This print-out should have 10 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

Please notice that for your homework to be considered towards your grade, it needs to be submitted one hour before the corresponding recitation starts. Work submitted after this time, but before the DUE DATE on top of this page, will be accepted but not graded.

PLEASE REMEMBER THAT YOU MUST CARRY OUT YOUR CALCULATIONS TO AT LEAST THREE SIGNIFICANT FIGURES. YOUR ANSWER MUST BE WITHIN ONE PERCENT OF THE CORRECT RESULT TO BE MARKED AS CORRECT BY THE SERVER.

Electrons on a Charged Sphere

23:01, trigonometry, numeric, > 1 min, normal.

001

A sphere is charged with electrons to -5×10^{-6} C. The charge of an electron is -1.6×10^{-19} C.

How many electrons are there on the sphere?

Charges on a Square

23:05, trigonometry, numeric, > 1 min, normal.

002

Four point charges, each of magnitude 2 μC, are placed at the corners of a square 10 cm on a side.

The value of Coulomb's constant is 8.98755×10^9 N $\cdot$ m^2/C^2.

If three of the charges are positive and one is negative, find the magnitude of the force experienced by the negative charge. Answer in units of N.

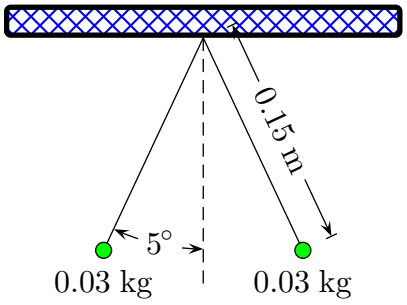
Hanging Charges

23:05, trigonometry, numeric, > 1 min, normal.

003

Two identical small charged spheres hang in equilibrium with equal masses as shown in the figure. The length of the strings are equal and the angle (shown in the figure) with the vertical is identical.

The acceleration of gravity is 9.8 m/s^2 and the value of Coulomb's constant is 8.98755×10^9 N m^2/C^2 .



Find the magnitude of the charge on each sphere. Answer in units of C.

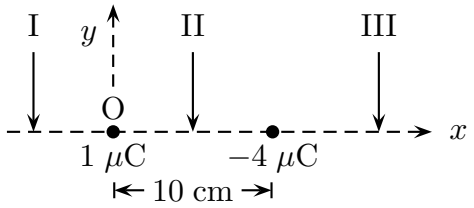
Field Due to Two Charges

23:07, trigonometry, numeric, > 1 min, normal.

004

Coulomb constant is 8.98755×10^9 N m^2/C^2.

The 1 μC charge is at the origin and a -4 μC charge is 10 cm to the right, as shown in the figure.



Identify the direction of $\vec{E}$ in the region II ($0 < x < 10$ cm, along the x-axis).

1. all possibilities: right, left, or zero

2. left

3. up

4. down

5. right

6. None of these

005

Identify the direction of $\vec{E}$ in region III ($x >$ 10 cm, along the x-axis).

1. right

2. left

3. up

4. down

5. all possibilities: right, left, or zero

6. None of these

006

Locate the x coordinate such that $\vec{E} = 0$.

Note: q_1 is at the origin O. Answer in units of cm.

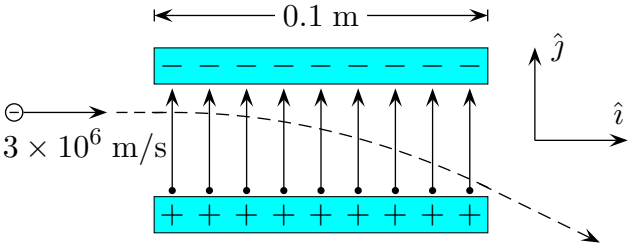
Electron Deflection

23:17, trigonometry, numeric, > 1 min, normal.

007

An electron traveling at 3×10^6 m/s enters a 0.1 m region with a uniform electric field of 200 N/C , as in the figure.

The mass of an electron is 9.10939×10^{-31} kg and the charge on an electron is 1.60218×10^{-19} C .



Find the magnitude of the acceleration of the electron while in the electric field. Answer in units of m/s^2.

008

Find the time it takes the electron to travel through the region of the electric field, assuming it doesn't hit the side walls. Answer in units of s.

009

What is the magnitude of the vertical displacement Δy of the electron while it is in the electric field? Answer in units of m.

Electron Gun in a TV

23:17, trigonometry, numeric, > 1 min, normal.

010

The electron gun in a television tube is used to accelerate electrons (mass of 9.10939×10^{-31} kg and charge of -1.60218×10^{-19} C) from rest to 3×10^7 m/s within a distance of 2 cm.

What electric field is required? Answer in units of N/C.