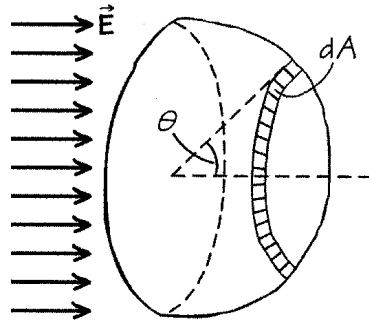


Prob24-08. By direct calculation (that is, without using Gauss' law), find the flux of a constant electric field E through a hemi-spherical surface of radius R whose circular base is perpendicular to the direction of the field (See figure). Your result should be the same as the flux through the top surface of a cylinder whose circular base, of radius R , is oriented perpendicular to the field direction. [Hint: The area of an infinitesimal strip at a latitude θ and a thickness $Rd\theta$ is $2\pi R^2 \sin \theta d\theta$; θ varies from 0 at the North Pole to $\pi/2$ at the equator.]



Prob2419: A given region has an electric field that is a sum of two contributions: a field due to a charge $q = 5 \times 10^{-8} \text{ C}$ at the origin plus a uniform field of strength $E_0 = 3000 \text{ N/C}$ in the $-x$ direction. Calculate the flux through each side of a cube with sides of length 20 cm that are parallel to the x , y and z -directions: the cube is centered at the origin.

Prob2429: A long, cylindrical shell of inner radius r_1 and outer radius r_2 carries a uniform volume charge density ρ . Find the electric field due to this distribution of charge everywhere in space.

Prob2435. Consider a solid sphere of radius 3 cm that carries a negative charge of $2 \mu\text{C}$ distributed uniformly. The sphere is placed concentrically in a spherical shell of radius 8 cm that has a positive charge of $5 \mu\text{C}$ distributed uniformly over it. Calculate the electric field as a function of radius r for $0 < r < 15 \text{ cm}$.

Prob2446: The electric field on a given day on the Earth's surface is 100 N/C , pointing radially inward. If this were true everywhere on the Earth's surface what would the sign and magnitude of the total charge be on the earth? If earth is treated as a conductor where is the charge located? What is the charge density?

Prob2447. A point charge q is placed a distance $L/2$ over the center of a conducting square plate of area L^2 . (a) Draw the electric field lines on both sides of the plate, which has charge $-q$. (b) Repeat part (a) for a charge on the plate of $2q$.