

Homework 4, due Oct. 25, 2007

**Note: the answers to some of these questions are in the back of the book  
- so show all your work!**

1.  $N$  identical, ideal Carnot refrigerators are in series. In each cycle, the  $n$ -th refrigerator absorbs heat  $Q_n$  at temperature  $T_n$ , and emits heat  $Q_{n+1}$  at temperature  $T_{n+1}$ . The emitted heat  $Q_{n+1}$  is then absorbed by the  $(n + 1)$ -th refrigerator, and so on. Each refrigerator requires  $3J$  of work to run, per cycle. You are given that  $Q_1 = 1J$ , and  $T_1 = 1K$ . Express the answers below in the appropriate units (J or K).
  - (a) What is  $Q_n$ , for all  $n \geq 1$ ?
  - (b) What is  $T_n$ , for all  $n \geq 1$ ?
2. problem **6-1** in the book.
3. problem **6-3** in the book.
4. problem **6-5** in the book.
5. problem **6-8** in the book.
6. problem **6-9** in the book.
7. problem **6-13** in the book.