

WORKSHEET 2B: Gauss's Theorem

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1 Conceptual Questions

- (a) A metallic sphere of radius $r = 5 \mu\text{m}$ with a total charge of -12.3 nC is placed in an electric field $\vec{E}(\vec{r}) = 3.2\hat{x} + 5.7\hat{y} - 7.3\hat{z} \text{ N/C}$. What is the electric field strength inside ($r < R$) the sphere?
- (b) Is Gauss's Law only valid for symmetric charge distributions?

2 What the Flux

- (a) What is the surface area of a sphere?
- (b) For a symmetric sphere, prove:

$$\Phi_e = \oint_S \vec{E} \cdot d\vec{A} = E \cdot 4\pi r^2$$

3 Through the Wire (again)

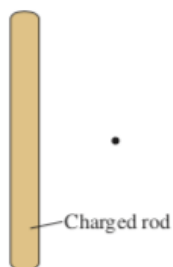


Figure 1: test

- (a) What is the surface area of the rod of length L ?
- (b)