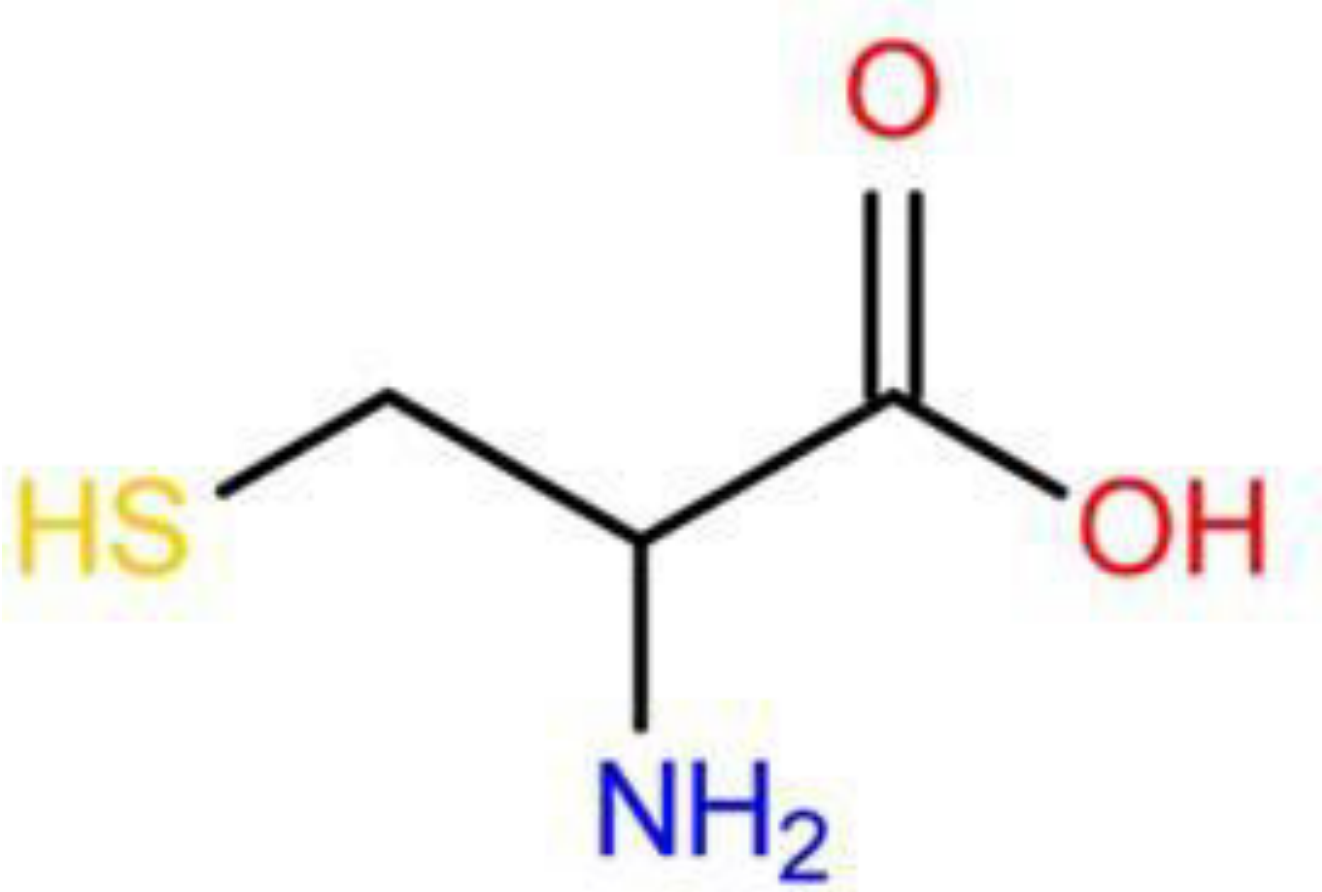
CARBOXYLIC ACIDS, AMINES, THIOLS



Cysteine amino acid

CARBOXYLIC ACIDS

CARBOXYLIC ACIDS

IUPAC naming system

A carboxylic acid contains a –COOH functional group (carboxyl). This group must be included in the main C-chain that is named as carbon #1.

CARBOXYLIC ACIDS

The "e" of –ane, –ene and –yne endings is replaced with –oic acid.

$HCOOH$	methanoic acid
CH_3COOH	ethanoic acid
CH_3CH_2COOH	propanoic acid

CARBOXYLIC ACIDS

Common naming system

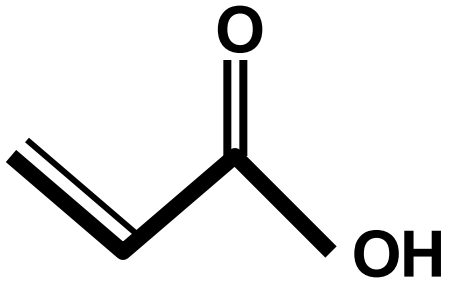
The prefix used with aldehydes may also be used with carboxylic acids. In this case an –ic acid is the suffix.

HCOOH	formic acid
CH_3COOH	acetic acid
CH_3CH_2COOH	proprionic acid

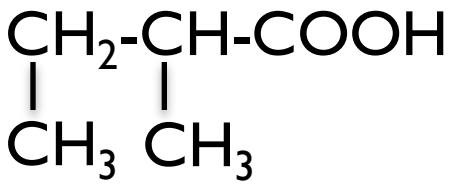
CARBOXYLIC ACIDS

Example #1

a) What is the structural formula for propenoic acid?



b) What is the IUPAC name for the following acid?



2-methylbutanoic acid

CARBOXYLIC ACIDS

Properties of Carboxylic Acids

Carboxylic acids have higher boiling points than their corresponding hydrocarbon.

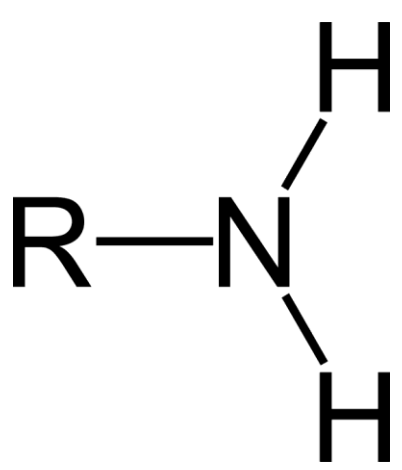
Carboxylic acids have similar solubility properties as their corresponding alcohol.

All carboxylic acids have acidic properties.

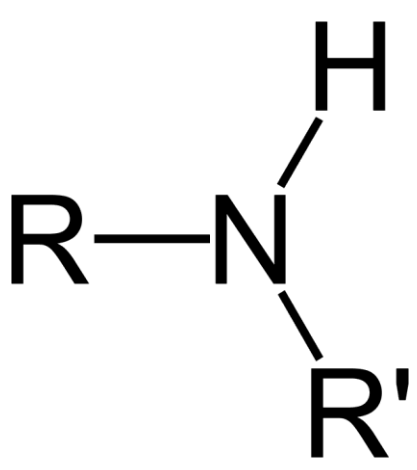
AMINES

AMINES

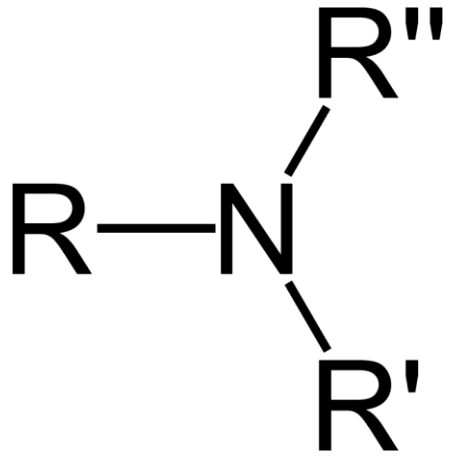
All amines are essentially derived from NH_3. Depending on the number of carbon side-chains off of the N, we can form different types of amines.



primary amine



secondary amine



tertiary amine

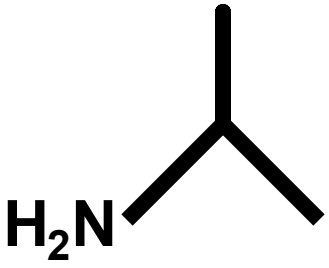
AMINES

IUPAC naming system

This system adds the suffix "amine" to the end of the name.

butan-1-amine

propan-2-amine

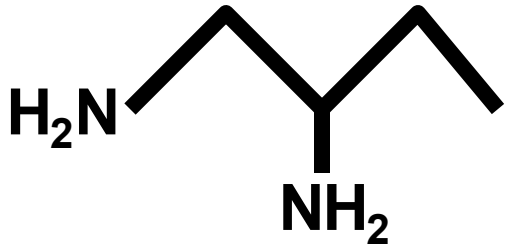


AMINES

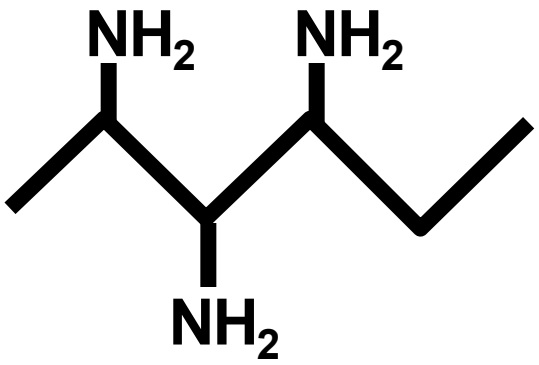
IUPAC naming system

When there is more than one amine group present, keep the "e" ending of the C-chain root.

butane-1,2-diamine



hexane-2,3,4-triamine



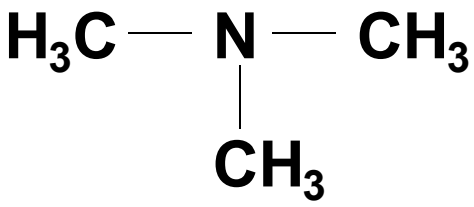
AMINES

IUPAC naming system

If there are carbon side-chains off of the N-group, it is denoted by an "*N*-" prefix.

N-methylbutan-1-amine

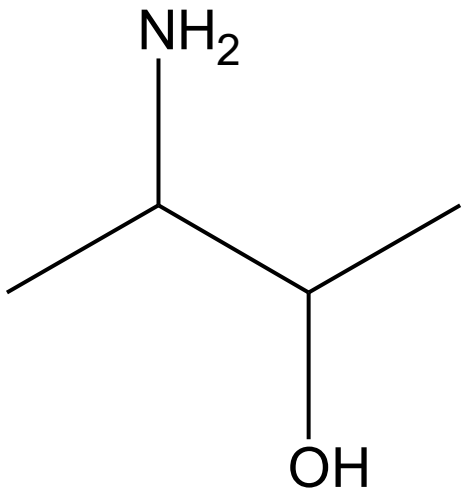
N,N-dimethylmethananime

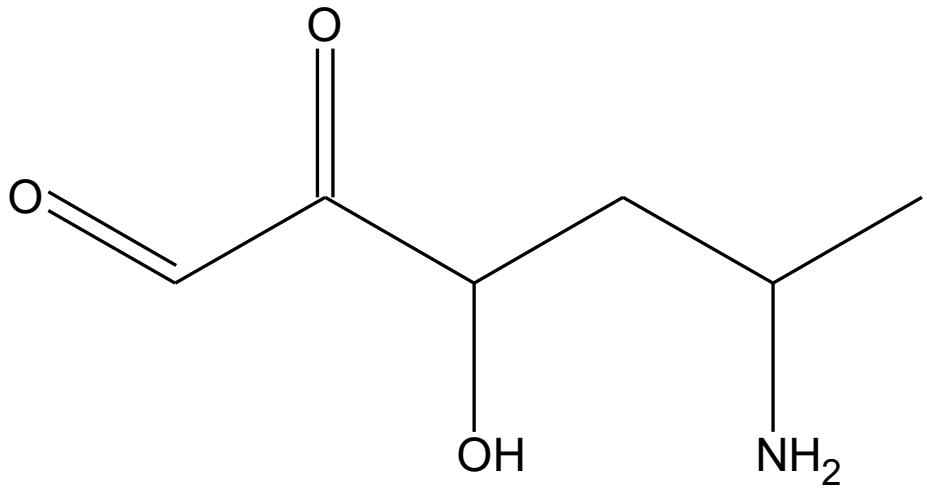


AMINES

IUPAC naming system

The N-group is treated as a side-chain and is added as a prefix on the C-chain root if a group with a higher priority is present.





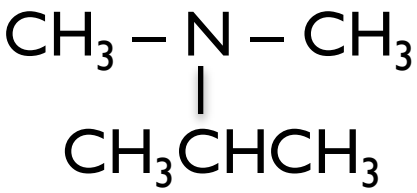
3-aminobutan-2-ol

5-amino-3-hydroxy-2-oxohexanal

AMINES

Example #2

Write the IUPAC name for the following molecule.

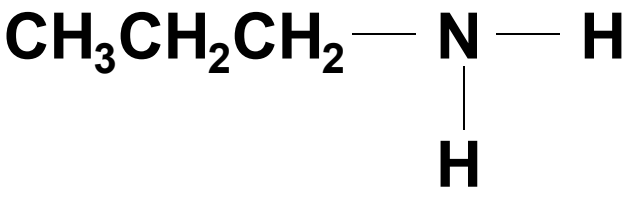


N,N-dimethylpropan-2-amine

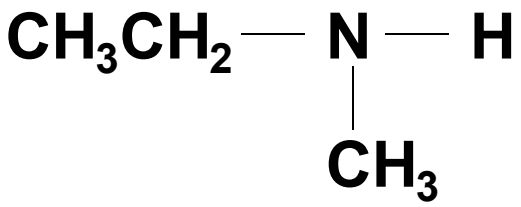
AMINES

Example #3

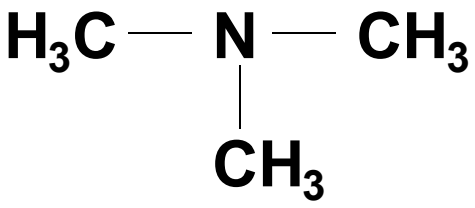
Draw a 1°, 2° and 3° amine which each contain a total of three carbons.



primary



secondary



tertiary

AMINES

Properties of Amines

Amines have [ ] boiling points than their hydrocarbon counterparts.

[ ] amines are more soluble in water than [ ] amines.

For mp and bp of amines of the same size,

$3° < 2° < 1°$

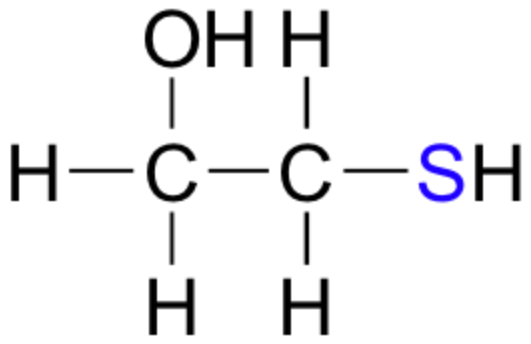
In general, amines are basic in nature.

THIOLS

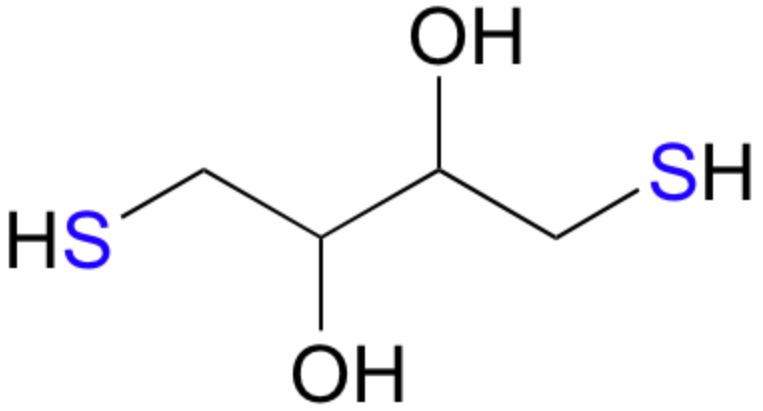
THIOLS

Properties of thiols

- Contains the sulfhydryl group (-SH)
- Strong odours



β-mercaptoethanol
(BME)



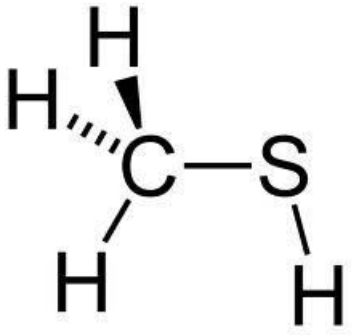
dithiothreitol
(DTT)

THIOLS

IUPAC naming system

Suffix 'thiol' is added to the end of the hydrocarbon group (analogous to alcohols)

Example:



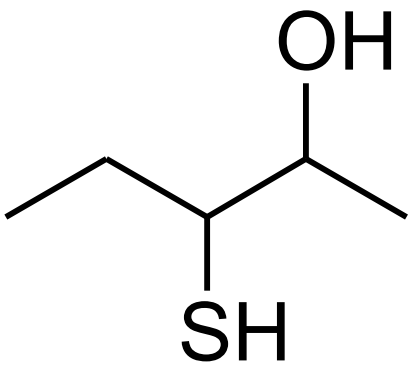
methanethiol

THIOLS

IUPAC naming system

When a group of higher priority exists on the same molecule, the prefix 'sulfanyl' is added to the end of the hydrocarbon group

Example:



3-sulfanylpentan-2-ol