CENGAGE | WEBASSIGN

Electric Forces & Fields #1 (Homework)

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Current Score

QUESTION	1	2	3	4	5	6	7	8	9	10
POINTS	20/20 ✓	1/1 ✓	1/1 ✓	1/1 ✓	1/1 ✓	2/2 ✓	2/2 ✓	0/2	1/2	0/2

TOTAL SCORE: 29/34 85.3%

Due Date

WED, DEC 18, 2024
11:59 PM GMT+8

REQUEST EXTENSION

Assignment Submission & Scoring

Assignment Submission

For this assignment, you submit answers by question parts. The number of submissions remaining for each question part only changes if you submit or change the answer.

Assignment Scoring

Your last submission is used for your score.

1. [20/20 Points] DETAILS MY NOTES SERCPAP12 15.STEP.1.SB. PREVIOUS ANSWERS ASK YOUR TEACHER PRACTICE ANOTHER

Electric Charge Polarity

A particle with a positive charge exerts an electric force that _____ a particle with a negative charge.

- (•) attracts
- ( ) repels

Electric Charge Conservation A

A muon, which has a negative charge, decays into an electron and a neutrino. A neutrino is a very light, neutral particle. How does the charge of the electron relate to the charge of the original muon?

- ( ) The charge of the muon is greater than the charge of the electron.
- (•) The charges are equal.
- ( ) The charge of the muon is greater than the charge of the electron.
- ( ) The answer depends on the energy of the reaction.

Electric Charge Conservation B

Determine whether the following statement is true or false.
Electric charge is conserved in all interactions.

- (•) True
- ( ) False

Fundamental Charge

Determine whether the following statement is true or false.
A helium nucleus, which consists of two neutrons and two protons, can have any charge, from zero up to twice the fundamental charge of 1.60×10^{-19} C, depending on its state of ionization.

- ( ) True
- (•) False

Definition of a Conductor and an Insulator A

Determine whether the following statement is true or false.
In a conducting material, electric charges move freely under the response to an electric force.

- (•) True
- ( ) False

Definition of a Conductor and an Insulator B

Determine whether the following statement is true or false.
In an insulating material, electric charges don't move freely in response to an electric force.

- (•) True
- ( ) False

Definition of a Conductor and an Insulator C

Which of the following is a good conductor?

- (•) copper
- ( ) glass
- ( ) plastic
- ( ) none of these

Definition of a Conductor and an Insulator D

Which of the following is a good insulator?

- (•) plastic
- ( ) copper
- ( ) aluminum
- ( ) none of these

Inverse Square Law of the Electric Force A

A bare nucleus is a distance r_0 from a free electron, and exerts an electric force of F_0 on it. What is the force F_{new} on an electron a distance $2.00r_0$ from the nucleus center, in terms of F_0?

1/4 F_0

Inverse Square Law of the Electric Force B

A bare nucleus is a distance r_0 from a free electron and exerts an electric force of F_0 on it. What is the distance to a second electron, in terms of r_0, if the force on it is $\frac{F_0}{4.00}$?

2 ✔ r_0

Dependence of the Electric Force on Charge

Charge Q is placed on a conducting sphere, which exerts an electric force F_1 on an electron a distance r_0 away. A second conducting sphere has charge $5.00Q$, is the same distance r_0 from another electron, and exerts a force F_2 on it. What is the ratio $\frac{F_2}{F_1}$?

5 ✔

Electric Fields in Conductors

Electric charge is placed on a solid silver pyramid and allowed to come to static equilibrium (which happens very quickly). Which of the following describes the electric field inside the pyramid?

- $E_{inside} = \frac{E_{surface}}{2}$
- $\frac{E_{surface}}{2} < E_{inside} < E_{surface}$
- (●) $E_{inside} = 0$
- $E_{inside} = E_{surface}$
- $0 < E_{inside} < \frac{E_{surface}}{2}$

✔

Electric Charge on Conductors A

Electric charge is placed on a gold bar and allowed to come to static equilibrium (which happens very quickly). Where is the excess charge?

- Some is on the surface, and the rest is spread uniformly throughout the interior of the gold.
- Some is distributed in the interior, but most of it is on the external surface of the gold.
- (●) It's spread over the surface of the gold.
- It's spread uniformly throughout the interior of the gold.
- There is insufficient information given to determine the answer.

✔

Electric Charge on Conductors B

Electric charge is placed on a solid metal object and allowed to come to static equilibrium (which happens very quickly).
Determine whether the following statement is true or false.
The excess charge resides on the surface unless the object has an irregular shape. If the shape is irregular, excess charge accumulates inside the object near points where the radius of curvature is smallest.

- True
- (●) False

✔

Electric Charge on Conductors C

Electric charge is placed on a solid metal object and allowed to come to static equilibrium (which happens very quickly).
Determine whether the following statement is true or false.
The excess charge resides on the surface.

- (●) True
- False

✔

Electric Fields Outside Conductors A

Suppose a conductor carries a positive charge. If a particle with a very small positive charge is placed at rest near the surface and released, which of the following statements is true?

- (●) The particle's initial acceleration will be directly away from the surface.
- The particle will remain in static equilibrium at its initial point.
- The particle's initial acceleration will be tangential to the surface.
- The particle will be attracted to the conductor and increase the existing positive charge.
- The direction of the particle's initial acceleration depends on the shape of the conductor.

✔

Electric Fields Outside Conductors B

Suppose a conductor carries a positive charge.
Determine whether the following statement is true or false.
The electric field just outside the conductor is perpendicular to the surface.

- (●) True
- False

✔

Electric Fields Outside Conductors C

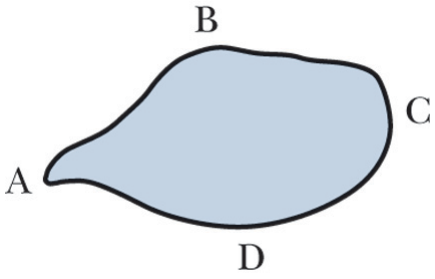
Electric charge is moving at constant velocity along a long, slender, cylindrical conductor.
Determine whether the following statement is true or false.
The electric field just outside the conductor is parallel to the charge's motion.

- True
- (●) False

✔

Charge Distributions on Conductors A

The conductor in the figure carries a net charge.



At which one of the labeled points is the surface charge density the greatest?

- (•) A
- ( ) B
- ( ) C
- ( ) D
- ( ) There is insufficient information given to determine the answer.

Charge Distributions on Conductors B

Determine whether the following statement is true or false.
By rounding the ends of lightning rods, French scientists improved on Benjamin Franklin's invention.

- ( ) True
- (•) False

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2. **[1/1 Points]** DETAILS MY NOTES **SERCPAP12 15.STEP.2.1A.** PREVIOUS ANSWERS ASK YOUR TEACHER PRACTICE ANOTHER

Calculate the magnitude of the electric force (in N) between an electron and a carbon nucleus that are separated by 5.00×10^{-9} m. The charge of an electron is -1.60×10^{-19} C and the charge of a carbon nucleus is 9.60×10^{-19} C. Treat the nucleus and the electron as point charges. ($k_e = 8.99 \times 10^9$ N · m^2/C^2)

5.52e-11 N

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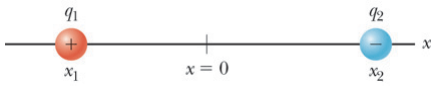
3. **[1/1 Points]** DETAILS MY NOTES **SERCPAP12 15.STEP.2.2A.** PREVIOUS ANSWERS ASK YOUR TEACHER PRACTICE ANOTHER

Charge $q_1 = 1.50 \times 10^{-5}$ C is at $x_1 = -4.25$ m on the x-axis, whereas charge $q_2 = -3.00 \times 10^{-5}$ C is at $x_2 = 5.10$ m.



Find the x-component of the force (in N) of charge q_1 on charge q_2. (Indicate the direction with the sign of your answer. $k_e = 8.99 \times 10^9$ N · m^2/C^2)

-0.0463 N

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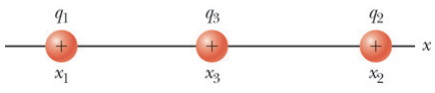
4. **[1/1 Points]** DETAILS MY NOTES **SERCPAP12 15.STEP.2.3A.** PREVIOUS ANSWERS ASK YOUR TEACHER PRACTICE ANOTHER

Charge $q_1 = 4.00 \times 10^{-5}$ C is at $x_1 = -4.00$ m on the x-axis, whereas charge $q_2 = 1.00 \times 10^{-5}$ C is at $x_2 = 2.20$ m.

Relative location of charges (not to scale)



Find the x-component of the force (in N) of charge q_1 and q_2 on charge $q_3 = 2.00 \times 10^{-5}$ C located at $x_3 = 1.00$ m. (Indicate the direction with the sign of your answer. $k_e = 8.99 \times 10^9$ N · m^2/C^2)

-0.961 N

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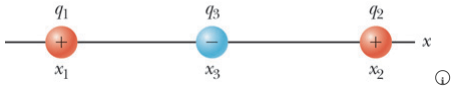
5. [1/1 Points] DETAILS MY NOTES SERCPAP12 15.STEP.2.3B. PREVIOUS ANSWERS ASK YOUR TEACHER PRACTICE ANOTHER

Three particles are located on the x-axis at $x_1 = -3.00$ m, $x_2 = 2.20$ m, and $x_3 = -1.00$ m and have charges $q_1 = 3.00 \times 10^{-5}$ C, $q_2 = 1.00 \times 10^{-5}$ C, and $q_3 = -4.00 \times 10^{-5}$ C, respectively.

Relative location of charges (not to scale)



Find the x-component of the force (in N) of charges q_2 and q_3 on charge q_1. (Indicate the direction with the sign of your answer. $k_e = 8.99 \times 10^9$ N · m^2/C^2)

2.60 ✔ N

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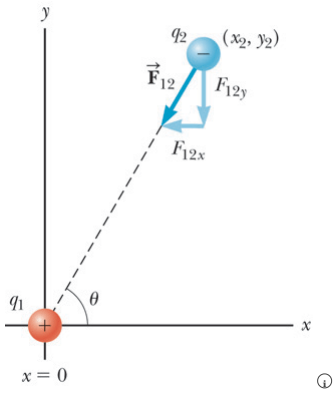
6. [2/2 Points] DETAILS MY NOTES SERCPAP12 15.STEP.2.4A. PREVIOUS ANSWERS ASK YOUR TEACHER PRACTICE ANOTHER

Charge $q_1 = 2.30 \times 10^{-5}$ C is at $(x_1, y_1) = (0, 0)$ whereas charge $q_2 = -4.40 \times 10^{-5}$ C is at $(x_2, y_2) = (2.40$ m, 3.00 m).

(Not to scale)



Find the x- and y-components of the force of charge q_1 on charge q_2. (Indicate the direction with the signs of your answers. Enter your answers in N. $k_e = 8.99 \times 10^9$ N · m^2/C^2)

F_{12x} = -0.385 ✔ N

F_{12y} = -0.481 ✔ N

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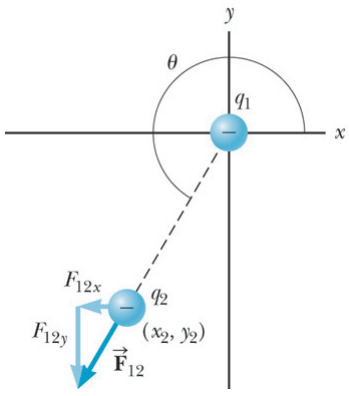
7. [2/2 Points] DETAILS MY NOTES SERCPAP12 15.STEP.2.4C. PREVIOUS ANSWERS ASK YOUR TEACHER PRACTICE ANOTHER

Charge $q_1 = -1.90 \times 10^{-5}$ C is at $(x_1, y_1) = (0, 0)$, whereas charge $q_2 = -4.20 \times 10^{-5}$ C is at $(x_2, y_2) = (-3.60$ m, -2.40 m).

(Not to scale)



Find the x- and y-components of the force of charge q_1 on charge q_2. (Indicate the direction with the signs of your answers. Enter your answers in N. $k_e = 8.99 \times 10^9$ N · m^2/C^2)

F_{12x} = -0.319 ✔ N

F_{12y} = -0.213 ✔ N

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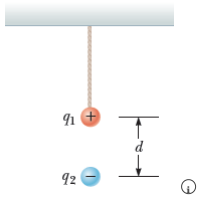
8. [0/2 Points] DETAILS MY NOTES SERCPAP12 15.2.P.004. PREVIOUS ANSWERS ASK YOUR TEACHER PRACTICE ANOTHER

A small sphere of mass m = 6.40 g and charge q_1 = 31.7 nC is attached to the end of a string and hangs vertically as in the figure. A second charge of equal mass and charge q_2 = −58.0 nC is located below the first charge a distance d = 2.00 cm below the first charge as in the figure.



(a) Find the tension in the string.

0.0751 ✗

Your response differs from the correct answer by more than 10%. Double check your calculations. N

(b) If the string can withstand a maximum tension of 0.180 N, what is the smallest value d can have before the string breaks?

0.99 ✗

Your response differs from the correct answer by more than 10%. Double check your calculations. cm

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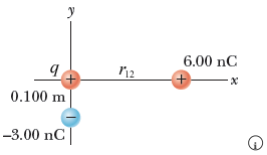
9. [1/2 Points] DETAILS MY NOTES SERCPAP12 15.2.P.011.MI. PREVIOUS ANSWERS ASK YOUR TEACHER PRACTICE ANOTHER

Three charges are arranged as shown in the figure below. Find the magnitude (in N) and direction (in degrees counterclockwise from the +x-axis) of the electrostatic force on the charge q = 5.24 nC at the origin. (Let r_{12} = 0.305 m.)



magnitude 1.45e-5 ✓ N

direction 77.87 ✗

Examine the diagram and determine which quadrant contains the angle of the net force.° counterclockwise from the +x-axis

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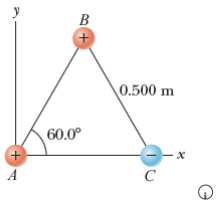
10. [0/2 Points] DETAILS MY NOTES SERCPAP12 15.2.P.013.OP. PREVIOUS ANSWERS ASK YOUR TEACHER PRACTICE ANOTHER

The figure below shows three small, charged beads at the corners of an equilateral triangle. Bead A has a charge of 1.60 μC; B has a charge of 5.40 μC; and C has a charge of −5.16 μC. Each side of the triangle is 0.500 m long. What are the magnitude and direction of the net electric force on A? (Enter the magnitude in N and the direction in degrees below the +x-axis.)



magnitude 0.526 ✗

Check the signs of the charges and the directions of the forces. Are the x-components of the forces in the same or opposite directions? N

direction 30.75 ✗

Use the x- and y-components of the net force on A to find the angle. Note the angle is measured from *below* the positive x-axis (clockwise). ° below the +x-axis

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