Quiz 13.3 – Le Châtelier's Principle

Name: _____

Question 1

Consider the reaction: $NH_3(aq) + H_2O(l) \rightleftharpoons NH_4^+(aq) + OH^-(aq)$

Tell which way the reaction will shift in response to the following changes:

- Remove OH^- through a precipitation reaction with Sr^{2+}
- Add ammonium nitrate salt to the solution
- Place the reaction solution in contact with high pressure $NH_3(g)$
- Dilute the reaction solution to 4 times its initial volume
- Boil away most of the solvent

Question 2

Consider the reaction: $C_3H_8(g) + 5\,O_2(g) \rightleftharpoons 3\,CO_2(g) + 4\,H_2O(g)$ $\quad \Delta H_{rxn} = -2044\ \frac{kJ}{mol}$

This reaction is highly product-favored. If you wanted to produce C_3H_8 from CO_2 and H_2O, what pressure and temperature conditions should you use? (ignore kinetic considerations)

Question 3

A certain gas reaction has colorless reactants and dark brown products. This reaction has reached equilibrium in a transparent piston with a movable head. The reaction begins colorless, but turns brown as you reduce the volume by pressing down on the piston head with high pressure. You then decrease the temperature while maintaining the reduced volume and the reaction again turns colorless. What can you say about the stoichiometry and enthalpy of this reaction?

Sonnet 18: Shall I compare thee to a summer's day?

By William Shakespeare

Shall I compare thee to a summer's day?
Thou art more lovely and more temperate:
Rough winds do shake the darling buds of May,
And summer's lease hath all too short a date;
Sometime too hot the eye of heaven shines,
And often is his gold complexion dimm'd;
And every fair from fair sometime declines,
By chance or nature's changing course untrimm'd;
But thy eternal summer shall not fade,
Nor lose possession of that fair thou ow'st;
Nor shall death brag thou wander'st in his shade,
When in eternal lines to time thou grow'st:
  So long as men can breathe or eyes can see,
  So long lives this, and this gives life to thee.