Chapter 15 practice problems

Give the major product of the following reactions:

a) \( \text{C}(\text{CH}_3)_3 \)  
\[ \text{C}(\text{CH}_3)_3 \text{OCH(OH)CH}_2\text{CCl}_3 \text{AlCl}_3 \text{in CH}_2\text{Cl}_2 \rightarrow \text{C}(\text{CH}_3)_3 \text{O} \text{CHO} \]

b) \( \text{CH}_3\text{CHO} \)  
\[ \text{HNO}_3, \text{H}_2\text{SO}_4, \text{Br}_2, \text{FeBr}_3 \]

6) \( \text{OCH}_2\text{CH}_3 \)  
\[ \text{AlCl}_3 \]

7) \( \text{CH}_2\text{CH}_2\text{CH}_3 \)  
\[ \text{hv}, \text{NaOEt, EtOH, } \Delta \]

8) \( \text{NC-OH} \)  
\[ \text{SO}_3, \text{H}_2\text{SO}_4 \]
Synthesize from benzene:

1) (CH₃)₂CHCl, AlCl₃
2) SO₃, H₂SO₄
3) HNO₃, H₂SO₄
4) NaOH, heat
5) H₃O⁺

Propose a mechanism for the following reaction:

1) AlCl₃
2) H₂O
3) H₃O⁺ workup

Propose a mechanism for the following reaction:
A student carried out a nitration of aniline using concentrated nitric and sulfuric acids. With such a highly activated ring, he expected to quickly isolate ortho and para nitroaniline. To his surprise, he isolated meta nitroaniline as the major product and the reaction was quite slow. How do you account for this?

In strong acid, amines are protonated to form ammonium salts. These are strong deactivating substituents.

Chapter 16 practice problems

A common metabolic pathway is the acid catalyzed ring closure of glucose to form the hemiacetal β-D-glucopyranose. Provide a mechanism for this process. Note: Invoking the presence of any strong base will be fatal for the patient digesting the glucose.
Trifluoroacetaldehyde and acetaldehyde both undergo nucleophilic addition reactions with a variety of reagents but one of these aldehydes reacts 100 times more rapidly. Draw both compounds, identify which one is more reactive and explain why. (Fluorine occupies approximately the same amount of space as a proton).

carbonyl is much more electrophilic in TFA due to electron withdrawing CF₃ group. The CH₃ group is electron donating and slows the reaction do
Give the major products of the following reactions.

a) \( \text{pH} = 4.5 \)

b) \( \text{1 equiv. CH}_3\text{OH, H}^+ \)

c) \( \text{H}^+, \text{intramolec.} \)

d) \( 1 \text{C}_6\text{H}_5\text{MgBr, 2) H}_3\text{O}^+ \)

e) \( \text{excess (CH}_3)_2\text{CHOH, H}^+ \)

f) \( 1 \text{n-butyl Li, 2) CH}_3\text{CH}_2\text{I, 3) H}_3\text{O}^+ (\text{HgCl}_2) \)

g) \( \text{1 HOCH}_2\text{CH}_2\text{OH, H}^+, 2) (\text{C}_6\text{H}_5)_3\text{P=CHCH}_3, 3) \text{H}_3\text{O}^+ \)

h) \( \text{H-Al[CH}_2\text{CH}(\text{CH}_3)_2]_2, 2) H_3O^+ \)

i) \( \text{1 CH}_2\text{CH}_2\text{CH}_3\text{NH, H}_3\text{O}^+ \)

j) \( \text{Li}[\text{C}_5\text{H}_4\text{Cu}] \)