

Lesson 27: Thermochemistry II

text: 430-441

what to know:

- concept of bond energies and relationship to enthalpy changes, §10-5
- first law of thermodynamics, its use and related terms, §10-6
- relationship of ΔH and ΔE , §10-6
- food calorimetry, p-440-441

questions:

1. Why are bond-breaking processes always endothermic and bond-making processes always exothermic?
2. Using bond energies from the table in the text, estimate the ΔH for the:
 - a. formation of hydrazine, N_2H_4 from hydrogen gas and nitrogen gas.
 - b. combustion of propane, C_3H_8 to form $CO_2(g)$ and $H_2O(g)$
3. Consider the following changes and state whether work is done on the system, by the system or no work is done and give the sign for w . Consider these open to the atmosphere.
 - a. $HgO(s) \rightleftharpoons Hg(l) + O_2(g)$
 - b. $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$
 - c. $3O_2(g) \rightleftharpoons 2O_3(g)$

4. Why is wrong to talk about a system of substance containing $\Delta work$ or $\Delta heat$? Or to talk of gasoline

or petroleum as being $\Delta energy$?

5. A gas expands and does P-V work on the surroundings equal to 325 J. At the same time it absorbs 127 J of heat from the surroundings. Calculate the change in energy of the gas.
6. For the vaporization of one mole of water at 100 °C, determine q_v , w_p , and q_p . [If $\Delta E = q_v$ and $\Delta H = q_p$, $\Delta E = q + w$ and $w = -P(\Delta V)$, then $q_p = q_v + P(\Delta V)$ and $\Delta H = \Delta E + P(\Delta V)$.] (101.3 J/L atm)
7. Why are decomposition reactions usually endothermic?