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$\mu = \frac{\frac{1}{2} m v_\perp^2}{B}$ (definition) so $\mu = \frac{2 m v_0^2}{B_{min}}$

since $v_\perp = 2v_0$ @ $B = B_{min}$

J: First check that particle is confined:

$$\mu B_{turn} = \frac{1}{2} m v_{\parallel}^2 \Big|_{B_{min}} + \frac{1}{2} m v_\perp^2 \Big|_{B_{min}} = \frac{1}{2} m v_0^2 + 2 m v_0^2$$

$$= \frac{5}{2} m v_0^2$$

so $B_{turn} = \frac{5}{2} m v_0^2 \cdot \frac{B_{min}}{2 m v_0^2} = \frac{5}{4} B_{min} < B_{max} = 3B_{m}$

so particle is deeply trapped

Velocity $v_\parallel$ is constant along whole cylinder, except at the infinitely short mirror region so

$$J = \oint v_\parallel \, dl = \int_0^L v_0 \, dl + \int_L^0 -v_0 \, dl = \underline{\underline{2 v_0 L}}$$

b) Slow increase means μ is conserved; $v_\parallel$ is unchanged, so μB increasing means $\frac{1}{2} m v_\perp^2$ increases and particle becomes even more deeply trapped.