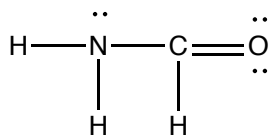


1. _____

1. (12 pts.) Draw resonance contributors for the following (a.) Lewis and (b.) skeletal structures.

a.

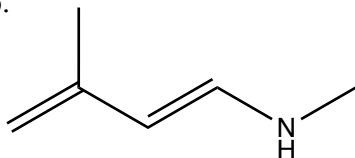


3. _____

4. _____

5. _____

b.

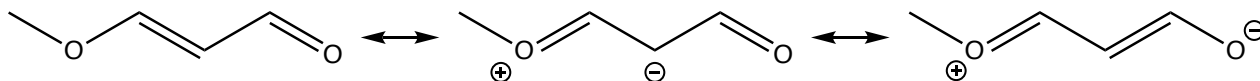


6. _____

7. _____

8. _____

2. Resonance contributors for a molecule are drawn below. (a. 4 pts.) Circle the resonance contributor that the actual molecule, the resonance hybrid, most strongly resembles, and (b. 6 pts.) draw the resonance hybrid. Remember to include δ^- and δ^+ symbols where appropriate.



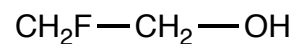
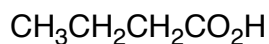
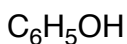
9. _____

10. _____

11. _____

12. _____

3. Rank the following molecules in order of decreasing acid strength: label them sequentially from the strongest acid with a #1 to the weakest acid with a #4.



pK_a = 10.0

pK_a = -1.6

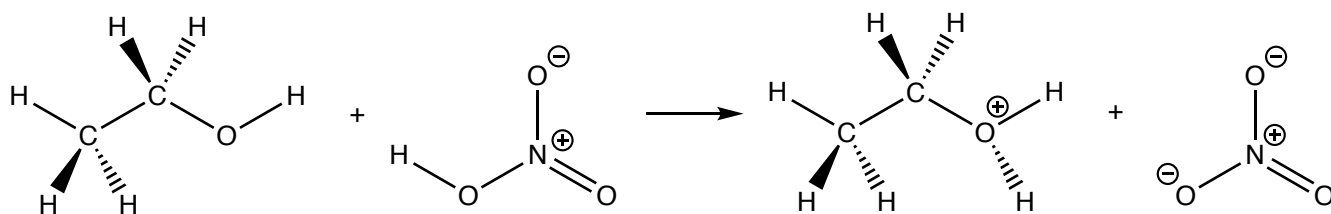
pK_a = 4.5

pK_a = 14.42

4. a. (6 pts.) Brønsted-Lowry acids are proton donors or acceptors?

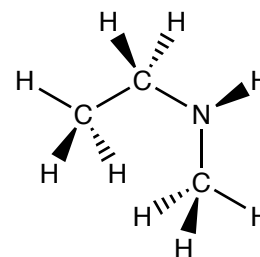
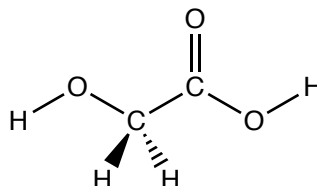
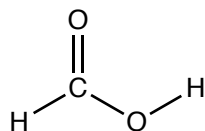
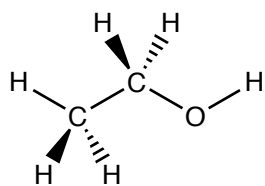
- b. (6 pts.) Lewis acids are lone-pair electron donors or acceptors?

5. An acid-base reaction is drawn below.

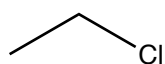


- (4 pts.) Identify the molecule that is acting as the acid (write the word "acid" under the acid).
- (4 pts.) Identify the molecule that is acting as the base (write the word "base" under the base).
- (4 pts.) Briefly, explain why ethanol can play its role in this reaction.

6. (12 pts.) For each of the following molecules circle the proton that is most likely to be removed by a base.

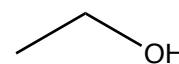


7. (10 pts.) Chloroethane, which is a gas at room temperature, has a dipole moment of 2.06 D, whereas ethanol, which is a liquid at room temperature, has a dipole moment of 1.69 D. Explain why the less polar ethanol has the higher boiling point.



chloroethane

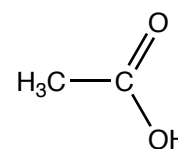
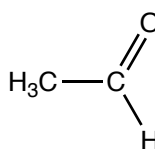
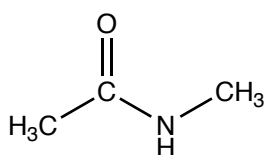
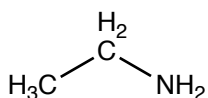
2.06 D



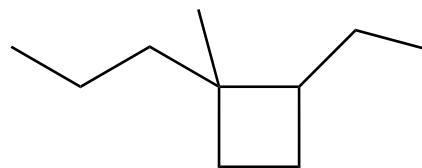
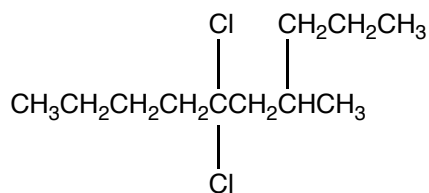
ethanol

1.69 D

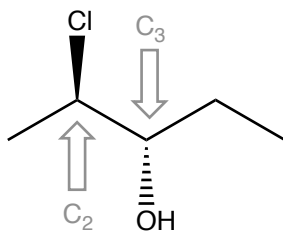
8. (12 pts.) Determine the name of the functional groups on the molecules drawn below.



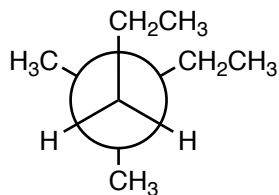
9. (16 pts.) Provide IUPAC names for the following molecules.



10. (8 pts.) Draw a Newman projection along the C₂ to C₃ bond of the rotamer of 2-chloro-3-pentanol shown below.



11. A rotamer of 3,3-dimethylhexane is drawn below. (a. 4 pts.) circle any groups that would be experiencing gauche interactions. (b. 4 pts.) Draw the lowest energy rotamer of 3,3-dimethylhexane. (c. 4 pts.) Draw the highest energy rotamer of 3,3-dimethylhexane.



12. (8 pts.) An electrostatic potential map of butane is pictured below. Briefly, describe what this picture tells us about the butane; for example, does the diagram reveal any areas of high or low electron density on the surface?

