

Quiz 9 - Solution.

This is a problem of a turned-on perturbation.

We have $E_{\uparrow}^{(0)} = \frac{1}{2} \hbar \omega$, $E_{\downarrow}^{(0)} = -\frac{1}{2} \hbar \omega$, $\langle \downarrow | \frac{1}{2} \sigma_y V | \uparrow \rangle = \frac{1}{2} i V$

Since $\omega_{\downarrow \uparrow} = \frac{1}{\hbar} (E_{\downarrow}^{(0)} - E_{\uparrow}^{(0)}) = -\omega$, we have

$$P_{\downarrow} = \frac{1}{4} |V|^2 \frac{4 \sin^2 \omega t / 2}{\hbar^2 \omega^2} = \frac{|V|^2}{\hbar^2 \omega^2} \sin^2 \frac{\omega t}{2}$$