

**VIII.J AMINES**

Amines present two additional nomenclature problems, the first of which is due to the fact that nitrogen is trivalent. An amine may have one alkyl chain ( $\text{RNH}_2$ , primary), two alkyl chains ( $\text{RR}^1\text{NH}$  secondary) or three alkyl chains ( $\text{RNR}^1\text{R}^2$ , tertiary) bonded to nitrogen. The question is how to distinguish between substituents on nitrogen and substituents on a carbon chain. This problem is overcome by using the prefix – for each substituent bonded to nitrogen.

The second problem is that there are three common systems used to name amines. In this section, we shall, use the best of the systems, which is summarized in the text box below. The family ending for amines is amine, and the prefix is amino. Amines are of lower priority than alcohols. The alternative systems are to name amines as alkyl amines, or amino alkanes.

**Guidelines for Naming Amines**

1. **The family ending for all amines is amine.**
2. **Primary amines are simply named as the appropriate alkyl amine.**
3. **Secondary amines,  $\text{RR}^1\text{NH}$  are named as follows:**
  - a. **The longest alkyl chain is used to designate the family ending.**
  - b. **The other alkyl group is named the N-alkyl substituent.** The 'N' indicates that a substituent bonded to nitrogen. When it is necessary to define carbon branches on the N-substituent, the carbon bonded to the nitrogen is C-1.
  - c. **The final name usually will be in the form N-alkylalkanamine.**
4. **Tertiary amines,  $\text{RR}^1\text{R}^2\text{N}$  are named similarly. The two alkyl substituent are designated N-alkyl substituents, and are listed in alphabetical order.** The name usually is in the form N-alkyl-N-alkylalkanamine.
5. **Carbon chains bearing an alkene are termed alkenamines.**
6. **Carbon chains bearing an alkyne are termed alkynamines.**

**VIII.J.1 Primary Amines ( $\text{RNH}_2$ )**

Primary amines ( $\text{RNH}_2$ ) can be considered as the 'parent' amines. They are simply named as alkanamines (or alkenamines or alkynamines depending on the nature of the hydrocarbon chain).

**Examples**

1. Give the IUPAC name for  $\text{CH}_3\text{CH}_2\text{NH}_2$

**OBSERVATIONS**

This trivial problem does not need a template



Parent Functional Group(s) : Primary amine  $\Rightarrow$  -anamine

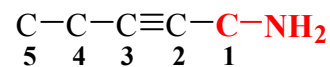
Chain attached to  $\text{NH}_2$ :  $\text{CH}_3\text{CH}_2-$   $\Rightarrow$  ethyl

**SOLUTION** Compound is ethanamine

2. Give the IUPAC name for  $\text{CH}_3\text{CH}_2\text{C}\equiv\text{CCH}_2\text{NH}_2$

**OBSERVATIONS**

Redraw the structure  $\text{CH}_3\text{CH}_2\text{C}\equiv\text{CCH}_2\text{NH}_2 \Rightarrow$



Fill out the text box

	OBSERVATION	IMPLICATION
Parent Group and Site	(Primary) amine at C-1	amine
Longest Carbon Chain/Ring	5 carbons	pent
# C=C or C≡C bonds and Site	1 C≡C at C-2	2-pentyn
Final Word		2-pentynamine
Substituents and Sites	None	
Alphabetizing substituents		

**SOLUTION:** Compound is: 2-pentynamine

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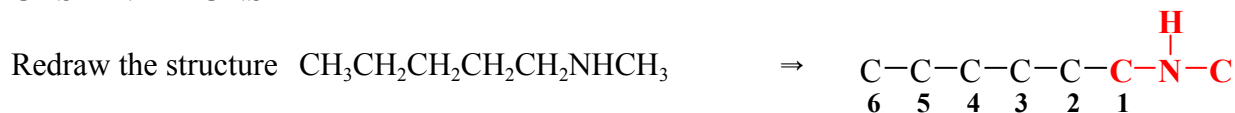
**VIII.J.2 Secondary Amines (RR'NH)**

Secondary amines are considered N-substituted primary amines. The shorter chain is the N-substituent.

**Examples**

1. Give the IUPAC name for  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{NHCH}_3$

**OBSERVATIONS**



Fill out the text box

	OBSERVATION	IMPLICATION
Parent Group and Site	(Secondary) amine at C-1	amine
Longest Carbon Chain/Ring	6 carbons	hex
# C=C or C≡C bonds and Site	None	hexan
Final Word		hexanamine
Substituents and Sites	CH <sub>3</sub> attached to N	N-methyl
Alphabetizing substituents		N-methyl

**SOLUTION:** Compound is: N-methylhexanamine

**VIII.J.3 Tertiary Amines (RR<sup>1</sup>R<sup>2</sup>N)**

Tertiary amines are treated as N-substituted primary amines also. The two shorter alkyl chains are designated N-substituents, and are placed in alphabetical order. If these two substituents are identical they are named as N,N-di....

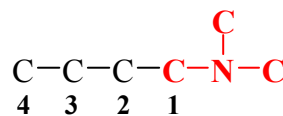
**Examples**

1. Give the IUPAC name for  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{N}(\text{CH}_3)_2$

**OBSERVATIONS**

Redraw the structure  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{N}(\text{CH}_3)_2$

⇒



Fill out the text box

	<b>OBSERVATION</b>	<b>IMPLICATION</b>
Parent Group and Site	(Tertiary) amine at C-1	amine
Longest Carbon Chain/Ring	4 carbons	but
# C=C or C≡C bonds and Site	None	butan
Final Word		butanamine
Substituents and Sites	2 CH <sub>3</sub> 's attached to N	N,N-dimethyl
Alphabetizing substituents		N,N-dimethyl

**SOLUTION:** Compound is: N,N-dimethylbutanamine