Name:

Physics 51
Homework #7
September 22, 2016

28-E42, SUP6

28-E42 Consider two widely separated conducting spheres, 1 and 2, the second having twice the diameter of the first. The smaller sphere initially has a positive charge q and the larger one is initially uncharged. You now connect the spheres with a long thin wire.

(a) How are the final potentials V_1 and V_2 of the spheres related?

(b) Find the final charges q_1 and q_2 on the spheres in terms of q.

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SUP6

(a) The current density across a cylindrical conductor of radius R varies according to the equation

$$j = j_0 \left(1 - \frac{r}{R}\right),$$

where r is the distance from the axis. Thus the current density is maximum j_0 at the axis $r = 0$ and decreases linearly to zero at the surface $r = R$. Calculate the current in terms of j_0 and the conductor's cross-sectional area $A = \pi R^2$.

(b) Suppose that, instead, the current density is a maximum j_0 at the surface and decreases linearly to zero at the axis, so that

$$j = j_0 \left(\frac{r}{R}\right).$$

Calculate the current. Why is the result different from (a)?

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