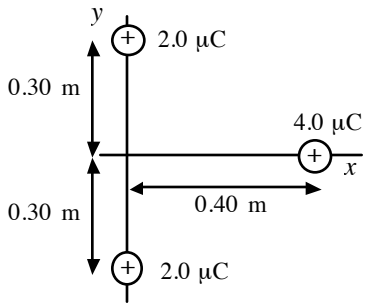
Name: _____ **Date:** _____ **Period:** _____

AP Physics C
Electrostatics HO26

1.) Two charges are located on the positive *x*-axis of a coordinate system. Charge q_1 = 1.0 nC is 2.0 cm from the origin, and charge q_2 = -3.0 nC is 4.0 cm from the origin. What is the total force exerted by these two charges on a charge q_3 = 5.0 nC located at the origin? (UP Ex 22-3)

2.) In the figure below, two equal positive point charges $q_1 = q_2$ = 2.0 μC interact with a third point charge Q = 4.0 μC. Find the magnitude and direction of the total force on Q. (UP Ex 22-4)



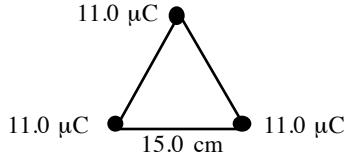
3.) Suppose the point charge on the *y*-axis at *y* = -0.30 m has a charge of –2.0 μC, the other charges remaining the same. Find the magnitude and direction of the net force on Q. (UP 22-14)

4.) Four identical charges *q* are placed on the corners of a square of side *L*. Find the magnitude and direction of the total force exerted on one charge by the other three charges. (UP 22-15)

5.) Two positive point charges *q* are placed on the *y*-axis at *y* = *a* and *y* = -*a*. A negative point charge –*Q* is located at some point on the +*x*-axis. Find the *x* and *y*-components of the net force that the two positive charges exert on –*Q*. (UP 22-16)

6.) How many electrons make up a charge of –30.0 μC? (G 16-1)

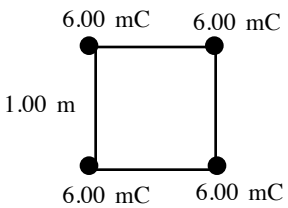
7.) Three particles of charges 11.0 μC are located at the corners of an equilateral triangle of side 15.0 cm. Calculate the magnitude and direction of the net force on each particle. (G 16-12)



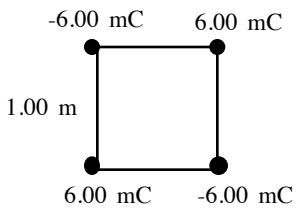
8.) A +5.7 μC and a –3.5 μC charge are placed 25 cm apart. Where can a third charge be placed so that it experiences no net force? (G 16-19)

9.) A charge of 6.00 mC is placed at each corner of a square 1.00 m on a side. Determine the magnitude and direction of the force on each charge. (G 16-13)

10.) Repeat Problem 9 for the case when two of the positive charges on opposite corners are replaced by negative charges of the same magnitude. (G 16-14)



Problem 9



Problem 10

Name: _____ **Date:** _____ **Period:** _____

AP Physics C
Electrostatics HO27

1.) A point charge $q = 6.0\ \mu C$ is located at the origin. Find the electric field vector at the following points.

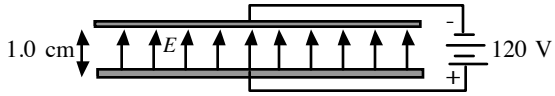
a.) x = 1.2 m and y = -1.6 m

b.) x = -2.2 m and y = -1.2 m

c.) x = 4.0 m and y = 2.5 m

d.) x = -2.0 m and y = 1.5 m

2.) Two large horizontal plates are separated by 1.00 cm and are connected to a 120 V battery. The magnitude of the electric field between the plates is uniform and has a magnitude of 1.20×10^4 N/C and is oriented vertically upward, as shown in the figure below. An electron is released from rest at the upper plate. ($m_e = 9.11 \times 10^{-31}$ kg, $e = -1.60 \times 10^{-19}$ C)



a.) What is the electrical force on the electron?

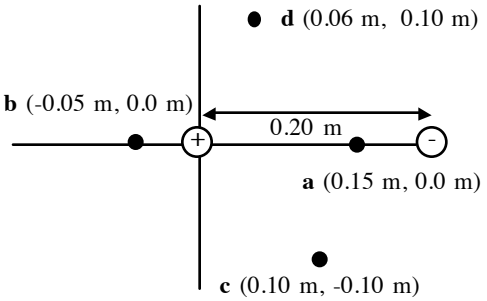
b.) What is the gravitational force on the electron?

c.) What is the acceleration of the electron?

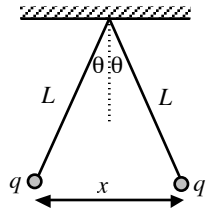
d.) What speed and kinetic energy does it acquire while traveling 1.0 cm to the lower plate?

e.) If we launch an electron into the electric field with an initial horizontal velocity v_0, what is the equation of its trajectory?

3.) Point charges q_1 and q_2 of +22 nC and –22 nC are placed 0.20 m apart. Find the electric field vector at points a, b, c, and d.



Problem 3

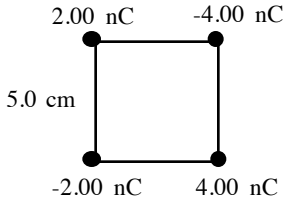


Problem 4

4.) Two tiny conducting balls of identical mass m and charge q hang from nonconducting threads of length L. Assume that θ is so small that tanθ can be replaced by sinθ and show that, for equilibrium

$$x = \left(\frac{q^2 L}{2\pi\varepsilon_0 mg} \right)^{1/3}$$

5.) What is the magnitude and direction of the electric field at the center of the square below?



Problem 5

Name: _____ **Date:** _____ **Period:** _____

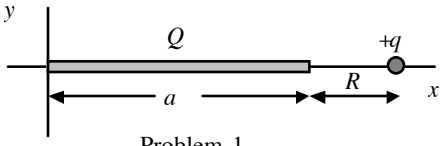
AP Physics C
Electrostatics HO28

1.) Positive charge Q is distributed uniformly along the positive x-axis from $x = 0$ to $x = a$ as shown below. A positive point charge q is located on the x-axis at $x = a + R$, a distance R to the right of the end of Q. (UP 22-66)

a.) Find the electric field vector produced by the charge distribution Q at points on the x-axis where $x > a$.

b.) Calculate the force that the charge distribution Q exerts on q.

c.) Show that if $x >> a$, the magnitude of the force reduces to that of a point charge.

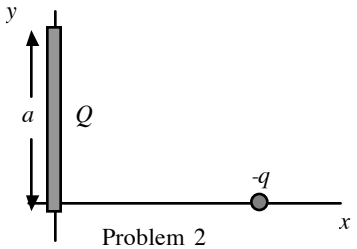


Problem 1

2.) Positive charge Q is distributed uniformly along the positive y-axis from $y = 0$ to $y = a$ as shown below. A negative point charge $-q$ lies on the positive x-axis, a distance x from the origin. (UP 22-67)

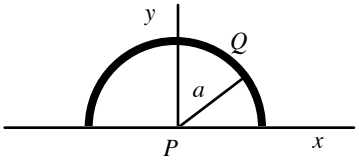
a.) Find the electric field vector produced by the charge distribution Q at points on the $+x$-axis.

b.) Calculate the force that the charge distribution Q exerts on q.

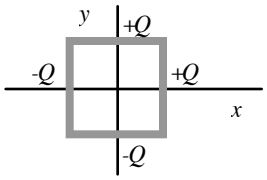


Problem 2

3.) Positive charge Q is uniformly distributed around a semicircle of radius a. Find the electric field at the center of curvature P.



Problem 3 (UP 22-80)



Problem 4 (UP 22-82)

4.) Electric charge is distributed uniformly along each side of a square. Two adjacent sides have positive charge with total charge $+Q$ on each. Each side of the square has a length a.

a.) If the other two sides have negative charge with total charge $-Q$ on each, what are the x- and y-components of the net electric field at the center of the square?

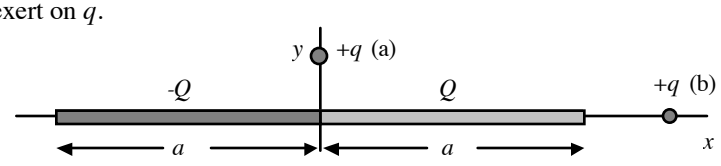
b.) Repeat the calculation of part (a) if all four sides have positive charge $+Q$.

5.) Negative charge $-Q$ is distributed uniformly around a quarter-circle of radius a that lies in the first quadrant, with the center of curvature at the origin. What are the x- and y-components of the net electric field at the origin? (UP 22-81)

6.) Positive charge $+Q$ is distributed uniformly along the $+x$-axis from $x = 0$ to $x = a$. Negative charge $-Q$ is distributed uniformly along the $-x$-axis from $x = 0$ to $x = -a$. (UP 22-74)

a.) A positive point charge q lies on the positive y-axis, a distance y from the origin. Find the force exerted on q by the positive and negative charge distributions.

b.) Suppose that the positive point charge lies on the positive x-axis, a distance $x > a$ from the origin. Find the force that the charge distributions exert on q.



Problem 6 (UP 22-74)