01/28/2022

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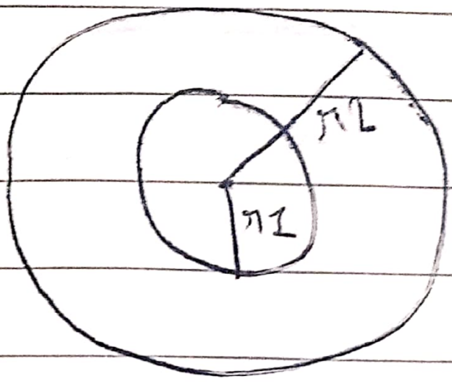
RECITATION #4

Ans



For $r < r_1$ (meaning inside the inner shell as charge is on the surface, there is no charge enclosed in the inner shell, so, $E = 0$

For $r_1 < r < r_2$,
just assume a Gaussian (circular) sur-
-face.

$$Q_{enclosed} = Q\left(\frac{V_{enclosed}}{V}\right)$$

$$Q_{enclosed} = Q\left(\frac{r^3 - r_1^3}{r_2^3 - r_1^3}\right)$$

the flux through the Gaussian surfa-
-ce will be

$$\phi = E \times 4\pi r^2$$

then, we have :-

$$E\, 4\pi r^2 = \frac{Q}{\varepsilon_0 \left(\frac{r^3 - r_1^3}{r_2^3 - r_1^3} \right)}$$

Rearranging, we get :-

$$E = \frac{Q}{4\pi r^2 \varepsilon_0} \left(\frac{r^3 - r_1^3}{r_2^3 - r_1^3} \right)$$

$$E = \frac{Q}{4\pi \varepsilon_0 r^2} \left(\frac{r^3 - r_1^3}{r_2^3 - r_1^3} \right)$$

For $r > r_2$,

The gaussian surface will enclose the whole spherical shell.

It means charge enclosed in Q.

So, $E \cdot 4\pi r^2 = \frac{Q}{\varepsilon_0}$

$$E = \frac{Q}{4\pi r^2 \varepsilon_0}$$