PS160 Superquiz Practice

November 23, 2002

1. Ice at -20 C. is added to 5 kg water at 50 C. Assuming the system is perfectly insulated and the final temperature of the system is 35 C, find the mass of ice.

2. 300 J of heat is added to a system, while the system does 150 J of work. If 40 J of work is also done on the system and another 20 Joules leaks away to the surrounding environment, find the change in the internal energy.

3. An ideal engine rejects 2000 J of heat to the cold reservoir. If the temperature of the cold reservoir is 100 C and the engine does 1000 J of work during the cycle, find the temperature of the hot reservoir. What is the efficiency of the engine?

4. A gas expands isothermally from 1 to 2 meters cubed. If there are 50/R moles of gas and 10,000 J of work is done, what is the temperature?

5. An engine consists of a two constant volume processes at 1 and 2 meters cubed, and two constant pressure processes at 10^5 pa and 2×10^5 pa, respectively. (A) Find the work done. (B) Find the heat transferred in, Q_H. (C) Find the heat rejected, Q_c. (D) Find the change in internal energy for each leg. Assume there are 100/R moles of gas.

6. 5 kg of water at 100 C is transformed to steam at 100C. Find the change in the entropy.

7. Don't forget heat transfer problems, conduction and radiation. e.g. A spherical jellyfish with r=0.2 meters maintains a body temperature of 40 C. What thickness of flubber with k=.3 is needed so that the creature radiates at no more than 50 watts? (or some such–got to work this one out!) Assume the average water temperature is 25 C.