1. Predict which equilibrium constant will be larger for the following pairs of reactions.

   a. \[
   \text{Ph} \quad \text{Ph} \quad \text{NaNH}_2 \quad K \quad \text{Ph} \quad \text{Ph} \quad \text{Na}^+ \quad \text{NH}_3
   \]
   \[
   \quad \text{Ph}_3\text{CH} \quad \text{NaNH}_2 \quad K \quad \text{PhC} \quad \text{Na}^+ \quad \text{NH}_3
   \]

   b. \[
   \quad \text{H} \quad \text{H} \quad \text{NaNH}_2 \quad K \quad \text{H} \quad \text{H} \quad \text{Na}^+ \quad \text{NH}_3
   \]
   \[
   \quad \text{CH}_2 = \text{CH} \quad \text{NaNH}_2 \quad K \quad \text{CH}_2 \quad \text{CH}_2 \quad \text{Na}^+ \quad \text{NH}_3
   \]

   c. \[
   \text{OH} \quad \text{H}_2\text{SO}_4 \quad K \quad \text{H}_2\text{SO}_4 \quad \text{H}_2\text{O}
   \]
   \[
   \quad \text{CH}_2 = \text{CHOH} \quad \text{H}_2\text{SO}_4 \quad K \quad \text{CH}_2 \quad \text{CH}_2 \quad \text{H}_2\text{O}
   \]

2. Rank the following compounds in the trend requested. Explain your answer for each.

   a. Rank the stability of the flat form of the following compounds.

   \[
   \quad \text{N=S} \quad \text{H} \quad \text{O}
   \]

   b. Rank these nitrogen containing compounds by rate of S\textsubscript{N}\textsubscript{2} reaction with methyl iodide.

   \[
   \quad \text{Ph} \quad \text{H} \quad \text{PhNH}_2
   \]
3. Rank bonds 1-4 for bond length.

b. In a reaction with HBr, which bond would react? Draw the structure of the product.

c. Compare the bond length for bonds 1, 2 and 3 in starting material and product after deprotonation.

d. Which bonds become shorter and which become longer upon deprotonation?