

 

 **PHYSICS 132**

**Homework # 2**   **2nd. Semester 2015-16**

**Student Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *Student #: -----------------------***

***Section:-----------***

----------------------------------------------------------------------------------------------

A solid sphere 10cm in radius carries 50µC charge distributed uniformly throughout its volume. It is surrounded by a concentric spherical shell of radius 20cm, uniformly charged with 40µC.

1. Find the volume charge density of the solid sphere?

$$ρ=\frac{Q\_{1}}{V}=\frac{50×10^{-6}}{\frac{4}{3}πr\_{1}^{3}}=\frac{50×10^{-6}}{\frac{4}{3}π\left(0.1^{3}\right)}=1.19×10^{-2} {C}/{m^{3}}$$

1. Find the surface charge density of the spherical shell?

$$σ=\frac{Q\_{2}}{S}=\frac{40×10^{-6}}{4πr\_{2}^{2}}=\frac{40×10^{-6}}{4π\left(0.2^{2}\right)}=7.96×10^{-5} {C}/{m^{2}}$$



1. Find the electric field at :

Using Gauss law

1. 5.0 cm from the center. $\left(r=0.05 m\right)$

|  |  |
| --- | --- |
| $$∮\_{}^{}\vec{E}.d\vec{A}=\frac{Q\_{enc}}{ϵ\_{°}}$$$$E\left(4πr^{2}\right)=\frac{ρ\left(\frac{4}{3}πr^{3}\right)}{ϵ\_{°}}$$$$E=\frac{ρr}{3ϵ\_{°}}=\frac{\left(1.19×10^{-2}\right)\*\left(0.05\right)}{3\*8.85×10^{-12}}=2.24×10^{7} {N}/{C}$$ |  |

1. 15 cm from the center. $\left(r=0.15 m\right)$

|  |  |
| --- | --- |
| $$∮\_{}^{}\vec{E}.d\vec{A}=\frac{Q\_{enc}}{ϵ\_{°}}$$$$E\left(4πr^{2}\right)=\frac{Q\_{1}}{ϵ\_{°}}$$$$E=\frac{Q\_{1}}{4πϵ\_{°}r^{2}}=\frac{50×10^{-6}}{4π\*\left(8.85×10^{-12}\right)\*\left(0.15^{2}\right)}=2.00×10^{7} {N}/{C}$$ |  |

1. 30 cm from the center. $\left(r=0.3 m\right)$

|  |  |
| --- | --- |
| $$∮\_{}^{}\vec{E}.d\vec{A}=\frac{Q\_{enc}}{ϵ\_{°}}$$$$E\left(4πr^{2}\right)=\frac{Q\_{1}+Q\_{2}}{ϵ\_{°}}$$$$E=\frac{Q\_{1}+Q\_{2}}{4πϵ\_{°}r^{2}}$$$$=\frac{90×10^{-6}}{4π\*\left(8.85×10^{-12}\right)\*\left(0.3\right)^{2}}$$$=9.00×10^{6} {N}/{C}$  |  |