

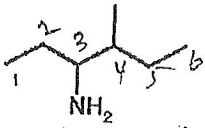
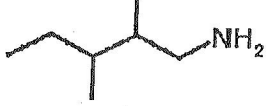
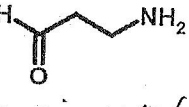
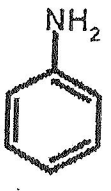
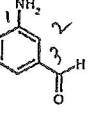
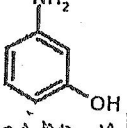
HOMEWORK #7

CHEM 121, section 1,
Chapter. 17. Amines and Amides
Homework# 7 Due

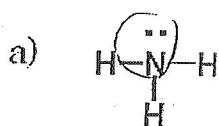
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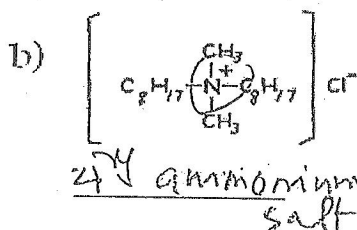
- 1) (3 pts) Identify the amines and amides from the following and give their common and/or IUPAC names.

a) $\text{CH}_3\text{CH}_2\text{CH}_2-\text{NH}_2$ Type: <u>primary (amine)</u> Name: <u>propylamine</u> IUPAC: <u>propanamine</u>	b) $\begin{array}{c} \text{CH}_3-\text{N}-\text{CH}_3 \\ \\ \text{CH}_3 \end{array}$ Type: <u>tertiary (amine)</u> Name: <u>N,N-dimethyl ethanamine</u>	c) $\begin{array}{c} \text{CH}_3\text{CH}_2-\text{N}-\text{CH}_2\text{CH}_3 \\ \\ \text{CH}_3 \end{array}$ Type: <u>tertiary amine</u> Name: <u>N,N-diethylmethanamine</u>
d)  Type: <u>primary (amine)</u> Name: <u>4-methyl-3-aminohexane</u>	e)  Type: <u>primary (amine)</u> Name: <u>2,3-dimethylpentan-1-amine</u>	f)  Type: <u>primary (amino aldehyde)</u> Name: <u>3-aminopropanal</u>
g) $\text{H}_2\text{N}-\text{CH}_2-\text{CH}_2-\text{NH}_2$ Type: <u>primary (diamine)</u> Name: <u>1,2-ethanediamine</u>	h) $\begin{array}{c} \text{CH}_3 \\ \\ \text{H}-\text{N}^+-\text{H} \quad :\ddot{\text{Cl}}:^- \\ \\ \text{CH}_3 \end{array}$ Type: <u>quaternary ammonium salt</u> Name: <u>N,N-dimethyl ammonium chloride</u>	i) $\text{CH}_3-\text{CH}_2-\text{C}(=\text{O})\text{NH}_2$ Type: <u>amide (primary)</u> Name: <u>propanamide</u>
j) $\text{CH}_3-\text{CH}_2-\text{C}(=\text{O})\text{NHCH}_2\text{CH}_3$ Type: <u>N-alkyl amide</u> Name: <u>N-ethylpropanamide</u>	k) $\text{CH}_3\text{C}(=\text{O})\text{N}(\text{CH}_3)_2$ Type: <u>N,N-dialkyl amide</u> Name: <u>N,N-dimethylethanamide</u>	l)  Type: <u>aromatic amine</u> Name: <u>aniline</u>
m)  Type: <u>aromatic heterocycle</u> Name: <u>pyridine</u>	n)  Type: <u>aromatic amino aldehyde</u> Name: <u>3-aminobenzaldehyde</u>	o)  Type: <u>amino phenol</u> Name: <u>3-aminophenol</u>

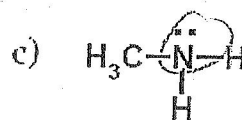
2) (3 pt) Classify each of the following as either 1', 2', or 3' amines and quaternary amine :



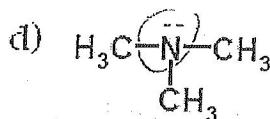
ammonia



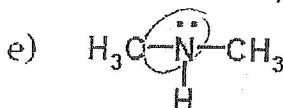
quaternary ammonium salt



1st amine

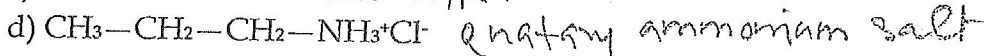
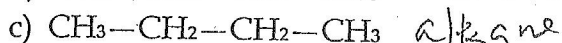
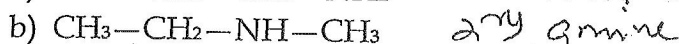


3rd amine



2nd amine

3) (3 pts) Consider the following compounds:



A. Arrange compounds in the order highest boiling point to lowest?

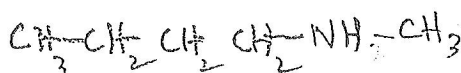
d > a > b > c

B. Arrange compounds in the order of highest solubility in water to the lowest?

d > a > b > c

4) (3 pts) Draw the structure of the following amines and amides:

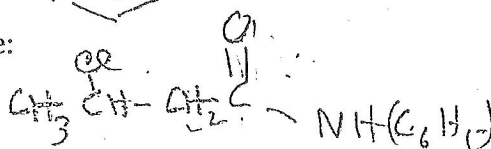
a. N-methyl-1-butanamine:



b. N-methylaniline:

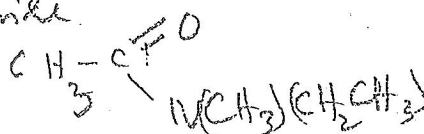


c. N-phenyl-3-chlorobutanamide:

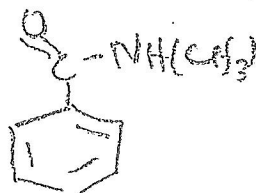


d. N-ethyl-N-methylethanamide

N,N-ethylmethyl ethanamide



e. N-methylbenzamide



5) (8 pt) Name and complete the following preparations/reactions of amines amides:

a)	$(3) \text{CH}_3\text{CH}_2\text{Cl} + \text{NH}_3 \longrightarrow (\text{CH}_3\text{CH}_2)_3\text{N} + 3\text{HCl}$
b)	$\text{H}_3\text{C}-\ddot{\text{N}}(\text{CH}_3)-\text{H} + \text{H}-\text{O}-\text{H} \longrightarrow \left[\text{CH}_3-\overset{\text{H}}{\underset{\text{CH}_3}{\text{N}}}-\text{H} \right]^+ + \text{OH}^-$
c)	$\text{H}_3\text{C}-\overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{N}}} + \text{H}-\text{Cl} \longrightarrow \left[\text{CH}_3-\overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{N}}}-\text{H} \right]^+ + \text{Cl}^-$
d)	$\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH} + \text{HN}(\text{CH}_3)_2 \xrightarrow{\text{heat}} \text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{N}(\text{CH}_3)_2 + \text{H}_2\text{O}$
e)	$\text{C}_6\text{H}_6 \xrightarrow[\text{H}_2\text{SO}_4]{\text{HNO}_3} \text{C}_6\text{H}_5\text{NO}_2 \xrightarrow{\text{H}_2/\text{catalyst}} \text{C}_6\text{H}_5\text{NH}_2$
f)	$\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2 + \text{HCl} \xrightarrow{\text{H}_2\text{O}} \text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH} + \text{NH}_4^+ \text{Cl}^-$ acid hydrolysis of amide
g)	$\text{NH}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NH}_4^+ + \text{OH}^-$
h)	$\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2 + \text{HCl} \xrightarrow{\text{H}_2\text{O}} \text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_3^+ + \text{Cl}^-$
i)	$\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2 + \text{NaOH} \xrightarrow{\text{H}_2\text{O}} \text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{ONa} + \text{NH}_3$ base hydrolysis of an amide
j)	$\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{N}(\text{R})_2 \xrightarrow[2) \text{H}_3\text{O}^+]{1) \text{LiAlH}_4} \text{R}-\text{CH}_2-\text{N}(\text{R})_2 + \text{H}_2\text{O}$ Reduction of ketone
k)	$\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}-\text{C}_6\text{H}_5 + \text{NaOH} \xrightarrow[\text{heat}]{\text{H}_2\text{O}} \text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{ONa} + \text{NH}_2-\text{C}_6\text{H}_5$ base hydrolysis of an amide
l)	$\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3 + \text{NH}_3 \longrightarrow \text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2 + \text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$ amide formation
m)	$\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{NH}_2 \xrightarrow{\text{heat}} \text{CH}_3-\text{CH}_2-\text{CH}_2-\text{NH}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{NH}_2 + \text{H}_2\text{O}$ intramolecular lactam formation (A β -lactam).
n)	$\text{H}_2\text{N}-(\text{CH}_2)_6-\text{NH}_2 + \text{HO}-\text{C}(=\text{O})-(\text{CH}_2)_4-\text{C}(=\text{O})-\text{OH} \longrightarrow \left[\text{N}-(\text{CH}_2)_6-\text{N}-\text{C}(=\text{O})-(\text{CH}_2)_4-\text{C}(=\text{O}) \right]_n + \text{H}_2\text{O}$ condensation polymerization nylon diamine + dicarboxylic acid