Chapter 15 The Laws of Thermodynamics

1. Be able to state the First and Second Laws of Thermodynamics and to describe what they mean.

2. Be able to interpret a PV diagram for a heat engine by identifying when the working gas is being compressed or expanded, when the gas is warming up or cooling down, and when the temperature of the gas remains unchanged.

3. Be able to calculate the total energy possessed by the working gas in a heat engine in a specific state on its PV diagram given the amount (m, N, or n) of the gas.

4. Be able to sketch or identify on a $P - V$ graph the "path" taken as a gas goes from its Initial State to its Final State during

   - an isobaric process.
   - an isochoric process.
   - an isothermic process.
   - an adiabatic process.

5. Be able to use a PV plot to determine the total amount of work done on a gas as the gas goes from its Initial State to its Final State.

6. Be able to use a heat engine cycle in a PV diagram to figure out the total work done on or by the working gas using the appropriate "areas."

7. Be able to describe what's going on during the cycle of a heat engine in terms of heating, working, expanding, compressing, warming, and cooling.

8. Be able to identify by name and on a PV plot the kinds of processes that occur in a Carnot Cycle and to describe what is special about Carnot Cycles.

9. Be able to explain how a refrigerator or air conditioner cools things down.

10. Be able to calculate the efficiency of a heat engine by using the energy you pay for and the work you get out of the engine.

11. Be able to calculate the efficiency of an ideal (Carnot) heat engine using the temperatures of the source of heat and the heat sink.

12. Be able to give a good, rough description of entropy that avoids the flawed idea that entropy is a measure of disorder.

13. Be able to calculate the change in entropy of a system given its temperature and enough information to figure out how much heat it loses or receives.

14. Be able to describe things that you have observed that illustrate something we have dealt with in this chapter.