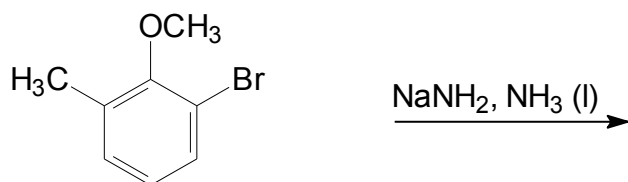


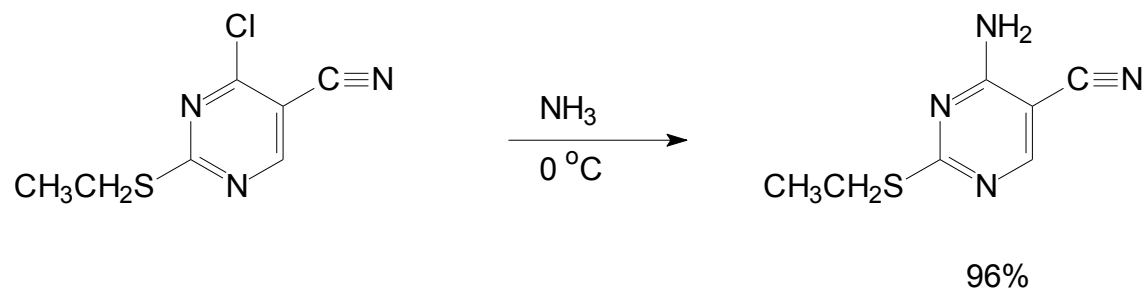
1. When 1-bromo-2-methoxy-3-methylbenzene is treated with sodium amide in liquid ammonia, a mixture of two products is formed, each with the molecular formula $C_8H_{11}NO$.

a) (5 pts). Draw the structures of the two products.



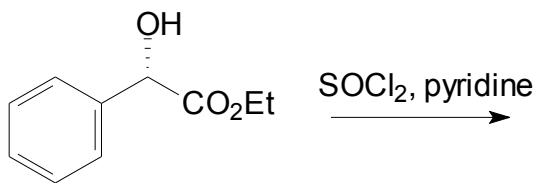
b) (10 pts). Propose a reasonable mechanism which would account for the formation of both products. Use curved arrow notation to indicate the movement of electrons.

2. (15 pts). Propose a complete, stepwise mechanism for the following reaction (including resonance structures). Use curved arrow notation to indicate the movement of electrons.



3. Reaction of (*S*)-ethyl 2-hydroxy-2-phenylacetate with thionyl chloride and pyridine gives a major product in good yield.

a) (5 pts). Draw the structure of the product.



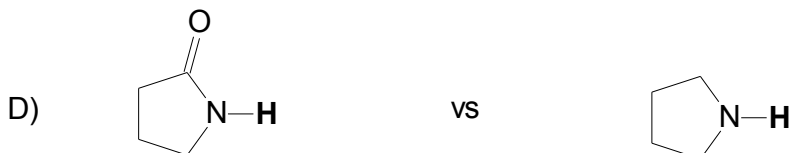
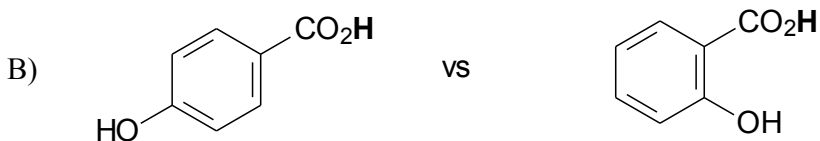
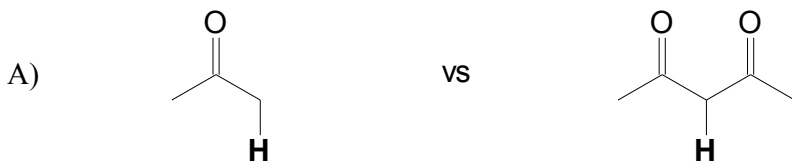
b) (10 pts). Propose a reasonable mechanism which would account for the formation of the product. Use curved arrow notation to indicate the movement of electrons.

4. (20 pts). For each pair of acids shown below (acidic **H in BOLD**).

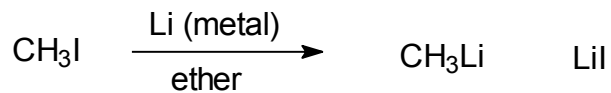
i.) (2 pts each) Draw the **structure(s)** of the corresponding conjugate base.

ii.) (1 pt. each) Choose which acid is stronger.

iii.) (2 pts. each) Give a *BRIEF* explanation.



5. (5 pts) Propose a complete, stepwise mechanism for the following reaction. Use curved arrow notation to indicate the movement of electrons.



6. (10 pts) Draw out a “generic” $\text{S}_{\text{N}}2$ reaction (including the transition state). **Briefly** discuss the following topics, as they relate to the $\text{S}_{\text{N}}2$ pathway. **Be brief.**

- i. Substrate structure (and rate of reaction).
- ii. Stereochemistry.
- iii. Solvent.
- iv. Leaving group.

7. (20 pts) Draw the structures of the major organic products formed in the following reaction schemes.

