AP Chemistry Name _____

Date _____ Per _____

Chapter 16: Introduction and Sections 16.1 to 16.3

Directions: Read up to the end of section 16.3 of our Zumdahl text, answering these questions as you go.

A. 16.1 _____

1. What does the first law of thermodynamics say? _____

_____

2. When methane burns, the _____ energy stored in the bonds of the methane and oxygen gas is turned into _____ energy. It's all bookkeeping!

3. Spontaneous = _____

a) What does it tell us about the speed of a reaction? _____

b) Important sentence: "In describing a chemical reaction, the discipline of chemical kinetics (chapter 12) focuses on the pathway between reactants and products; _____ (chapter 16) considers only the _____ and _____ states and does not require knowledge of the the _____ between reactants and products." (Fig 16.2 is great.)

b) Are diamonds really forever? _____

4. What is "exothermicity"? _____

_____ Is it the total answer? ____

5. Entropy : Symbol = _____ There are a couple of definitions of entropy in this section.

a) Entropy can be viewed as a measure of _____ or disorder.

b) Entropy is a thermodynamic function that describes the _____ _____ that are _____ to a system.

c) Rate in order of increasing entropy: the three states of H_2O

_____ _____ _____

Lowest entropy ----------> Greatest entropy

d) Which of these pairs have the greatest S? (Circle one for each.)

a whole beaker/ a shattered beaker CO_2 and H_2O / flash paper

B. 16.2 _____

6. What does the second law of thermodynamics say? _____

_____

a. What does “surr” stand for? _____

C 16.3 _____

7. Does a positive ΔS mean an increase or a decrease in entropy? _____

8. “The impact of the transfer of a given quantity of energy as heat to or from the surroundings will be greater at _____ temperatures.”

9. What does ΔH mean? _____ I think the best definition of enthalpy is this: **“The enthalpy of a substance is a measure of the energy that is released or absorbed by the substance when bonds are broken and formed during a reaction.”**

(From “Cracking the AP Chemistry Exam,” 2011 ed, by The Princeton Review pg 114)

a. What is the formula for ΔS in terms of ΔH and T?

10. Finally, turn to Appendix 4 in the back of the book. S^o is the standard absolute entropy of a substance at 25° C (298 K) and 1.00 atm. Skim the chart to answer the following:

a) What are the units for S^o? _____

b) What substance has a S^o that’s closest to 0? _____

c) What substance has the highest listed S^o? _____

d) S^o can be negative. What do all the substances with a negative S^o have in common?

_____

e) Consider pure metals. Does S^o increase or decrease as you go down the periodic table? _____ What would you guess is the reason for this? _____

_____

f) List the S^o values for the diatomic halogens (except astatine). Include units, of course.

_____ = _____

_____ = _____

_____ = _____

_____ = _____

What force explains this trend? _____