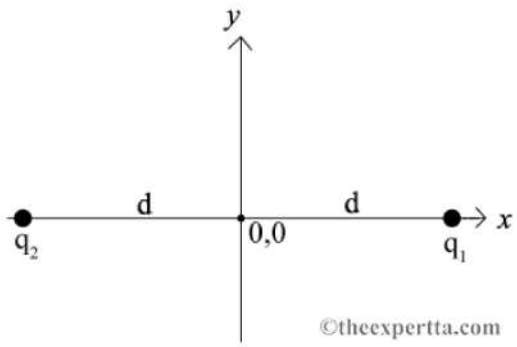
PHYS 1442-001 N/A

N/A Begin Date: 12/5/2019 12:01:00 AM -- **Due Date:** 12/5/2019 11:59:00 PM **End Date:** 12/12/2019 11:59:00 PM

Problem 1: Two charges lie in a line along the x axis. Charge 1 is q_1 = ***1.4*** C and charge 2 is q_2 = ***2.45*** C. They are each a distance of d = ***0.053*** m from the origin.



What is the distance on the x-axis from the origin at which the electric field will be zero. Give your answer in meters.
Numeric : A numeric value is expected and not an expression.
x_o = _____

Problem 2: A free electron is suspended in an electric field near the surface of the Earth.

Part (a) Give an expression for the magnitude of this electric field assuming the electron is stationary, in terms of the mass m_e and charge e of the electron, and the gravitational acceleration g.
Expression :
E = _____

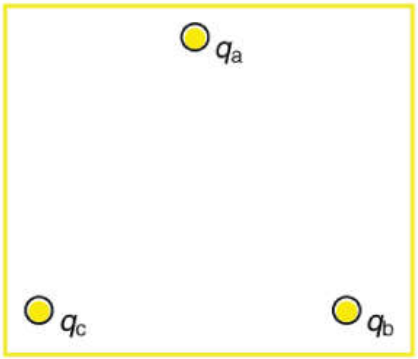
Select from the variables below to write your expression. Note that all variables may not be required.
α, **β**, **γ**, **θ**, **a**, **d**, **e**, **g**, **h**, **j**, **k**, $\mathbf{m_e}$, **P**, **S**, **t**

Part (b) What is the magnitude of this electric field, in N/C, assuming the electron is stationary?
Numeric : A numeric value is expected and not an expression.
E = _____

Part (c) What does the small value for this field imply regarding the relative strength of the gravitational and electrostatic interaction?
MultipleChoice :

1) The coulomb force is the same as gravity.
2) The coulomb force is extraordinarily weaker than gravity.
3) None of these.
4) The coulomb force has nothing to do with gravity.
5) The coulomb force is extraordinarily stronger than gravity.

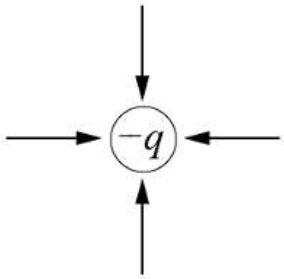
Problem 3: In the figure, the point charges are located at the corners of an equilateral triangle ***21*** cm on a side.



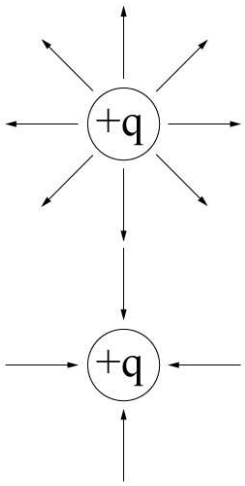
Part (a) Find the magnitude of the electric field, in newtons per coulomb, at the center of the triangular configuration of charges, given that q_a = *1.2* nC , q_b = -*7.9* nC , and q_c = *1.9* nC.
Numeric : A numeric value is expected and not an expression.
|E| = _____

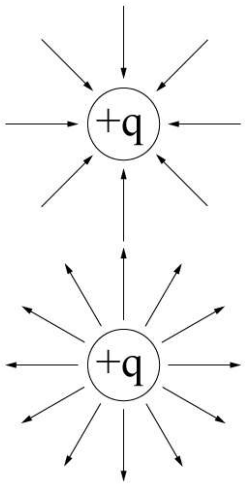
Part (b) Find the direction of the electric field in degrees below the right-pointing horizontal (the positive *x*-axis).
Numeric : A numeric value is expected and not an expression.
θ = _____

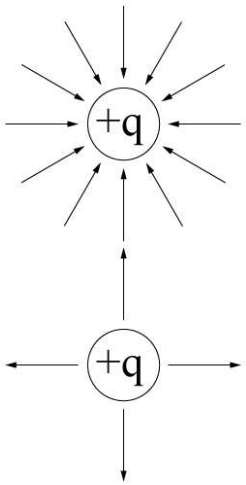
Problem 4: The following figure shows the electric field lines from a point charge -q.



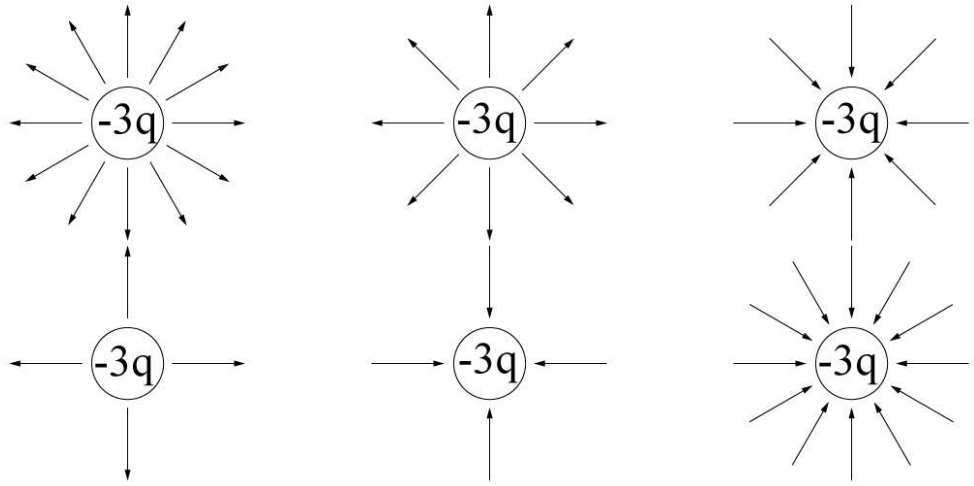
Part (a) What do the electric field lines look like near a point charge +*q*?
SchematicChoice :







Part (b) What do the electric field lines look like near a point charge -3.00*q*?
SchematicChoice :



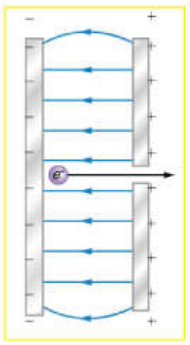
Problem 5: Suppose you have a *3.9* μC charge and a *265* N/C electric field that points due east.

What is the magnitude of the force, in newtons, exerted on the charge by the electric field?
Numeric : A numeric value is expected and not an expression.
F = _____

Problem 6: A simple and common technique for accelerating electrons is shown in the figure, which depicts a uniform electric field between two plates. Electrons are released, usually from a hot filament, near the negative plate, and there is a small hole in the positive plate that allows the electrons to pass through.

Randomized Variables

$E = 2.6 \times 10^4$ N/C



Calculate the horizontal component of the electron's acceleration if the field strength is 2.6×10^4 N/C. Express your answer in meters per second squared, and assume the electric field is pointing in the negative x-direction as shown in the figure.
Numeric : A numeric value is expected and not an expression.
a_x = _____

Problem 7: Consider a ring of charge with a linear charge density *110* nC/m. The radius of the ring is *87* cm.

Part (a) What is the magnitude of the electric field, in newtons per coulomb, a distance ***2.25*** m from the center of the ring along the axis of the ring?
Numeric : A numeric value is expected and not an expression.
$\boldsymbol{E}$ = _____

Part (b) Give an expression for the electric field very far from the ring, when $z_0 >> R$. Write this expression in terms of the Coulomb constant k, the charge density λ, the distance z_0, and the radius R.
Expression :
$\boldsymbol{E(z_0 >> R)}$ = _____

Select from the variables below to write your expression. Note that all variables may not be required.
β, **γ**, **λ**, **π**, **θ**, **d**, **g**, **h**, **j**, **k**, **m**, **n**, **P**, **R**, $\mathbf{z_0}$

Part (c) Give an expression for the electric field very close to the plane of the ring, when $z_0 << R$. Write this expression in terms of the Coulomb constant k, the charge density λ, the distance z_0, and the radius R.
Expression :
$\boldsymbol{E(z_0 << R)}$ = _____

Select from the variables below to write your expression. Note that all variables may not be required.
β, **γ**, **λ**, **π**, **θ**, **d**, **g**, **h**, **j**, **k**, **m**, **n**, **P**, **R**, $\mathbf{z_0}$