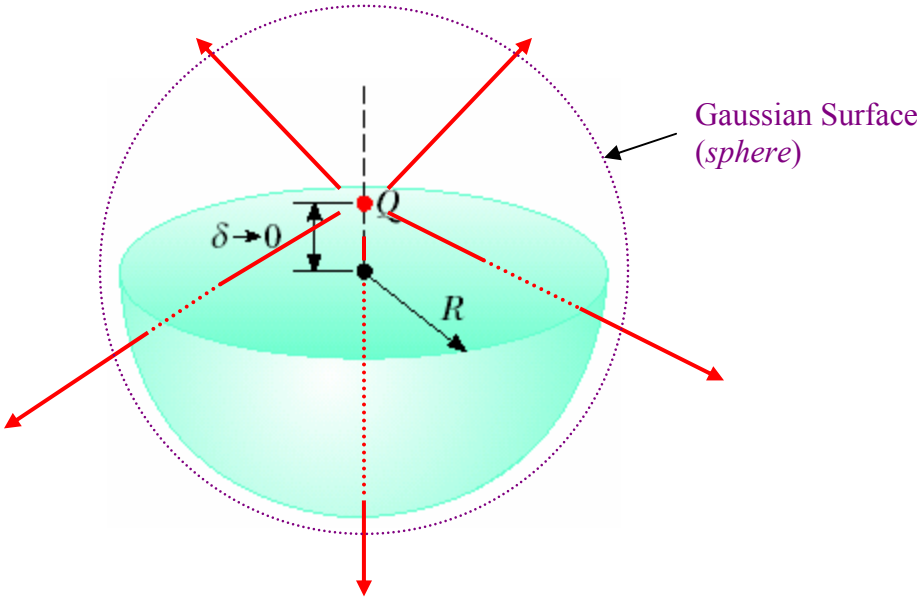
# Flux Through Half a Sphere

A point charge $Q$ is located just above the center of the flat face of a hemisphere of radius $R$ as shown in following Figure. What is the electric flux ($\Phi_E$) due to the point charge

($a$) Through the curved part of the surface?

($b$) Through the flat face?




*a*) Since No charge is enclosed by the closed surface, the total flux must be zero.

$$\Phi_{E_{total}} = \Phi_{E_{flat}} + \Phi_{E_{curve}} = 0$$

➔ $$\Phi_{E_{flat}} = -\Phi_{E_{curve}}$$

For a complete sphere that would enclose charge Q, the total flux would be:

$$\Phi_{E_{total}} = \frac{Q_{enc}}{\varepsilon_o} = \frac{Q}{\varepsilon_o}$$

Since only half of the sphere is used and the charge is located at about the center ($\delta \to 0$), the flux through the bottom surface is just half the value for the total sphere:

$$\Phi_{E_{curve}} = \frac{Q}{2\varepsilon_o}$$

**Note**: This is a positive value indicating that the Electric field lines are leaving the surface

*b*) $$\Phi_{E_{flat}} = -\frac{Q}{2\varepsilon_o}$$

**Note**: This is a negative value indicating that the Electric field lines are entering the surface