Chemistry 14B
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Ch 8: First Law of Thermodynamics Worksheet

1. There are two parts to this problem.
   a. Calculate the heat that must be supplied to a 500.0 g copper kettle containing 400.0 g of water to raise its temperature from 22.0^oC to the boiling point of water, 100.0^oC. The specific heat capacity of solid copper is $0.38\,J/{}^oC \cdot g$

   b. What percentage of the heat is used to raise the temperature of the water?

2. How many grams of water can be heated from 25.0^oC to 100.0^oC by the heat released from converting 49.7 g of PbO to Pb?

   The converting reaction is: $PbO_{(s)} + C_{(s)} \rightarrow Pb_{(s)} + CO_{(g)}$ ΔH = -106.9 kJ

Note: This worksheet may contain problems adapted from Dr. Lavelle's past exams.

3. The internal energy of a system increased by 982J when it absorbed 492kJ of heat.

    a. How much work was done?

    b. Was work done on the system or by the system?

4. Calculate the change in internal energy of a system if the system released 342 J of heat and did 289 J of work on its surrounding.

5. If an isolated system contained +100 kJ of energy, after 100 years, ΔU =

6. A balloon filled with 31.9 mol of Helium has a volume of 876 L at 0^oC and 1.00 atm pressure. At constant pressure, the temperature of the balloon is suddenly increased to 38.0^oC, causing the balloon to expand to a volume of 998L. (The molar heat capacity of Helium is 20.8 $J/^oC$ mol)

    a. What is the change in internal energy?

    b. How much heat is added?

c. How much work is done?

7. Explain each of the sign conventions for work and heat.