

Chemistry 220b, Section 1

Quiz 3 (25 pts)

Thursday, March 20, 2008

Name _____

Write and sign the VU Honor Pledge:

signature

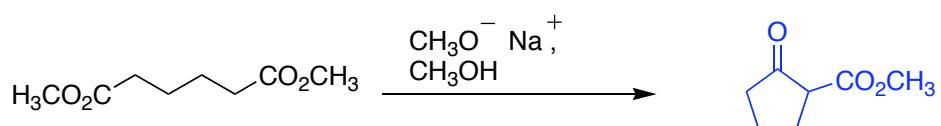
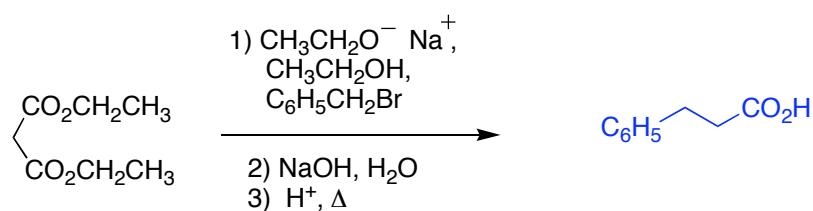
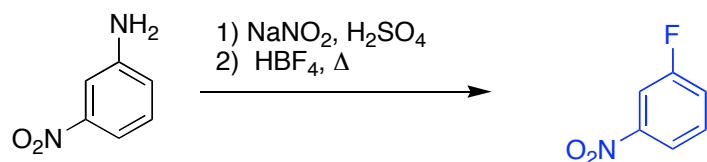
This Quiz is closed book and closed notes

NOTE: It is difficult for me to give you partial credit if you do not show your work!

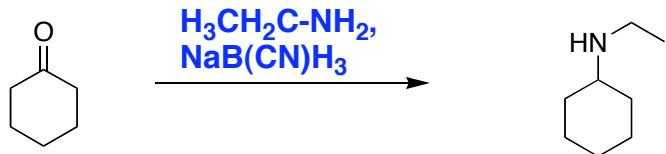
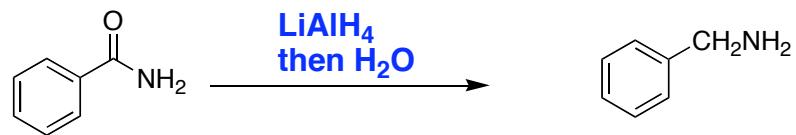
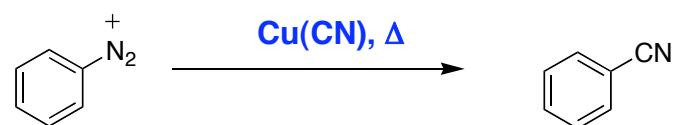
Neatness counts

Good Luck !!

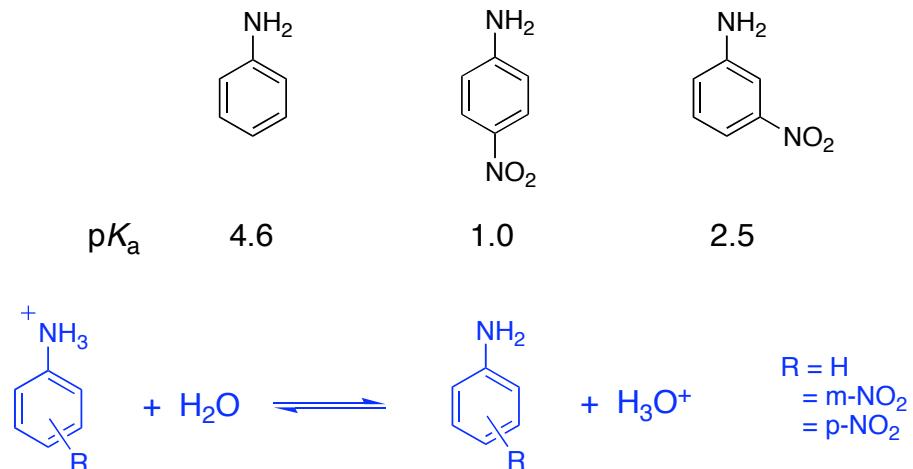
1. Give the final product of the following reactions. (9 pts)



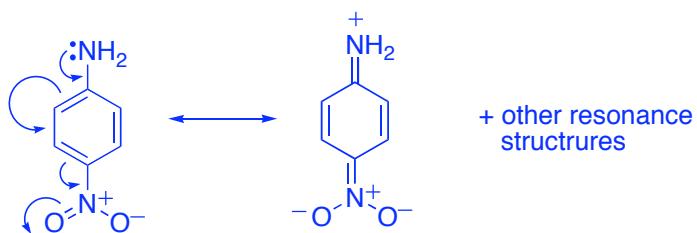
2. Give the necessary reagent(s) for the following reactions. (9 pts)



3. The nature and position of a substituent can influence the pK_a of aniline (4.6). Briefly explain the effect of a nitro substituent of the pK_a of aniline. Why is the pK_a lower for *p*-nitroaniline (1.0) than *m*-nitroaniline (2.5) ? (7 pts)



Aniline is more basic than the nitroanilines (as indicated by the higher pK_a for the conjugate acid, the anilinium ion). The nitro group is electron withdrawing making the aromatic ring electron-deficient; this will also withdraw electron density from the making it less available for acid base chemistry. In the case of *p*-nitroaniline, the electron pair on the amino group can be delocalized into the nitro group through resonance. This is a stabilizing interaction that is absent in the protonated anilinium ion ($O_2N\text{-C}_6\text{H}_4\text{-NH}_3^+$); thus, the unprotonated form is favored, which is reflected in the lower pK_a (more acidic) of the conjugate acid (anilinium ion). This direct resonance delocalization of the amino electron pair into the nitro group is not possible for the *m*-nitroaniline. The effect of the *m*-nitro group is largely an inductive effect while both inductive and resonance effects are in play for the *p*-nitroaniline.



Problem 1: _____ (9 pts)

2: _____ (9 pts)

3: _____ (7 pts)

Total out of 25: _____