New West Charter High School -- Chem/Honors -- Unit 7 -- Quest #6 -- 50/70 points

Write TRUE if the statement is true, OR write the word(s) that substitutes for the underlined word(s) that would make it true. Writing false only earns partial credit. Three points apiece. And BE NEAT!

_____ 1) If K_{eq} is very <u>small</u>, more reactants than products are present in the reaction vessel.

_____ 2) An increase in entropy is <u>always</u> expected; it's the Second Law of Thermodynamics.

_____ 3) The <u>potential energy</u> is a transitional state where old bonds are broken and new bonds are being formed.

_____ 4) The molar enthalpy of formation for elements in their standard state is <u>calorimetry</u>.

_____ 5) We explain the results of the Rate of Reaction lab experiment by the <u>reversible</u> theory of matter.

6) For five points, draw a potential energy diagram for an <u>endothermic</u> chemical reaction with clear labels for energy, time, activated complex, activation energy, and the heat of reaction. <u>Honors Only</u>: Annotate how a catalyzed reaction would change the curve.

7) Consider the balanced, reversible reaction: $2NO\ (g) + 2H_2\ (g) \Longleftrightarrow N_2\ (g) + 2H_2O\ (g) + 23.6\ kJ$ and answer the following questions (two points each):

a) Is it exothermic or endothermic? _____

b) If we remove nitrogen gas, which way will the equilibrium shift? _____

c) If we add pressure to the system, which way will the equilibrium shift? _____

d) Entropy favors the forward or backward reaction? _____

8) What is the equilibrium constant expression for the reaction:

$Fe_2O_3\ (s) + 3H_2\ (g) \Longleftrightarrow 2\ Fe\ (s) + 3H_2O\ (g)$

9) What is the expression for Gibbs Free Energy?

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10) Consider the famous reaction: N_2 (g) + $3H_2$ (g) <==> $2NH_3$ (g) For five points, find the equilbrium constant at 45 °C when [N_2] = .86 M, [H_2] = .63 M, and [NH_3] = .18 M

11) A small tanker truck holds 2000 L of water. How much energy is required to raise the temperature of that much water from 25 °C to 55 °C? (...be careful about the units...)

12) A certain reaction has a ΔH = -280 kJ , ΔS = -1.8 kJ/K, and T = 300 K. Find ΔG. Is the reaction spontaneous?

Honors Section:

13) If we input 14.9 kJ of energy into a tub containing 25 kg water at 47 °C, what will its final temperature be?

14) The enthalpy of combustion of propane gas, C_3H_8, is -456.2 kJ/mol.

a) Write the balanced thermochemical equation for the complete combustion of propane gas.

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b) If 0.15 mol of propane reacts according to the equation in part a, how much energy is released?

c) How many grams of propane are required to react to produce 5000 kJ of energy?

15) Find the minimum temperature required for a reaction to occur if its ΔH = 390 kJ and ΔS = -1.4 kJ/K.