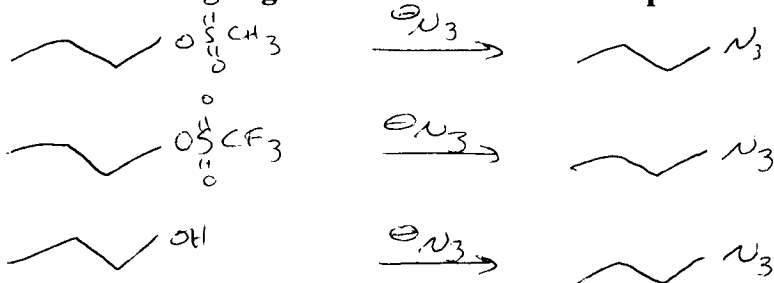
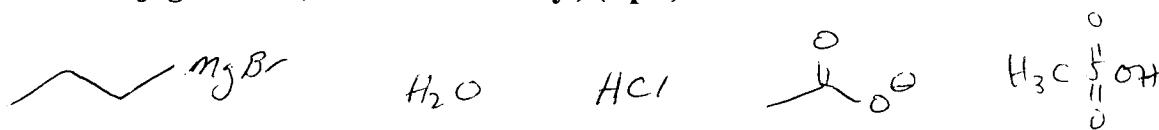


Practice Exam 2 - CHEM 322 - Spring 2003 - Dr. Neal Zondlo

1. Which of the following substitution reactions will proceed most rapidly? Why? (5 pts)



2. The following acids and bases are mixed together in equal amounts (1 mole each). Which species are observed at equilibrium? (Hint: Start by ranking the compounds (or their conjugate acids) in order of acidity.) (8 pts)



3. Propose a structure for an "unknown" compound given the following spectroscopic data. Indicate the # of degrees of unsaturation. Explain your answer. (12 pts)

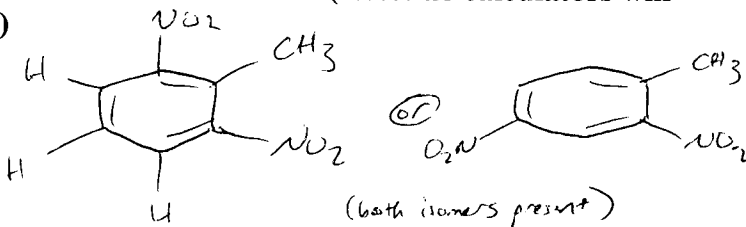
IR 1670 cm^{-1} , 2210 cm^{-1} (strong bands)

$^1\text{H NMR}$: 9.13 ppm (singlet, 1 H), 1.29 ppm (singlet, 9 H)

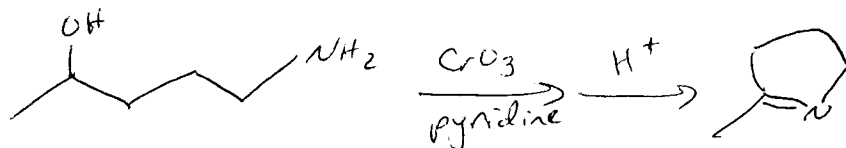
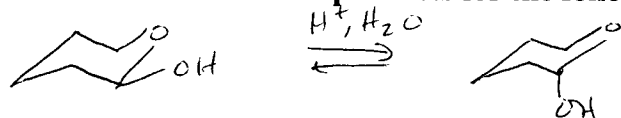
$^{13}\text{C NMR}$: 180 , 104 , 76 , 28 , 24 ppm

molecular formula C7H10O molecular weight 110.1

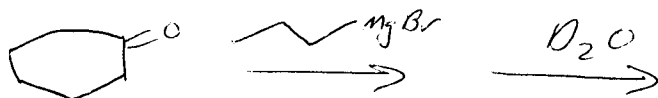
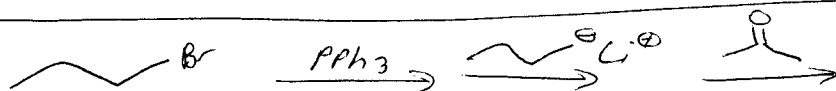
4. Mass spectrometry is used in the detection of explosives. For example, dinitrotoluene (below) is a contaminant of the common explosive TNT (trinitrotoluene). Calculate the observed m/z peak for dinitrotoluene with one electron removed (parent peak in MS) (that is, calculate the molecular weight of dinitrotoluene). Use $\text{H}=1$, $\text{C}=12$, $\text{N}=14$, $\text{O}=16$. Start by indicating the molecular formula for dinitrotoluene. (Note: no calculators will be permitted during the exam.) (8 pts)



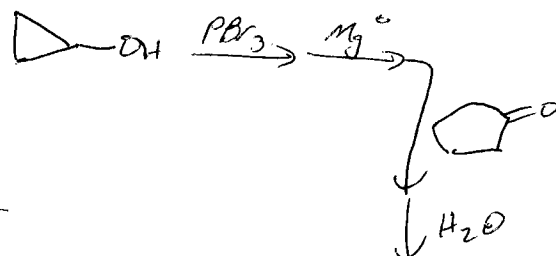
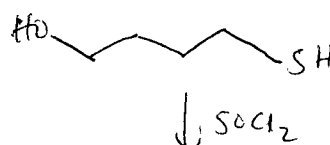
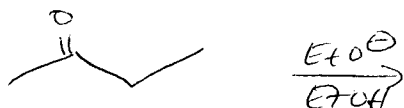
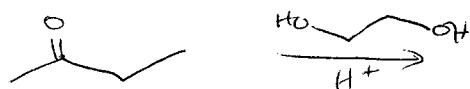
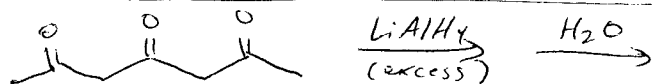
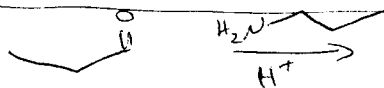
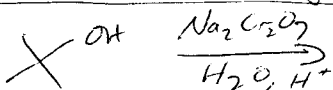
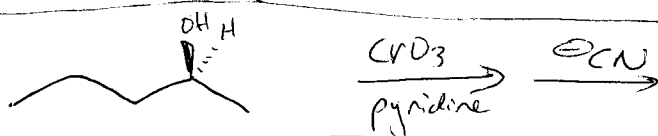
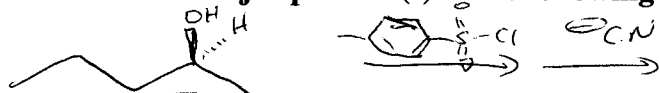
5. Provide mechanisms and products for the following reactions. (12 pts)



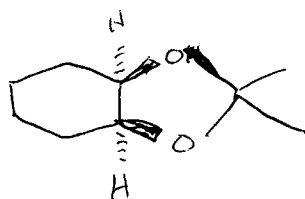
6. Provide mechanisms and products for the following transformations. (18 pts)



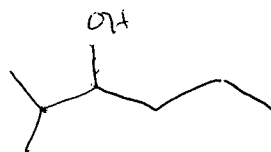
7. Provide the major product(s) of the following reactions. (16 pts)



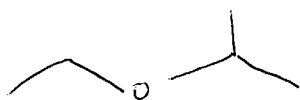
8. Propose syntheses of the following compounds using the requested reagents. (20 pts)



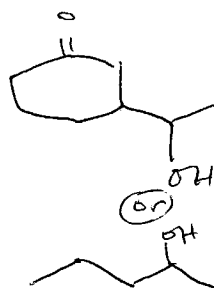
from acetone
+ any alkene
with ≤ 6 carbons



From any $\text{C}=\text{O}$
compounds with
 ≤ 4 carbons and
any other reagents



from any
alkenes



From any compounds
with ≤ 6 carbons
(note: a little tricky ...
see section on using
acetals as "protecting groups")
From any alcohols with
 ≤ 4 carbons