

Physics 4B

PLC Activity #4: Gauss' Law

*To get credit for this activity, you must show your answers to a PLC tutor and have them initial the sign-out sheet **before 4:00 pm on Thursday.***

Show all of your work for each question.

Part 1: Gauss' Law Physlets

Go to **Chapter 24: Gauss's Law**. Do the following Physlet Physics exercises and answer the questions listed.

1) Physlet Problem 24.2

The bar graph displays the electric flux passing through the cylindrical flux detector (position is given in meters and flux is given in Nm^2/C). Drag the surface and observe the flux readings. Rank the charges (lines of charge extending into and out of the screen) from most negative to most positive.

(Note: The Gaussian surface encloses two or three charges at a time. It never partially encloses a line charge.)

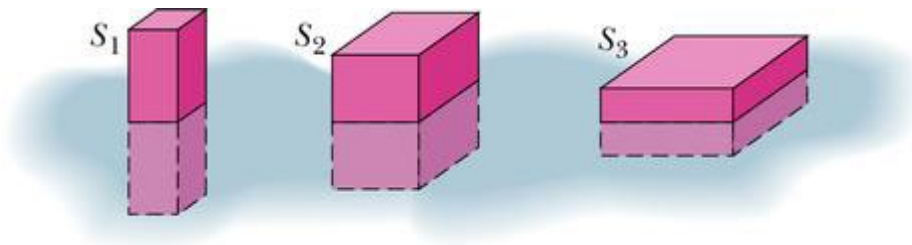
2) Physlet Problem 24.6

The green square represents a cross section of a cube. Use the test charge to explore the direction of the electric field inside the cube (position is given in meters and electric field strength is given in newtons/coulomb). Click-drag the cursor anywhere inside the cube to measure the magnitude of the electric field.

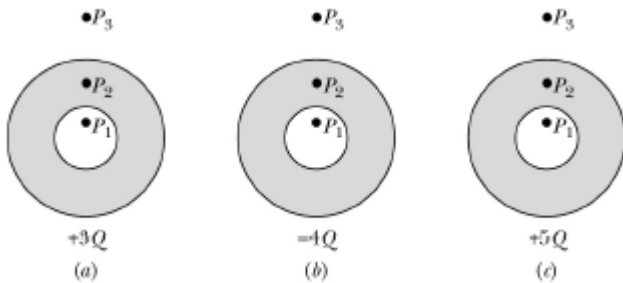
For each configuration, find the flux through the top, bottom, left, and right sides of the cube.

Part 2: Conceptual Questions

3) The figure below shows three Gaussian surfaces, each half-submerged in a large, thick metal plate with a uniform surface charge density. Gaussian surface S_1 is the tallest and has the smallest square end caps; surface S_3 is shortest and has the largest square end caps; and S_2 has intermediate values. Rank the surfaces according to (a) the charge they enclose, (b) the magnitude of the electric field at points on their top end cap, (c) the net electric flux through that top end cap, and (d) the net electric flux through their bottom end cap, greatest first.



4) There are three hollow conducting spheres of the same size; the net charge of each sphere is given. Rank the spheres according to the magnitudes of the electric fields they produce, greatest first, at (a) point P_1 , which are the same radial distance within the hollows; (b) points P_2 , which are at the same radial distance within the material of the spheres; and (c) points P_3 , which are at the same radial distance outside the spheres.



5) A small charged ball lies within the hollow of a metallic spherical shell of radius R . Here, for three situations, are the net charges on the ball and shell, respectively: (1) $+4q, 0$; (2) $-6q, +10q$; (3) $+16q, -12q$. Rank the situations according to the charge on (a) the inner surface of the shell and (b) the outer surface, most positive first. Rank the situations according to the magnitude of the electric field (c) halfway through the shell and (d) at a point $2R$ from the center of the shell, greatest first.