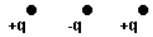
PHYS-115(x) (Kaldon-xxxxx) **Name** _____
WMU - Winter 2001
Exam 1 - 100,000 points **Book Title** _____
Section: **3a** A to F **3b** G to M **3c** N to S **3d** T to Z

Sample Exam 01/23/2001•Rev.5

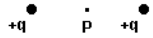
State Any Assumptions You Need To Make -- Show All Work -- Circle Any Final Answers
Use Your Time Wisely - Work on What You Can - Be Sure to Write Down Equations
BOLDFACE Variables Are Vectors - Feel Free to Ask Any Questions

Random Problem Title (50,000 points)

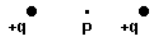
1.) Three charges, $|q| = 4.00 \times 10^{-6}$ C, are rigidly arranged in line with spacing $a = 10.0$ cm $= 0.100$ m as shown. (a) Find the vector electric force, $\vec{F}_E$, acting on the charge at the right.



(b) The center charge at point P is removed. Find the electric field vector, $\vec{E}_{total}$, at the center point P.

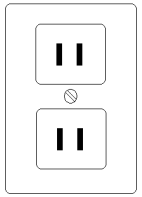


(c) Find the electric potential, V, at the center point P.



(d) A charged piece of copper has $q = 6.61 \times 10^{-6}$ C. Calculate what has to be added or removed to make this real charge from an uncharged piece of copper?

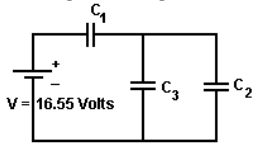
(e) The two main slots of an electrical outlet in the United States are 1.00 cm apart. However, you never see sparks shooting between the slots when the potential difference is 125 volts. At what minimum voltage will you see sparks in dry air?



Scraps of Problems Pulled From Wherever (50,000 points)

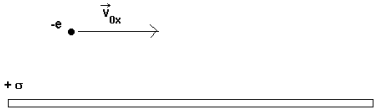
2.) (a) A real capacitor $C_1 = 1.11$ pF is made of parallel plates of area of 1.257×10^{-5} m². Find the separation air gap, d, between the plates.

(b) The capacitor C_1 is placed in the following circuit and has charges $Q = \pm 1.655 \times 10^{-11}$ C on its plates. What is the equivalent capacitance C of this circuit? *You do not need to know C_2 and C_3 to solve this problem.*



(c) Capacitors C_2 and C_3 are identical capacitors. Find their value. *If you did not get an answer to (b), use $C_{eq} = 10.0$ pF.*

(d) An electron ($m = 9.11 \times 10^{-31}$ kg) has velocity $\vec{v}_{ox} = 555 m/s\hat{i}$ at $t = 0$, when it is 1.00 cm above an infinite sheet of charge with $\sigma = +1.00 \times 10^{-6}$ C/m². Find the time t when the electron touches the sheet of charge. *Ignore gravity.*



(e) A very thin line of charge has $Q = -1.00 \times 10^{-4}$ C, $L = 1.00$ m. Since all real charges are made of electrons, then assuming the electrons are all evenly spaced single file along the line, find the distance d between each electron.