The midterm is not cumulative, in that every question will be on content since the first midterm, but physics *is* cumulative, meaning the newer content may require you to use the older content.

First Law Energy is conserved, energy flow diagrams

Second Law Entropy of system + surroundings cannot decrease

Work $W = -\int p dV$

Heat $\Delta S = \frac{Q}{T}$ if temperature is approximately constant

Heat engines $\frac{W_{\text{net}}}{Q_{\text{in}}} \leq 1 - \frac{T_C}{T_H}$

Equipartition $\frac{1}{2}k_B T$ internal energy per quadratic degree of freedom

Quantum heat capacity When $\frac{1}{2}k_B T \ll$ energy level gaps a degree of freedom does not contribute to the heat capacity or internal energy.

Quantum spectra $E_{\text{photon}} = \hbar\omega = \Delta E_{\text{system}}$

Momentum and wavelength $p = \frac{h}{\lambda} = \frac{2\pi\hbar}{\lambda}$

Momentum of light $E_{\text{light}} = p_{\text{light}} c$

Intensity of light Energy per time per area