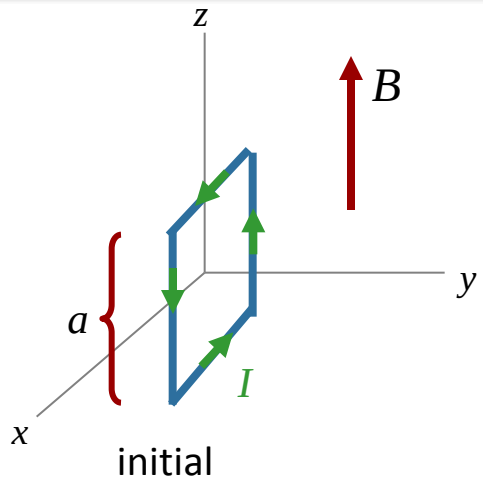
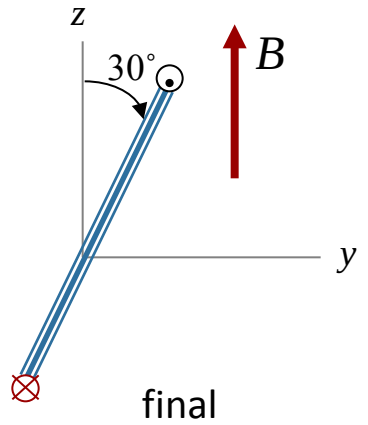
Calculation

A square loop of side a lies in the x–z plane with current I as shown. The loop can rotate about x axis without friction. A uniform field B points along the $+z$ axis. Assume a, I, and B are known.

$$U = -\vec{\mu} \cdot \vec{B}$$



initial



final

What is the potential energy of the final state?

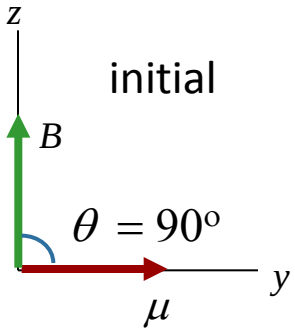
A) $U_{final} < 0$

B) $U_{final} = 0$

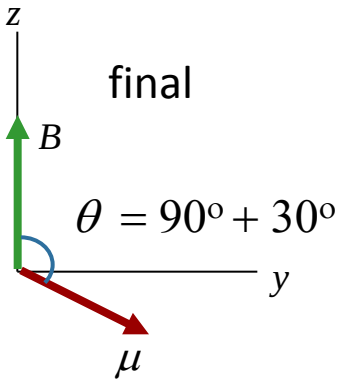
C) $U_{final} > 0$

Check: μ moves away from B

Energy must increase !



initial



final

$\theta = 120^0$

$\vec{\mu} \bullet \vec{B} < 0$

$U = -\vec{\mu} \cdot \vec{B} > 0$