This print-out should have 14 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

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.

001 (part 1 of 3) 4 points
An electric field of magnitude 2700 N/C is applied along the x axis.

Calculate the electric flux through a rectangular plane 0.148 m wide and 0.82 m long if the plane is parallel to the yz plane. Answer in units of $N \cdot m^2/C$.

002 (part 2 of 3) 4 points
Calculate the electric flux through the same rectangle, if it is parallel to the xy plane. Answer in units of $N \cdot m^2/C$.

003 (part 3 of 3) 4 points
Calculate the electric flux through the same rectangle, but now the rectangle contains the y axis and its normal makes an angle of $56\,^\circ$ with the x axis. Answer in units of $N \cdot m^2/C$.

004 (part 1 of 1) 5 points
A 122 cm diameter loop is rotated in a uniform electric field until the position of maximum electric flux is found. The flux in this position is measured to be $439000\ N \cdot m^2/C$.

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

005 (part 1 of 1) 4 points
A point charge 9.8 μC is located at the center of a uniform ring having linear charge density 10.9 μC/m and radius 3.77 m.
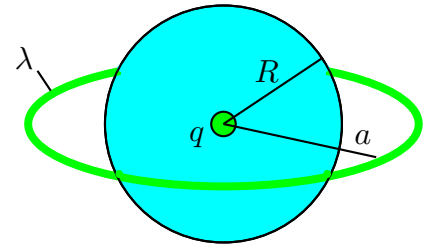
Determine the total electric flux through a sphere centered at the point charge and having radius R, where $R < a$, as shown. Answer in units of $N \cdot m^2/C$.

006 (part 1 of 3) 4 points
The charge per unit length on a long, straight filament is 65 μC/m.

Find the electric field 4.2 cm from the filament, where the distance is measured perpendicular to the length of the filament. Answer in units of N/C.

007 (part 2 of 3) 2 points
Find the electric field 27 cm from the filament. Answer in units of N/C.

008 (part 3 of 3) 2 points
Find the electric field 139 cm from the filament. Answer in units of N/C.

009 (part 1 of 2) 4 points
Consider a thin spherical shell of radius 13.4 cm with a total charge of 13.5 μC distributed uniformly on its surface.

Find the electric field 9.1 cm from the center of the charge distribution. Answer in units of N/C.

010 (part 2 of 2) 3 points
Find the electric field 29.2 cm from the center of the charge distribution. Answer in units of N/C.

011 (part 1 of 4) 4 points
A solid sphere of radius 63 cm has a total positive charge of 27.5 μC uniformly distributed throughout its volume.

Calculate the magnitude of the electric field at the center of the sphere. Answer in units of N/C.

012 (part 2 of 4) 4 points
Calculate the magnitude of the electric field
15.75 cm from the center of the sphere. An-
swer in units of N/C.

013 (part 3 of 4) 3 points
Calculate the magnitude of the electric field
63 cm from the center of the sphere. Answer
in units of N/C.

014 (part 4 of 4) 3 points
Calculate the magnitude of the electric field
97.8 cm from the center of the sphere. Answer
in units of N/C.