

CHEM-457 (S14)
Problem Set 4

1. Miessler, Fischer and Tarr #6.1, 6.2, 6.30, 6.34, 6.37, 6.38 and 6.42

2. Baking powder, which is a mixture of AlSO_4 and NaHCO_3 produces a gas when dissolved in water. Explain what reactions are giving rise to this gas production.

3. Predict whether the equilibrium constants for the following reactions should be greater than 1 or less than 1. Please rationalize your answer.
 - (a) $\text{NH}_2^- + \text{H}_2\text{O} \rightleftharpoons \text{NH}_3 + \text{OH}^-$ (Reaction carried out in water)
 - (b) $\text{CdI}_2 + \text{CaF}_2 \rightleftharpoons \text{CdF}_2 + \text{CaI}_2$
 - (c) $\text{PtCl}_2 + \text{Mg}(\text{S}_2\text{O}_3) \rightleftharpoons \text{Pt}(\text{S}_2\text{O}_3) + \text{MgCl}_2$
 - (d) $\text{KCl} + \text{CuBr} \rightleftharpoons \text{CuCl} + \text{KBr}$

4. For each of the following pairs of compounds, indicate which species is the stronger acid. Please explain your rationale.
 - (a) $[\text{Fe}(\text{OH}_2)_6]^{3+}$ vs. $[\text{Fe}(\text{OH}_2)_6]^{2+}$
 - (b) HClO_3 vs. HClO_4
 - (c) H_3PO_4 or H_2SO_4
 - (d) HNO_3 or $\text{B}(\text{OH})_3$

5. For each of the following pairs of compounds, indicate which species is the harder and softer acid or base. Please explain your rationale.
 - (a) Zn^{2+} vs. Hg^{2+}
 - (b) K^+ vs. Cu^+
 - (c) Fe^{2+} vs. Fe^{3+}
 - (d) Me_3P vs. Me_3N
 - (e) Cl^- vs. I^-
 - (f) NH_2^- vs. N_3^-

