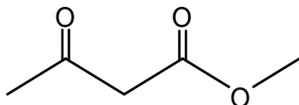


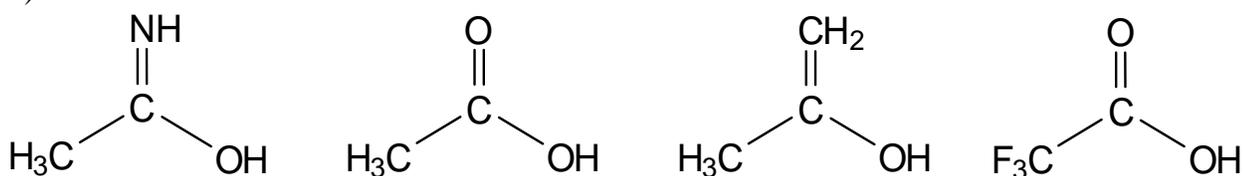
Chemistry 2500 (Fall 2017): Assignment #13 – Operational Species (A/B/E/Nu)

1. Label and rank all acid and base sites in the following question. Explain your rationale using figures as appropriate.



2. Rank the following compounds in order of increasing OH acidity. No explanation is required.

a)

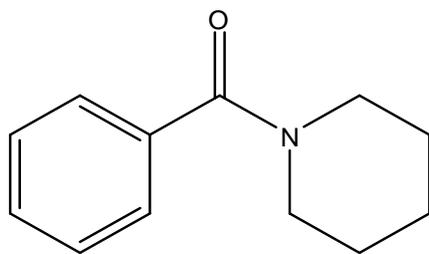


b)

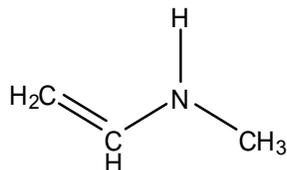


3. Identify and rank all Acid, Base, Nucleophile and Electrophile Sites in the Following Molecules:

a)



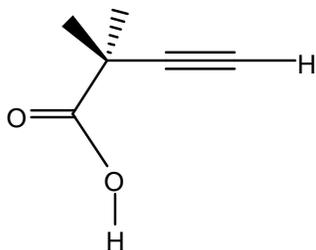
b)



c) [Na][CN]

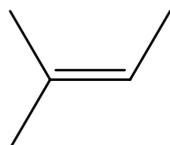
d) [K][SCN]

4. You are in the middle of a “hands-on” job interview at Nova Chemicals. You have been given a vial containing the compound depicted below and asked to *selectively* deprotonate the carboxylic acid. You find five other chemicals in the lab: NaNH₂, HBr, KOCH₃, NaCl and ^tBuLi. Which chemical do you use? Explain fully.

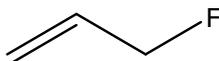


5. For each of the following alkenes, indicate which carbon of the carbon-carbon double bond is more electrophilic. Briefly explain your answer.

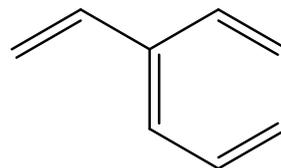
a)



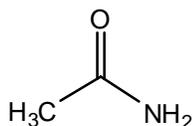
b)



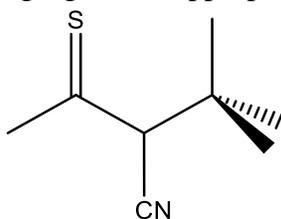
c)



6. a) Label and rank only the base sites in the following molecule. Explain your rationale using figures as appropriate.



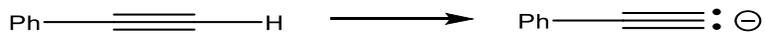
- b) Label and rank only the acid sites (pK_a less than 36) in the following molecule. Explain your rationale using figures as appropriate. (8 points)



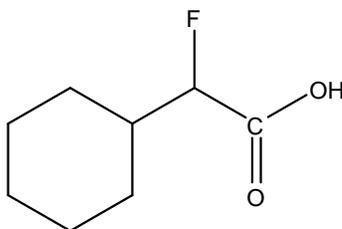
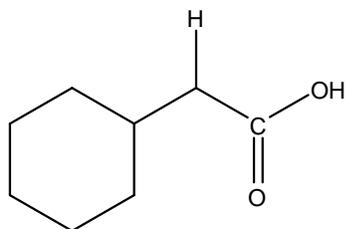
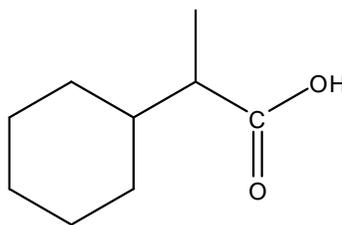
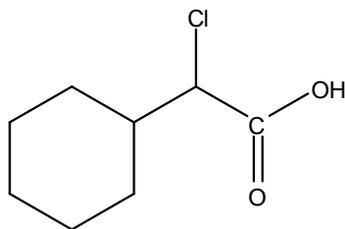
7. Identify each of the following:

- The conjugate base of ammonia, NH₃.
- The conjugate acid of hydrofluoric acid, HF.
- The conjugate base of ethanol, CH₃CH₂OH.

8. In the following unbalanced reaction, which of NaOH, NaNH₂, NaSH, HCl, or H₂O is the correct reagent to use? Your *brief* explanation must discuss why each reagent is or is not the best choice.

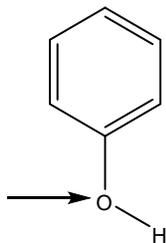


9. Rank the following compounds in order of acidity (from 1 to 4 where 1 = most acidic and 4 = least acidic). *No explanation is required.*

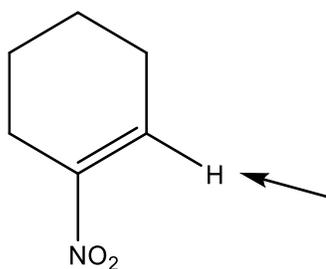


10. In each of the following compounds, a particular atom is indicated with an arrow. Determine whether the atom is nucleophilic, basic, acidic, electrophilic or none of these. The indicated atom may have more than one correct descriptor. No explanation is required.

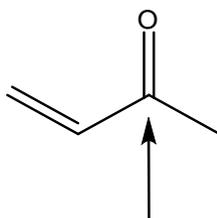
a)



b)

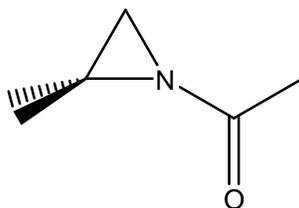


c)



11. Identify and rank all acid, base, electrophile and nucleophile sites in the following molecules:

a)



b)



12. Which of the following bases would you use to *selectively deprotonate* the SH functionality, NaNH_2 , $t\text{BuLi}$ or NaOH . Explain fully.

