Physics 1161 Lecture 3
Electric Flux and Shielding

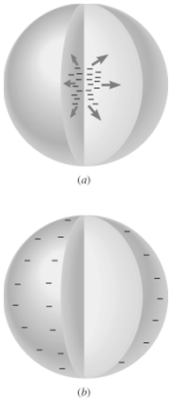
Checkpoint 3

Which is (are) true?

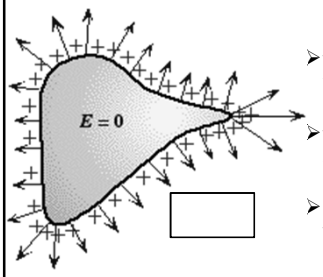
- **When the charge distribution on a conductor reaches equilibrium,**
- **a. the electric field within the conductor is zero.**
- **b. any electric charge deposited on the conductor resides on the surface.**
- **c. the electric field at the surface is perpendicular to the surface.**

Charged Conductors

- **Electrostatic equilibrium** -- excess charge has distributed itself so as to reduce the total amount of repulsive forces.
- Once a charged conductor has reached the state of electrostatic equilibrium, there is no further motion of charge about the surface.



Electrostatic Equilibrium



- any excess charge lies only at the surface of the conductor
- the electric field is zero within the solid part of the conductor
- the electric field at the surface of the conductor is perpendicular to the surface
- charge accumulates, and the field is strongest, on pointy parts of the conductor

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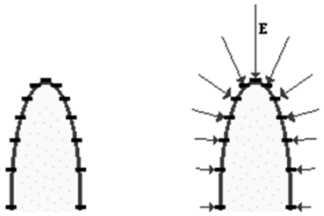
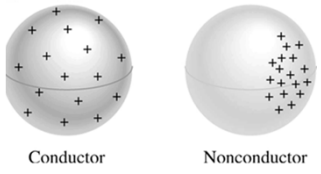


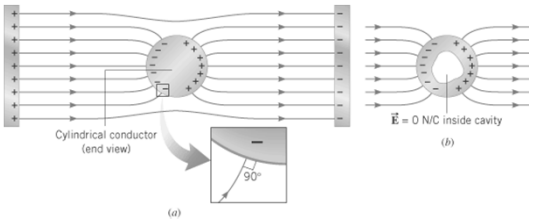
excess charge lies only at surface of conductor



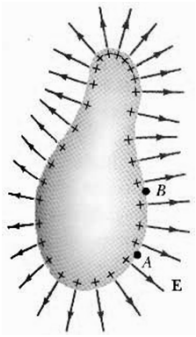
Checkpoint 4-2

- 1) The magnitude of the electric field inside the charged sphere is ...
- Zero
- Negative
- Positive

electric field is zero within the solid part of the conductor



electric field at surface of conductor is perpendicular to the surface



Shielding

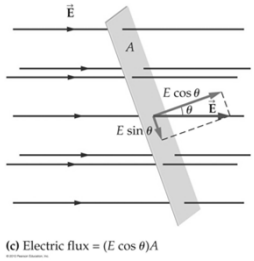
- A conductor shields its interior from external electric fields.
- Shielding occurs whether the conductor is hollow or solid.
- Many electrical devices use this property to shield sensitive circuit elements

Electric Flux

$$\phi = E \cdot A \cos\theta$$

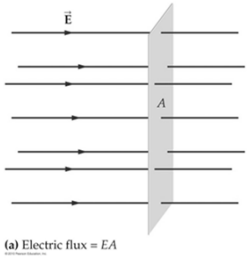
θ is the angle between the normal to the surface and the field

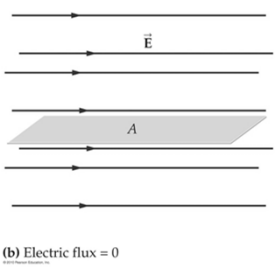
SI units:



http://webphysics.davidson.edu/physlet_resources/bu_semester2/c03_flux.html

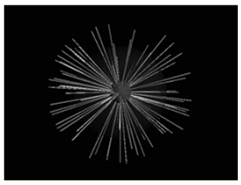
Electric Flux





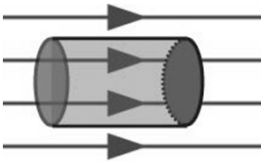
Gauss' Law

$$\Phi = EA$$



In general, flux through a closed surface depends only on enclosed charge.

An uncharged cylinder of radius R and length L is immersed in a uniform electric field E. What is the flux Φ of the electric field through the closed surface?



1. $\Phi = 2\pi R^2 E$
2. $\Phi = \pi R^2 E$
3. $\Phi = 0$
4. $\Phi = (2\pi RL + 2\pi R^2)E$