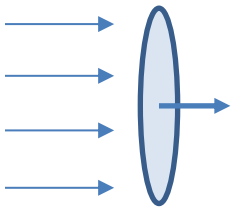
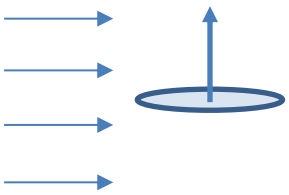
CONCEPT: ELECTRIC FLUX

- Flux is a measure of HOW MUCH of a field passes through a surface.
  - ELECTRIC FLUX is how much of the ELECTRIC FIELD passes through a surface.



[ALL | NONE | SOME]



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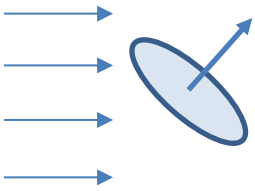
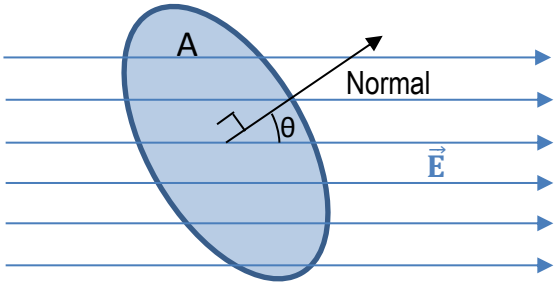


[ALL | NONE | SOME]

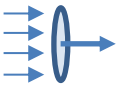
- ELECTRIC FLUX depends upon the ANGLE of the surface



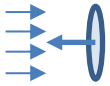
- Normal → _____ to the surface
- θ → between the Electric Field and the _____ of the surface

→ $\Phi_E =$ _____ - Units: $\frac{N \cdot m^2}{C}$

- The TOTAL FLUX through a closed surface is the _____ of fluxes through each individual surface.
  - **Positive** fluxes: when $\vec{E}$ and the normal point in the **[SAME | OPPOSITE]** direction.



  - **Negative** fluxes: when $\vec{E}$ and the normal point in the **[SAME | OPPOSITE]** direction.



EXAMPLE: The electric flux through each surface of a cube is given below. What is the total flux through the cube?

$\Phi_1 = 100\ Nm^2/C$ $\Phi_2 = 20\ Nm^2/C$

$\Phi_3 = 0\ Nm^2/C$ $\Phi_4 = 0\ Nm^2/C$

$\Phi_5 = -40\ Nm^2/C$ $\Phi_6 = -80\ Nm^2/C$

PRACTICE: TOTAL ELECTRIC FLUX

The electric flux through each surface of a cube is given below. Which surfaces of the cube does the electric field run parallel to?

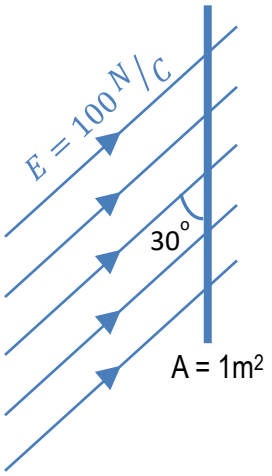
$\Phi_1 = 100\ Nm^2/C$ $\quad\quad$ $\Phi_2 = 20\ Nm^2/C$

$\Phi_3 = 0\ Nm^2/C$ $\quad\quad$ $\Phi_4 = 0\ Nm^2/C$

$\Phi_5 = -40\ Nm^2/C$ $\quad\quad$ $\Phi_6 = -80\ Nm^2/C$

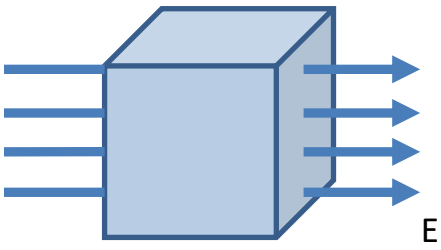
EXAMPLE: FLUX THROUGH ANGLED SURFACE

What is the magnitude of the electric flux through the surface depicted below?



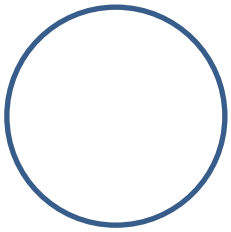
EXAMPLE: FLUX THROUGH CUBE

A cube of side length 2 cm is placed in an electric field of magnitude 100 N/C as shown below. What is the electric flux through each side of the cube?



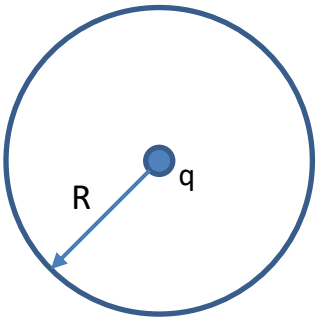
PRACTICE: NORMAL OF A SPHERICAL SHELL

Where does the normal vector point for a spherical shell?



EXAMPLE: FLUX THROUGH SPHERICAL SHELL BY POINT CHARGE

What is the electric flux through a spherical shell of radius R due to a point charge, **q**, at the center?



PRACTICE: FLUX THROUGH TWO SURFACES

What is the total flux through the two surfaces depicted in the following figure? Note that surface 1 has an area of 50 cm^2 and surface 2 has an area of 100 cm^2, and E = 500 N/C**.**