

Physics 101: How the "world" works Fall 2008

Homework 8

Due in your studio, Tues. Dec. 2, Wed. Dec. 3, or Thurs. Dec. 4

Chapter 8 Exercises

- (1) 13
- (2) 15
- (3) 21
- (4) 27
- (5) 36

Chapter 8 Problems

- (6) 2
- (7) 7 (Use: $\alpha = 11 \times 10^{-6}$ /deg C.)

Other problems

- (8) How long does it take bring a pot of water to a boil? Make your estimate based on the following assumptions: The pot contains 1 liter of water, so it has a mass of 1 kg. It starts at a temperature 20 deg C. You put the pot on a large burner on an electric stove, that draws 2.1 kW when you set it to "High."
- (9) Study the lecture slides posted on the course website describing the operation of a Stirling engine.
 - a) Draw a pressure-volume diagram for the air insided the engine. Remember that you've got an isothermal expansion at high temperature, a drop in temperature (and thus pressure) at fixed volume, an isothermal compression at low temperature, and a rise in temperature (and thus pressure) at fixed volume. Label your diagram with the four steps in the cycle.
 - b) Which part of the motion is the "power stroke", in which thermal energy in the hot reservoir is converted into mechanical energy?
 - c) Which part of the motion is it that removes mechanical energy from the rotating parts of the engine, and sends heat into the cold reservoir, i.e. the "compression stroke"?
 - d) How can you show graphically (on the p-V diagram) that the engine should put more mechanical energy into the spinning parts each cycle than is removed each cycle by the rest of the steps in the cycle?