1. Fill in the major product(s) of two of the following three reactions. Choose only two and indicate them, or the first two problems will be graded.

a. \[ \text{Br} \xrightarrow{\text{Cl}} \text{Ph} \xrightarrow{\text{AlCl}_3, \text{CCl}_4} \]

b. \[ \text{CN} \xrightarrow{\text{Na, NH}_3} \text{-}40^\circ\text{C, EtOH} \]

c. \[ \text{CN} \xrightarrow{\text{Cl}_2, \text{AlCl}_3, \text{CCl}_4} \]

2. Fill in the reagents that would carry out two of the three following transformations. Choose only two and indicate them, or the first two problems will be graded.

a. \[ \text{CH}_2\text{CH}_3 \xrightarrow{\text{CH(CH}_3)_2} \text{CO}_2\text{H} \]

b. [benzene] \[ \xrightarrow{\text{NO}_2} \text{I ONLY!} \]
c. aniline

(9) 3. In the following reaction, para-bromoacetophenone is formed. Give a complete mechanism to explain this fact. Include any and all pertinent resonance structures, as well as every step of the reaction.