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(a)

$$1 = \langle \psi(0) | \psi(0) \rangle = \frac{1}{3} + A^2 + \frac{1}{6}$$

$$A = \frac{1}{\sqrt{2}}$$

(b)

$$\begin{aligned} |\psi(t)\rangle &= e^{\frac{-i\hat{H}t}{\hbar}} |\psi(0)\rangle = \frac{1}{\sqrt{3}} e^{\frac{-i\hat{H}t}{\hbar}} |\phi_1\rangle + \frac{1}{\sqrt{2}} e^{\frac{-i\hat{H}t}{\hbar}} |\phi_2\rangle + \frac{1}{\sqrt{6}} e^{\frac{-i\hat{H}t}{\hbar}} |\phi_3\rangle \\ &= \frac{1}{\sqrt{3}} e^{\frac{-iE_1t}{\hbar}} |\phi_1\rangle + \frac{1}{\sqrt{2}} e^{\frac{-iE_2t}{\hbar}} |\phi_2\rangle + \frac{1}{\sqrt{6}} e^{\frac{-iE_3t}{\hbar}} |\phi_3\rangle \end{aligned}$$

(c)

$$P = |\langle \phi_3 | \psi(t) \rangle|^2 = \left| \frac{1}{\sqrt{6}} e^{\frac{-iE_3t}{\hbar}} \right|^2 = \frac{1}{6}$$

Mohammad Behtaj & Adel Sepehri



Translate by: @PhysicsDirectory Telegram Channel