

CH1010

Tutorial 3 Answers

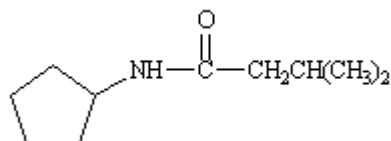
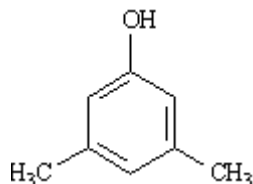
1. Provide **IUPAC names** for the following compounds:



pentanedial

ANS:

3,5-dimethylphenol

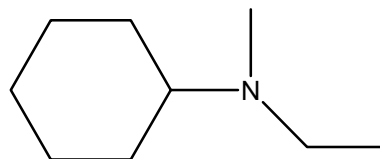


ANS:

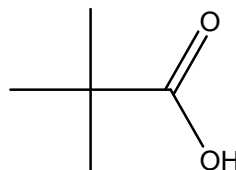
N-cyclopentyl-3-methylbutanamide

2. Draw **line-angle structures** corresponding to the following IUPAC names:

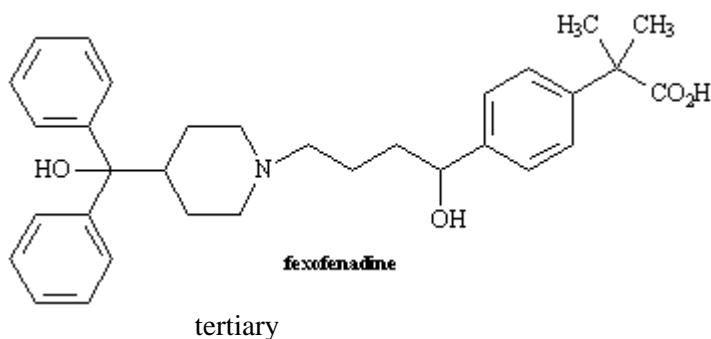
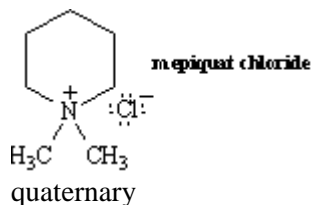
- *N*-ethyl-*N*-methylcyclohexylamine



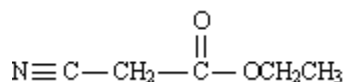
- 2,2-dimethyl-propanoic acid



3. **Classify** each of the following **nitrogen atoms** in the following compounds as primary, secondary, tertiary, or quaternary.



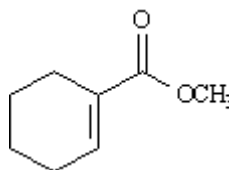
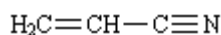
4. At what approximate positions might this compound show **infrared** absorptions?



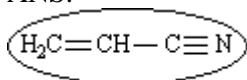
ANS:

This compound should show a medium absorption at $2210\text{--}2260\text{ cm}^{-1}$ for the nitrile, a strong absorption at about 1735 cm^{-1} for the ester carbonyl. There would also be a strong absorption at about 1100 cm^{-1} for the C-O bond of the ester in the fingerprint region.

5. Circle any **conjugated portions** in the molecules below.



ANS:



ANS: not conjugated

6. An impure organic liquid was obtained from the wood of the sandalwood tree *Santalum austrocaledonian* using standard laboratory techniques.

- How could **purification** of the liquid be carried out?

A minor component of the organic liquid was obtained in a pure form and gave the following microanalytical results:

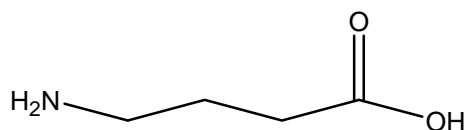
C: 46.59 % H: 8.80 % N: 13.58 %

Infrared spectroscopy of a sample of the liquid gave several strong bands at 3390, 2900 and 1705 cm^{-1} . In a mass spectrum of the compound a molecular ion was obtained at m/z 103.

- Determine the **empirical** and **molecular formulae** for this compound.
- Draw a **line-angle structure** for a possible molecule that obeys this molecular formula, and indicate how this could be verified using **infrared spectroscopy**.

The compound would be purified by fractional distillation and the purity verified by boiling point, TLC or further microanalysis.

$\text{NH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}$ 4-aminobutanoic acid



Working:

$$100\% - (46.59 + 8.80 + 13.58) = 31.03\% = \% \text{O}$$

$$46.59/12.01 = 3.879 \quad 8.80/1.008 = 8.73 \quad 31.03/16.00 = 1.939 \quad 13.58/14.01 = 0.969$$

/0.969

4

9

2

1

C4

H9

O2

N1

m/z

4×12

+

9×1

+

2×16

+

14

=

103

empirical + molecular formulae $\text{C}_4\text{H}_9\text{O}_2\text{N}$

IR Bands: NH 3390, OH(COOH) 2900, CO(COOH) 1705, CH 2900