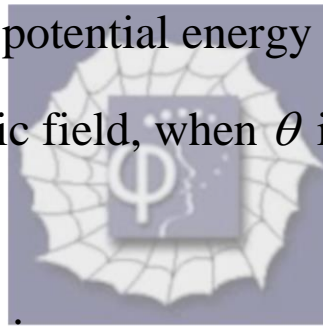**308.**

Problem 28.51 (RHK)

We have to find the work required to turn an electric dipole end for end in a uniform electric field $\dot{E}$, in terms of the dipole moment $\dot{p}$ and the initial angle θ_0 between $\dot{p}$ and $\dot{E}$.

Solution:

We recall that the potential energy $U(\theta)$ of an electric dipole in an electric field, when θ is the angle between $\dot{p}$ and $\dot{E}$, is

$$U(\theta) = -pE\cos\theta .$$

If an electric dipole is flipped from its initial position with angle θ_0 its final angle will be $\pi + \theta_0$.

So the work done in flipping a dipole will be

$$U(\pi + \theta_0) - U(\theta_0) = 2pE\cos\theta_0 .$$