**FS2024**
**Clicker Week 1**
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1. $\Psi(x,t)$ has no direct physical meaning

   ■ **T** ☐ F Only $\int |\Psi|^2 dr$ has a statistical interpretation

2. The kinetic energy of a wavefunction is related to its curvature.

   ■ **T** ☐ F $\hat{E}_{\text{kin}} = \frac{\hat{p}^2}{2m} = -\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}$ has a second derivative, indicating curvature relationship.

3. According to the uncertainty principle if $\sigma_x$ is very large, then the momentum is well determined.

   ☐ T ■ **F** Common misconception; The uncertainty principle is an inequality: $\sigma_x \cdot \sigma_p \geq \frac{\hbar}{2}$.

4. The variance of a discrete variable j is given by $\sum_{j=0}^{\infty}(j - \langle j \rangle)P(j)$.

   ☐ T ■ **F** In the equation, a power of two is missing at the end; it should be $(j - \langle j \rangle)^2$.

5. Any solution of the Schrödinger Equation can be normalized

   ☐ T ■ **F** For example, $\Psi(x) = e^{ikx}$ is not square-integrable and cannot be normalized.

6. In the quantum mechanical description of black body radiation, every photon mode out to infinite frequency carries $k_b T$ of energy,where $k_b$ is Boltzmann's constant and T is the absolute temperature.

   ☐ T ■ **F** The energy of each photon mode in black body radiation depends on its frequency

7. According to Ehrenfest's theorem expectation values in quantum mechanics follow classical laws.

   ■ **T** ☐ F

8. According to the de Broglie relation, an electron cannot act simultaneously as a particle and a wave at small length scales.

   ☐ T ■ **F** De Broglie links particle behavior to wave behavior.