**Chapter 9 Homework Key**

3, 17, 20, 24, 26, 35, 41, 47, 51, 52

3. Isomers are two or more compounds with the same formula but a different arrangement of atoms and have different properties. Geometric isomers have a different 3D shape but have the same atom connections, like cis-butene and trans-butene. Constitutional isomers are molecules with the same molecular formula but different atom connectivity order, like butane and 2-methylpropane.

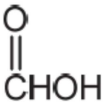
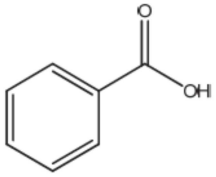
17. (a) 6 (b) 9 (c) 5 (d) 5

20. Subtract 2 hydrogens from the general formula for each ring or pi bond. An alkyne has 2 pi bonds. #H = 8 (general formula for 5C = 12–2–2 = 8)

24. (a) butane - $CH_3CH_2CH_2CH_3$ (b) isobutene $CH_3CHCH_3$ with $CH_3$ below

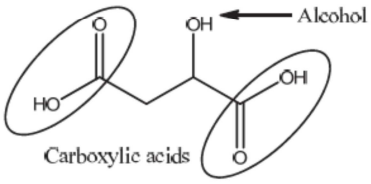
25. (a) methyl (b) *sec*-butyl

26. (a) isopropyl (b) *tert*-butyl

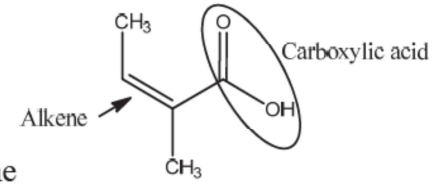
35. (a) propanoic acid
(b) pentanoic acid
(c) CHOOH or 
(d) 

41. (a) same
(b) same
(c) isomer (they are 2-methylpentane and 3-methylpentane)

47. Two carboxylic acids circled, and an alcohol



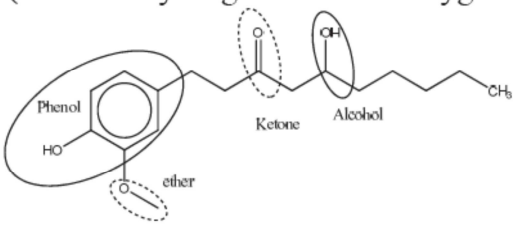

48. Carboxylic acid, circled, and an alkene



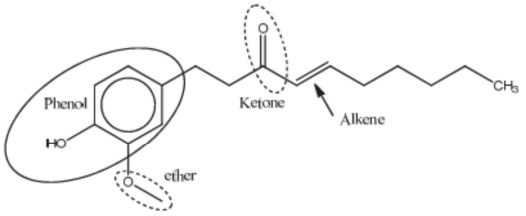
51. (a) $C_{17}H_{26}O_4$

(b) $C_{17}H_{24}O_3$ (loss of 2 hydrogens and one oxygen = loss of water)

(c) Gingerol:



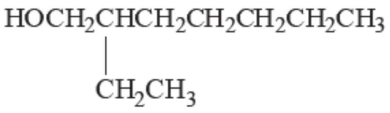

(d) Shogaol:



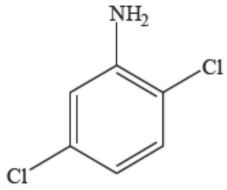

(e) dehydration (loss of water)

52. (a) $C_6H_{12}$ - cyclohexane or

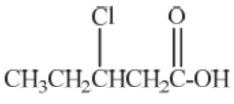
(b) $C_9H_{20}O$




(c) $C_6H_5Cl_2N$




(d) $C_5H_9ClO_2$




(e) $C_8H_9O_2N$