

58. (a) The kinetic energy gained is due to the potential energy decrease as the dipole swings from a position specified by angle θ to that of being aligned (zero angle) with the field. Thus,

$$K = U_i - U_f = -\mu B \cos \theta - (-\mu B \cos 0^\circ) .$$

Therefore, using SI units, the angle is

$$\theta = \cos^{-1} \left(1 - \frac{K}{\mu B} \right) = \cos^{-1} \left(1 - \frac{0.00080}{(0.020)(0.052)} \right) = 77^\circ .$$

- (b) Since we are making the assumption that no energy is dissipated in this process, then the dipole will continue its rotation (similar to a pendulum) until it reaches an angle $\theta = 77^\circ$ on the other side of the alignment axis.