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 \(-5 \times 10^{-6}\) C. The charge of an electron is \(-1.6 \times 10^{-19}\) 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 \(\mu\)C, are placed at the corners of a square 10 cm on a side.

The value of Coulomb’s constant is \(8.98755 \times 10^9\) 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 \(8.98755 \times 10^9\) N \(\cdot\) 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 \(8.98755 \times 10^9\) N \(\cdot\) m\(^2\)/C\(^2\).

The 1 \(\mu\)C charge is at the origin and a \(-4 \mu\)C 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
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

What is the magnitude of the vertical displacement $\Delta y$ of the electron while it is in the electric field? Answer in units of $\text{m}$.

**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 $9.10939 \times 10^{-31}$ kg and charge of $-1.60218 \times 10^{-19}$ C) from rest to $3 \times 10^7$ m/s within a distance of 2 cm.

What electric field is required? Answer in units of $\text{N/C}$.