Summary of Lecture 13

- Density Operator $\rho = \sum_\alpha P_\alpha |\phi_\alpha\rangle\langle\phi_\alpha|$ $\quad 0 \le P_\alpha \le 1$ $\quad \sum_\alpha P_\alpha = 1$
- Pure vs. mixed states
- Expectation value $\langle A \rangle = \mathrm{tr}\left(\rho A\right)$
- Time evolution $\frac{\mathrm{d}}{\mathrm{d}t}\rho = -\frac{\mathrm{i}}{\hbar}\left[H, \rho\right]$
- Canonical Ensemble $\rho = \frac{1}{Z}\exp\left(-\beta H\right)$ $\quad Z = \mathrm{tr}\left[\exp\left(-\beta H\right)\right]$
- Entropy $S = -k_\mathrm{B}\mathrm{tr}\left(\rho \ln \rho\right)$ ($S = 0$ for pure states)

Next Lecture (14)

- Density Operators for Subsystems

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This Lecture (14)

- Density Operators for Subsystems