Daily Practice Problems

Que 1) A uniformly charged sphere carries a total charge of $2\pi \times 10^{-12} C$. Its radius is 5 cm and is placed in vacuum. Determine its surface charge density.

Ans) $2 \times 10^{-10} cm^{-2}$

Que 2) A metal cube of length 0.1 m is charged by $12\mu C$. Calculate its surface charge density.

Ans) $2 \times 10^{-4} cm^{-2}$

Que 3) Obtain the formulae for the electric field due to a long thin wire of uniform linear charge density λ without using gauss's law.

Ans) $E = \frac{\lambda}{2\pi\epsilon_0 y}$

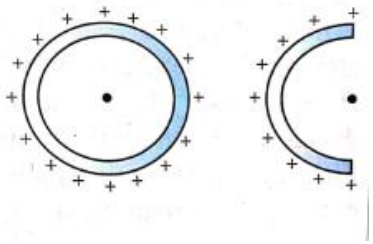
Que 4) A charge is distributed uniformly over a ring of radius 'a'. obtain an expression for the electric field intensity E at a point on the axis of the ring. Hence show that for points at large distances from the ring, it behaves like a point charge.

Ans) $E = \frac{1}{4\pi\epsilon_0} . \frac{qx}{(x^2+a^2)^{\frac{3}{2}}}$

Que 5) A thin semicircular ring of radius a is charged uniformly and the charge per unit length is λ. Find the electric field at the center.

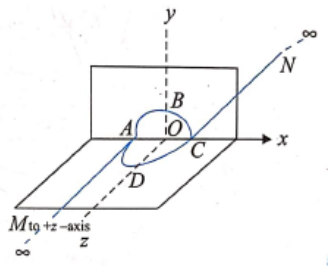
Ans) $E = \frac{\lambda}{2\pi\epsilon_0 a}$

Que 6) Two pieces of plastic, a full ring, have the same radius and charge density. Which electric field at the center has the greater magnitude? Define your answer.



Ans) Half Ring.

Que 7) Two semicircular wires ABC and ADC, each of radius R, are lying on xy and xz planes, respectively, as shown in the figure. If the linear charge density of the semicircular parts and straight parts is λ, find the electric field intensity $\vec{E}$ at the origin.



Ans) $-\frac{\lambda}{2\pi\epsilon_0 R}(\hat{j} + \hat{k})$