1. Water can act either as an acid or base. In (a) show an acid-base reaction with water as an acid. In (b) show an acid-base reaction with water as a base.

(a) \[ \text{H} - \overset{\text{O}}{\text{O}} - \text{H} + \text{CH}_3\text{Li} \rightarrow \text{H} - \overset{\text{O}}{\text{O}} - \text{H} + \text{CH}_3\text{Li} \]

(b) \[ \text{H} - \overset{\text{O}}{\text{O}} - \text{H} + \text{H}_2\text{SO}_4 \rightarrow \text{H} - \overset{\text{O}}{\text{O}} - \text{H} + \text{H}_2\text{SO}_4 \]

2. Circle the strongest acid. Put a box around the weakest.

HF \[ \boxed{\text{NH}_3} \quad \text{H}_2\text{O} \quad \text{HCl} \]

3. Circle all the atoms that belong to each functional group and name the functional groups.

[Diagram of functional groups: ether, amide, ketone]

4. Complete the following acid-base reactions. Show all lone pairs and formal charges.

1. (a) \[ \text{CH}_2\text{O} + \text{NH}_3 \rightarrow \text{CH}_2\text{ONH}_3 + \text{NH}_4^+ \]

1. (b) \[ \text{CH}_3\text{OH} + \text{NH}_2 \rightarrow \text{CH}_3\text{ONH}_3 + \text{H}_3\text{NH} \]

5. Convert the following two Newman projections into the identical wedge-line drawings in 3-D. Circle the most stable Newman projection. Name this alkane.

[Newman projections and 3-D drawings]

6. Phenol and cyclohexyl alcohol are drawn below. Which is the stronger acid (circle)? Draw the conjugate bases. Consider resonance.

[Structural drawings: phenol and cyclohexyl alcohol]