10B11PH211 (Physics – II, 2010-11) Tutorial Sheet 1

1. Find the volume of a sphere of radius R using spherical polar coordinates.
2. Find the gradient of $r = \sqrt{(x^2 + y^2 + z^2)}$, i.e., the magnitude of the position vector.
3. Find out the area of the curved surface of a right circular cylinder where r = 2 m, h = 5 m, and $30^o \le \phi \le 120^o$.
4. Find the electric field a distance z above the midpoint of straight line of length 2L, which carries a uniform line charge density λ .
5. Find the field outside a uniformly charged solid sphere of radius R and total charge q using Gauss' law.
6. The volume in cylindrical coordinates between r = 2 m, and r = 4 m contains a uniform charge density ρ . Use Gauss' law to find $\vec{D}$ in all regions.
7. A circular disc of radius 2 m is charged with density $\sigma_s = \frac{Sin^2\phi}{2r}$ (C/m^2), where r and ϕ are in cylindrical coordinate system. The disc is placed inside at the centre of a cube of side 5 m. calculate the net flux that crosses from the surface of the cube.

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