Quiz 15.4 – Le Châtelier's Principle

Name: Key

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

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)

High pressures and high temperatures

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?

heat + Colorless ⇌ brown

more moles (g) fewer moles (g)

Endothermic