PHYS 1220 Group Work Sheet
Heat and Phase Changes

With your group, discuss how to answer these questions and write your group answer in the space provided. Explain/show how you got your answer: don't just write down a number! (Especially not one without units!)

1. The 2004 Tour de France's Alpe d'Huez time trial was a climb with its finish 1200 m higher than the start. The winner, Lance Armstrong, and his gear had a combined mass of 84 kg. How much work did he need to do to raise his elevation?

2. Muscle is about 20% efficient, so Lance had to deplete 5 times as much stored energy as the work he produced.
   a. How much energy did he consume?

   b. How much energy that he burned was *not* converted to work? This energy became thermal energy within his body.

3. Show that $\Delta T = Q/(mc)$. What assumption must you make?

4. Lance Armstrong's body mass was 75 kg. Assume c = 2090 J/(kg K). If he were a closed system, what would have been his change in temperature?

5. During the Alpe d'Huez climb, how much sweat would Lance have needed to evaporate to keep his body temperature constant?
(The heat q needed to vaporize a mass m of water is $q = m\ (2.255 \times 10^6$ J/kg). Solve for mass m and then substitute in the appropriate values.)