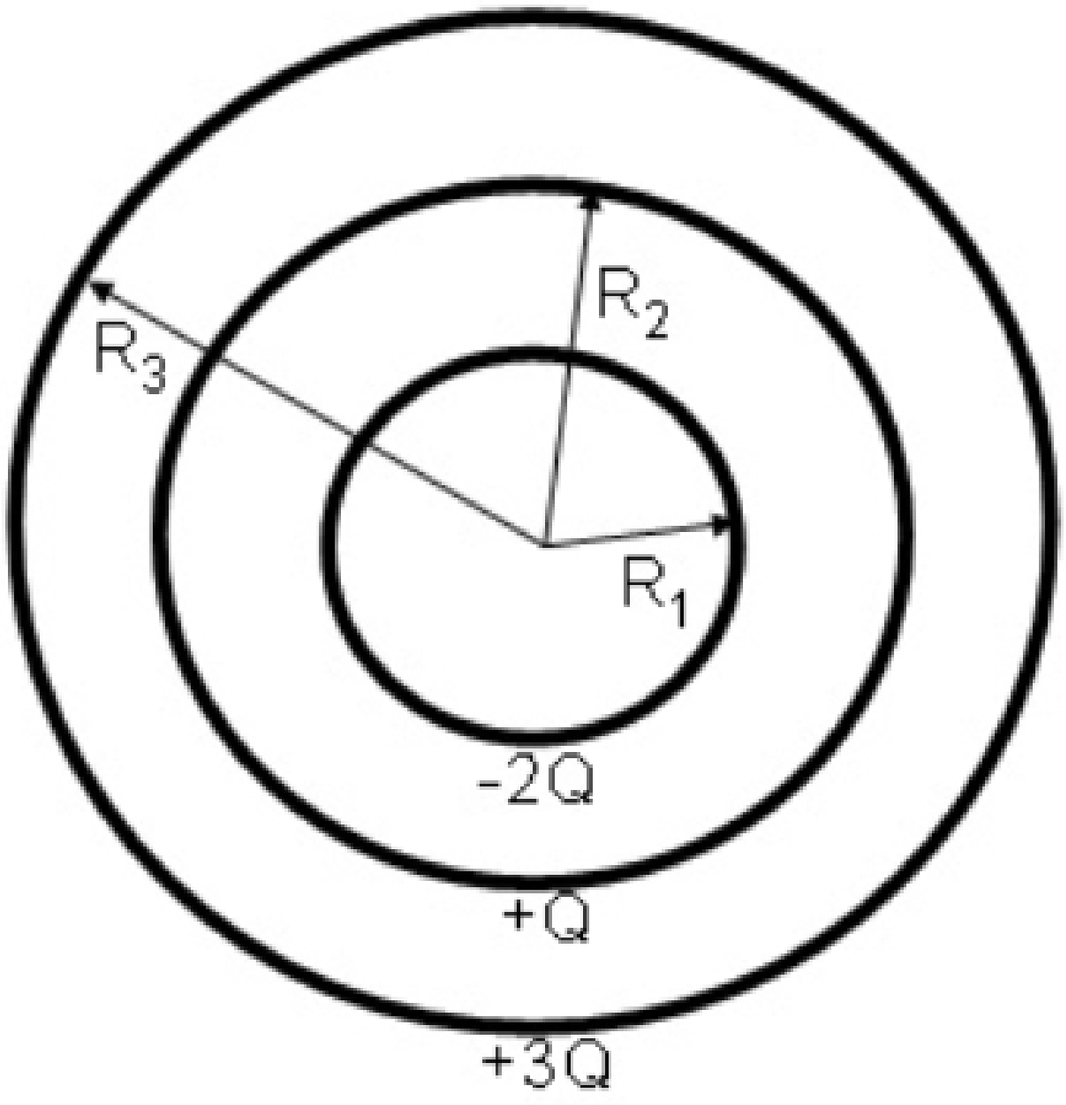
Homework II, due Tuesday, Jan. 20
PHY2061 (show work for credit)

1.) Make up a possible test problem, with solution, based on the material in Chap. 27, Gauss' Law. Please write legibly.

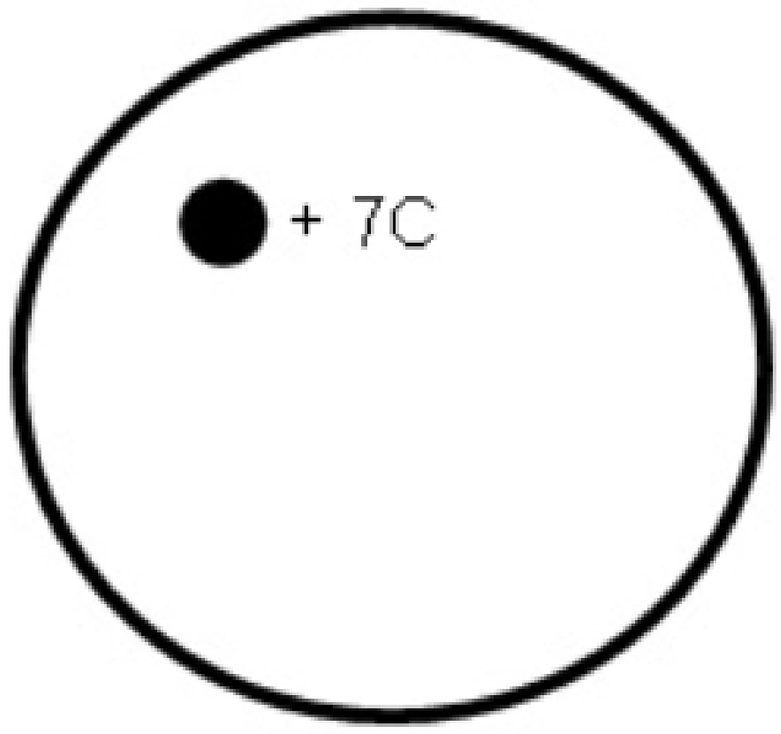
2.) Three thin (but finite thickness) concentric conducting shells have radii $R_1 < R_2 < R_3$ and charges -2Q, +Q, and +3Q respectively, where Q is some positive number. What is the charge on the inner surface of the outmost shell?



3. In class, we discussed a cube in space through which passed a uniform field and found that the cube contained no charge. Suppose we have a cube of side 1 m that occupies 0 to 1 m along all three positive axes with one corner at the origin, i. e. 0 □ x □ 1 m, 0 □ y □ 1 m, 0 □ z □ 1 m, and that we have an electric field given by $E = 3.0\ i + 2.5\ j$ (units of V/m, letters printed in *italics* represent vectors, where *i* is a unit vector in the x-direction, and *j* is a unit vector in the y-direction.) What is the total charge contained in this cube?

4. **In a spherical insulator with radius R on which charge q is 'uniformly distributed' (remember the definition of this from class), the electric field at a distance of R/4 from the center of the sphere is what fraction of the field at the surface of the sphere? Show work for credit.**

5. At time t=0, the conducting spherical shell shown in the picture, which has no net charge, has a charged object inside the shell somewhere with charge=+7 Coulombs.



Now, at some later time t > 0, the conducting spherical shell is connected to ground and whatever charge flows does so and a new equilibrium charge on the shell is reached. The shell is now again disconnected from ground. What now is the net total charge, if any, on the spherical shell? Give your reasoning, not just an answer.