

3. (10 pts) Compare the Lewis Structures for the conjugate bases of HNO_3 ($\text{pK}_a = -1.3$) and HNO_2 ($\text{pK}_a=3.4$). Briefly describe the reason for their difference in acidity.

4. (10 pts) For the following pairs of molecules, determine which would have the higher boiling point and briefly describe your reasoning.
 - a. Hexane and isohexane

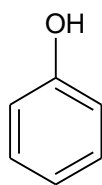
 - b. Diethyl ether and 1-butanol

5. (10 points) Draw the four possible conformers of 1-ethyl-2-methylcyclohexane. Use the Chair conformations only, and be sure to label them as cis or trans.

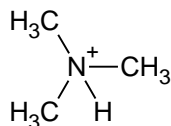
Section 2: Answer four of the following five questions. Be clear on which questions you are answering, and draw an 'X' through the question that you will not answer or not have graded. If it is unclear, the first four questions will be graded.

6. (10 points) Write the reaction that occurs when methyl amine is added to water. Identify the acid, base, conjugate acid, conjugate base, and the side of the reaction that is favored at equilibrium.

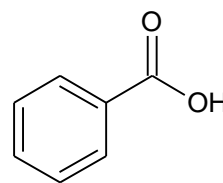
7. You are given a mixture of the following compounds with their pKa's shown beneath them:



pKa = 10.0



pKa = 10.6



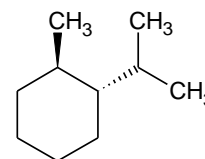
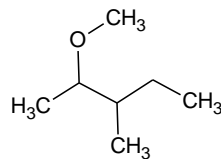
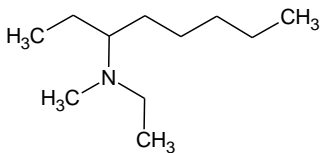
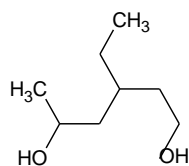
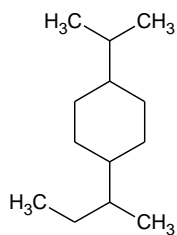
pKa = 4.2

Using ether, water, acid, and base, draw a flowchart that will separate each of these compounds from the mixture.

8. (10 pts) Draw each of the following compounds:

- N,6-dimethyl-3-heptanamine
- 1,2-dichloro-3-methylpentane
- 4-ethoxy-2-fluoroheptane
- 4-methyl-2,3-pentanediol
- Cis-1,2-dimethylcyclohexane

9. (10 points) Name each of the following compounds.



10. (10 points) The molecule below is Mevacor, a statin that is used to combat high cholesterol in the blood. Give the total number of sp^3 and sp^2 hybridized atoms in this molecule.

