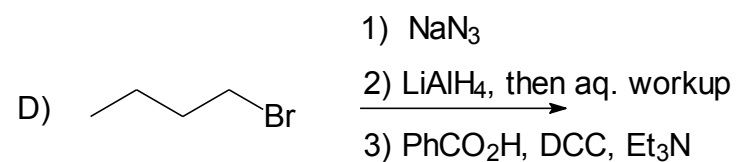
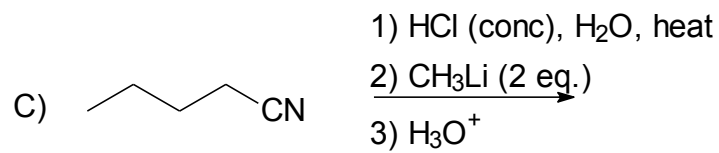
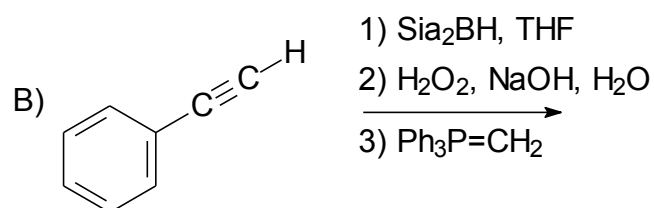
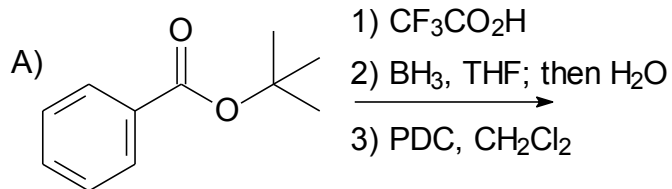
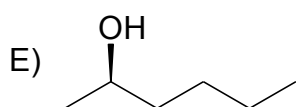
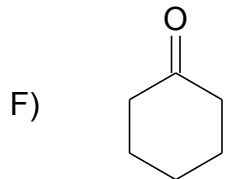


1. (40 pts) Draw the structure(s) of the major organic product(s) formed **after each step** in the following reaction sequences.

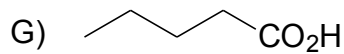




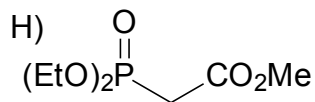
- 1)  $\text{Ph}_3\text{P}$ ,  $\text{EtO}_2\text{CN}=\text{NCO}_2\text{Et}$   
 $p\text{-O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$
- 2)  $\text{KOH}$ ,  $\text{MeOH}$
- 3)  $(\text{COCl})_2$ ,  $\text{DMSO}$ ,  $\text{Et}_3\text{N}$



- 1)  $\text{LDA}$ ,  $\text{THF}$ ,  $-78\text{ }^\circ\text{C}$
- 2)  $\text{PhSeCl}$
- 3)  $\text{H}_2\text{O}_2$

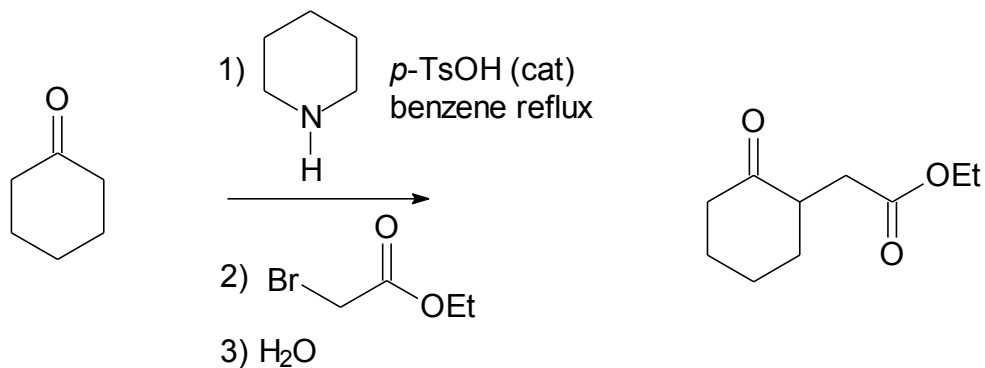


- 1)  $(\text{COCl})_2$
- 2)  $\text{LiAlH}(\text{O}t\text{-Bu})_3$ , then aq. workup
- 3)  $\text{H}_2\text{NOH}$ ,  $p\text{-TsOH}$  (cat)

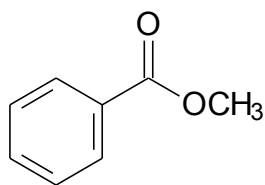


- 1)  $\text{PCl}_5$
- 2)  $\text{CF}_3\text{CH}_2\text{OH}$  (2 eq.)
- 3)  $\text{KHMDS}$ , 18-Crown-6;  
then  $\text{PhCHO}$

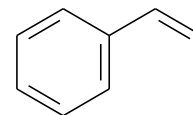
2. (15 pts) Propose a reasonable stepwise mechanism for the following reaction. Draw the structures of all of the intermediates formed (including resonance structures, if applicable) in your proposed pathway. Use curved arrow notation to indicate the movement of electrons.



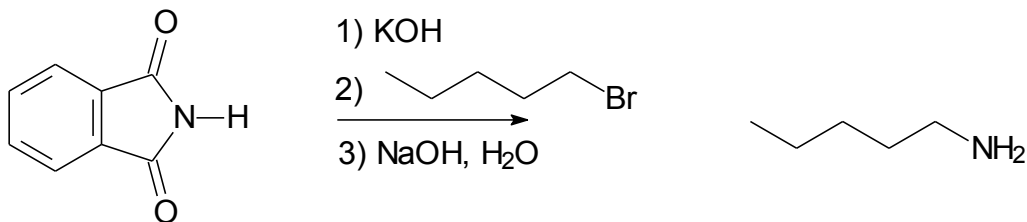
3. (15 pts) Propose a reasonable stepwise mechanism for the following reaction. Draw the structures of all of the intermediates formed (including resonance structures, if applicable) in your proposed pathway. Use curved arrow notation to indicate the movement of electrons.



- 1) *i*-Bu<sub>2</sub>AlH, hexane,  
then aq. workup (H<sub>3</sub>O<sup>+</sup>)  
2) Me<sub>3</sub>SiCH<sub>2</sub>Li, Et<sub>2</sub>O,  
then aq. workup (H<sub>3</sub>O<sup>+</sup>)  
3) KH



4. (15 pts) Propose a reasonable stepwise mechanism for the following reaction. Draw the structures of all of the intermediates formed (including resonance structures, if applicable) in your proposed pathway. Use curved arrow notation to indicate the movement of electrons.



5. (15 pts) Propose a reasonable stepwise mechanism for the following reaction. Draw the structures of all of the intermediates formed (including resonance structures, if applicable) in your proposed pathway. Use curved arrow notation to indicate the movement of electrons.

