between the plates of the capacitor so that it completely filled the volume. Find C.

(5) Suppose that in one region of space, the electric potential varies as V(x)=ax. Find the magnitude of the electric field in this region of space.