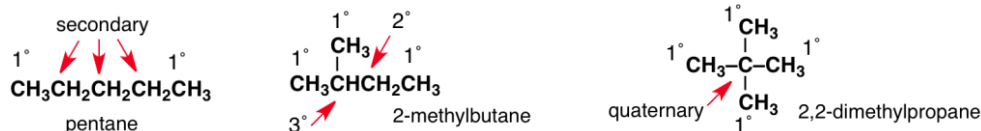


Solutions to Exercises, Chapter 3

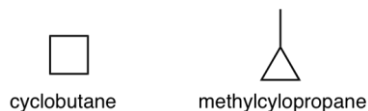
- 3.1** (a) Two hydroxy groups (OH) and a carbonyl group (C=O)
 (b) A hydroxy (OH), an amino (NH₂), and a carboxy group (COOH)
 (c) Two double bonds (C=C) and a carbonyl group (C=O)
 (d) A hydroxy (OH), an amino (RNH), an alkoxy (-O-), and an amide (aminocarbonyl) group (CONH₂)



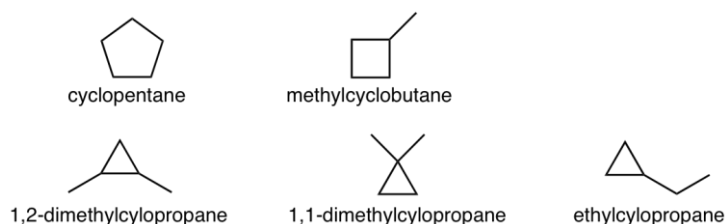
3.3



- 3.4** The general formula for cycloalkanes and acyclic alkenes is C_nH_{2n}.

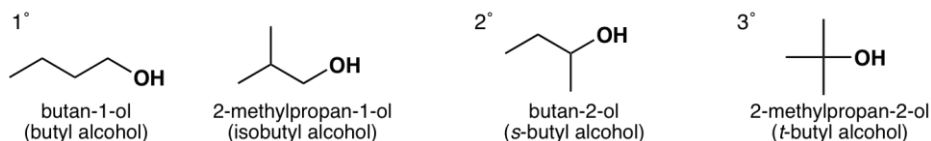


3.5



(1,2-Dimethylcyclopropane has *cis* and *trans* isomers.)

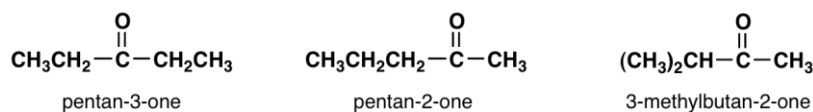
3.6



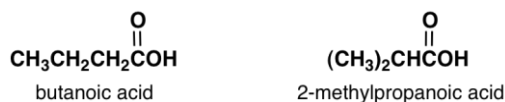
3.7

$(\text{CH}_3\text{CH}_2)_2\text{NH}$	$\text{CH}_3\text{CH}_2\text{CH}_2\text{NHCH}_3$	$(\text{CH}_3)_2\text{CHNHCH}_3$
diethylamine	<i>N</i> -methylpropylamine	<i>N</i> -methylisopropylamine
<i>N</i> -ethylethanamine	<i>N</i> -methylpropan-1-amine	<i>N</i> -methylpropan-2-amine

3.8

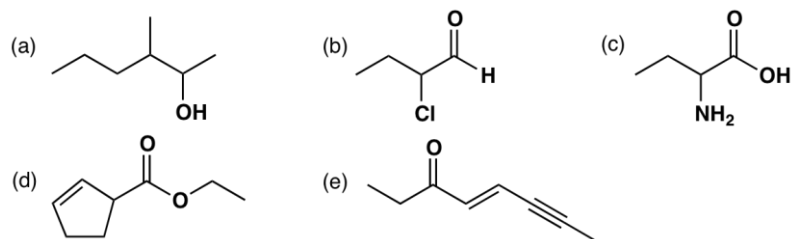


3.9



3.10 Isopropyl: methylethyl, isobutyl: 2-methylpropyl, *s*-butyl: 1-methylpropyl, *t*-butyl: dimethylethyl, neopenyl: 2,2-dimethylpropyl, benzyl: phenylmethyl

3.11

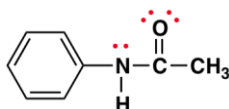


3.12 (a) 1,4-dichlorobenzene (*p*-dichlorobenzene) (b) 3-nitroaniline (*m*-nitroaniline)
(c) 1,2,4,5-tetramethylbenzene (d) 2,4,6-tribromophenol

3.13 Butanal is a polar compound and molecules have an appreciable dipole moment so there are dipole-dipole interactions. These dipole-dipole interactions, however, are smaller than the hydrogen-bonding interactions of butan-1-ol, but

larger than the dispersion forces of pentane.

- 3.14** The O and N atoms of the amide group have lone pairs which are hydrogen-bond acceptors and the H on the N atom is a hydrogen-bond donor. These features contribute to the solubility in water. The benzene ring is quite a large nonpolar group and contributes adversely to the solubility in water.



- 3.15** Propanone is a polar molecule with a carbonyl group which is a good hydrogen-bond acceptor due to the lone pairs on the O. Intermolecular interactions between propanone and water are greater than those between propanone molecules themselves.
- 3.16** Formamide is strongly polar, its dielectric constant (111) being larger than that of water (80); it is also a hydrogen-bond donor and has lone pairs of electrons.