

Home Work Set # 5, Physics 217, Due: October 10, 2001

Problem 1

Two spherical cavities, of radii a and b , are hollowed from the interior of a neutral conducting sphere of radius R (see Figure 1). At the center of each cavity a point charge is placed; call these charges q_a and q_b .

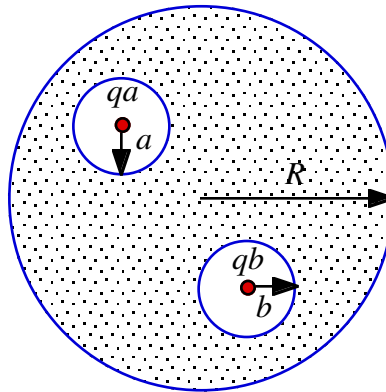


Figure 1. Problem 1.

- Find the surface charge densities σ_a , σ_b and σ_R .
- What is the field outside the conductor?
- What is the field within each cavity?
- What is the force on q_a and q_b ?
- Which of these answers would change if a third charge, q_c , were brought near the conductor?

Problem 2

A metal sphere of radius R carries a total charge Q . What is the force of repulsion between the "northern" and the "southern" hemisphere.

Problem 3

Find the capacitance per unit length of two coaxial metal cylindrical tubes, of radii a and b (see Figure 2).

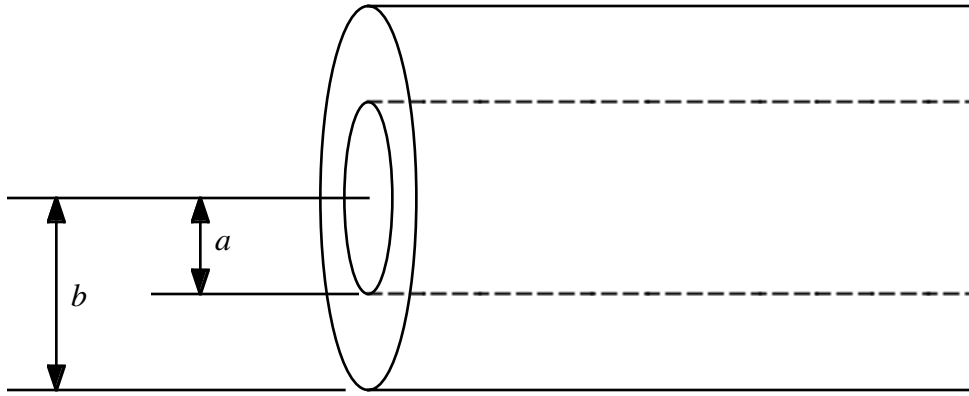


Figure 2. Problem 3.