JASPERSE CHEM 360 TEST 4 VERSION 3 Ch 19-21 Amines, Carboxylic Acids, Carboxylic Acid Derivatives

- 1. Nomenclature. Provide Either the Name or the Structure for the Following Chemicals. (10 points)
- a. N-ethyl-N-methyl-4-methyl-1-pentanamine
- b. sodium (R)-3-hydroxybutanoate
- c. 4-methylpentanoyl chloride

2. For each nitrogen a-f, identify the hybridization of the <u>nitrogen atom</u>, and identify the hybridization of the <u>nitrogen lone pair</u>. [Adenine is an important player in information transfer (DNA, RNA, genetics, etc.) and energy storage/release (ATP/ADP).]

$$\begin{array}{c} H \underset{\text{o}}{\overset{e}{\underset{\text{o}}{\bigvee}}} MH_2 \\ \text{f} \\ N \underset{\text{c}}{\overset{a}{\underset{\text{o}}{\bigvee}}} M \underset{\text{c}}{\overset{\text{d}}{\underset{\text{d}}{\bigvee}}} \\ H \underset{\text{c}}{\overset{\text{d}}{\underset{\text{d}}{\bigvee}}} M \underset{\text{c}}{\overset{\text{d}}{\underset{\text{d}}{\bigvee}}} \\ \end{array}$$

Nitrogen	Hybridization of	Hybridization of
Atom	the Nitrogen Atom	the Nitrogen Lone Pair
<u>a</u>		
<u>b</u>		
<u>c</u>		
<u>d</u>		
<u>e</u>		
C		
$\underline{\mathbf{f}}$		

- 3. Synthesis Reactions. Draw the feature product of the following reactions (need not show any byproducts). (15 points)
- a. Ph \longrightarrow Br $\xrightarrow{\text{1. Mg}}$ 2. CO₂ 3. H⁺
- h Ph NMe₂ 1. NaOH 2. SOCl₂ 3. PhCH₂OH
- c. $\frac{1. \text{ LiAlH}_4}{2. \text{ H}_3\text{O}^+}$
- d. OH $\frac{1. \text{ SOCl}_2}{2. \text{ Me}_2\text{NH (excess)}}$ $3. \text{ LiAlH}_4; \text{H}_2\text{O}$
- e. $\frac{\text{MeNH}_2, \text{ cat. } \text{H}^+}{\text{NaBH}_3\text{CN}}$
- PhOCH₃ $\frac{1. \text{ NaOH, H}_2\text{O}}{2. \text{ H}^+}$

4. Synthesis Reactions. Draw the feature product of the following reactions (need not show any byproducts). (15 points)

b. 1. HNO₃, H₂SO₄
2. Br₂, FeBr₃
3. Fe, HCl
4. NaNO₂, HCl
5. CuCN

Not responsible

$$\begin{array}{c|c} \bullet & \hline & 1. \ SOCl_2 \\ \hline c. \ Ph & \hline & 2. \ CH_3CO_2H \end{array}$$

d. OH
$$\frac{1. \text{ SOCl}_2}{2. \text{ MeOH}}$$

e.
$$\begin{array}{c}
1. \text{ KMnO}_4 \\
\hline
2. \text{ excess MeLi} \\
3. \text{ H}_3\text{O}^+
\end{array}$$

5. Draw the mechanisms for the following reactions. (5 points)

6. Provide Reagents for the following Transformations (15 points)

- 7. Which, when dissolved in diethyl ether, will: (5 points each)
- a) Extract into NaOH/H₂O?
- b) Extract into HCl/H₂O?
- c) Extract into water?

$$A$$
 Me_2N
 B
 C
 D

8. Hydrolysis Reactions. Draw the starting materials for the following hydrolysis reactions. (6 points)

a.
$$\frac{1. \text{ NaOH, H}_2\text{O}}{2. \text{ HCl}} \xrightarrow{\text{CO}_2\text{H} + \text{HO}} \text{Ph}$$
b.
$$\frac{1. \text{ NaOH, H}_2\text{O}}{2. \text{ HCl}} \text{ Ph} \xrightarrow{\text{CO}_2\text{H} + \text{HO}} \text{CO}_2\text{H} + \text{HO}} \text{Ph}$$

9. Rank the following according to their reactivity toward NaOH/H₂O hydrolysis.

Given the structures **A-D** above, which of the following reactions will proceed spontaneously? (2 points)

$$\mathbf{A} + \mathrm{H_2NCH_3} \rightarrow \mathbf{B}$$

$$\mathbf{A} + \text{HOCH}_3 \rightarrow \mathbf{C}$$

$$\mathbf{A} + \mathrm{HCl} \rightarrow \mathbf{D}$$

- 10. Rank the acidity of the following, 1 being most acidic, 3 being least (3 points each)
- a. acetic acid vs. water vs. NH₄+Cl⁻
- b. CH₃OH vs. CH₃NH₂ vs. F₂CHOH
- c. p-methoxybenzoic acid vs. benzoic acid vs. acetone

- 11. Rank the basicity of the following, 1 being most basic, 3 being least (3 points each)
- a. CH_3OH vs. $PhNH_2$ vs. CH_3NH_2

b.
$$V_{S}$$
. V_{S} . V_{S} . V_{S} .

c.
$$(CH_3CH_2)_3N$$
 H_2O