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

**001** 10.0 points
A 54 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 $8.02 \times 10^5$ N · m$^2$/C.
What is the electric field strength? Answer in units of N/C.

**002** (part 1 of 3) 10.0 points
An electric field of magnitude 3350 N/C is applied along the x axis.
Calculate the electric flux through a rectangular plane 0.542 m wide and 0.79 m long if the plane is parallel to the yz plane. Answer in units of N · m$^2$/C.

**003** (part 2 of 3) 10.0 points
Calculate the electric flux through the same rectangle, if it is parallel to the $xy$ plane. Answer in units of N · m$^2$/C.

**004** (part 3 of 3) 10.0 points
Calculate the electric flux through the same rectangle, but now the rectangle contains the $y$ axis and its normal makes an angle of $28^\circ$ with the $x$ axis. Answer in units of N · m$^2$/C.

**005** 10.0 points
A point charge $7.5 \mu C$ is located at the center of a uniform ring having linear charge density $15 \mu C/m$ and radius 4.92 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 · m$^2$/C.

**006** (part 1 of 3) 10.0 points
The charge per unit length on a long, straight filament is $90 \mu C/m$.
Find the electric field 13.6 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) 10.0 points
Find the electric field 18 cm from the filament. Answer in units of N/C.

**008** (part 3 of 3) 10.0 points
Find the electric field 142 cm from the filament. Answer in units of N/C.

**009** (part 1 of 4) 10.0 points
A solid sphere of radius 51 cm has a total positive charge of 34.7 $\mu C$ uniformly distributed throughout its volume.
Calculate the magnitude of the electric field at the center of the sphere. Answer in units of N/C.

**010** (part 2 of 4) 10.0 points
Calculate the magnitude of the electric field 12.75 cm from the center of the sphere. Answer in units of N/C.

**011** (part 3 of 4) 10.0 points
Calculate the magnitude of the electric field 51 cm from the center of the sphere. Answer in units of N/C.

**012** (part 4 of 4) 10.0 points
Calculate the magnitude of the electric field 90.9 cm from the center of the sphere. Answer in units of N/C.

**013** (part 1 of 2) 10.0 points
Consider a thin spherical shell of radius 14.3 cm with a total charge of 30.7 $\mu C$ distributed uniformly on its surface.
Find the electric field 6.8 cm from the center of the charge distribution. Answer in units of N/C.

**014** (part 2 of 2) 10.0 points
Find the electric field 18.1 cm from the center
of the charge distribution. Answer in units of N/C.