

RAA01 – Checklist of things to know/review

**RAA01 contains all information from lectures up to and including lecture 10: Heat engines and heat pumps. Below is a short list of important concepts to understand. The goal of this list is to help you organize your thoughts as you study. This sheet does not contain everything that we covered, just the highlights to help point you in the right direction.*

- Energy:
 - Can you define a system and determine any/all energy transformations within the system and transfers into or out of the system?
- Microscopic view of matter:
 - Solids, liquids, gases picture.
 - State variables (P, T, N, V).
 - Microscopic view of pressure? Macroscopic view of pressure?
- Kinetic theory of gases:
 - Do you know relate temperature to the average microscopic translational kinetic energy of a system?
 - Boltzmann postulated a connection between degrees of freedom and thermal energy of a system; can you recall what this is?
 - What is the degree of freedom for translational motion?
 - Do you qualitatively understand why diatomic particles have more degrees of freedom than monatomic particles?
 - Many of the problems covered under the kinetic theory of gases are proportional reasoning type questions. Are you comfortable with proportional reasoning?
- Thermodynamic equilibrium:
 - Macroscopic definition?
 - Microscopic definition?
- Equations of state:
 - Ideal gas law
 - Microscopic understanding of how we qualitatively arrived at this relationship.
 - Proportional reasoning type questions show up a lot here.
- First law of thermodynamics:
 - Conceptually understand we are really just using the energy conservation equation but limiting our studies to systems with only thermal energy changing.
 - What role does heat play?
 - Identify systems with both work and heat, systems with only work, and systems with only heat as mechanisms for a change in thermal energy.
- Heat:
 - Specific heat
 - Phase transitions (latent heat)
 - Calorimetry
 - Heat transfer mechanisms
- Heat engines and heat pumps:
 - Identify a heat engine and a heat pump based off of a diagram.
 - Definition of efficiency.
 - Steady state?