

Chapter 16

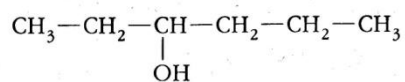
Answers to Questions

1.

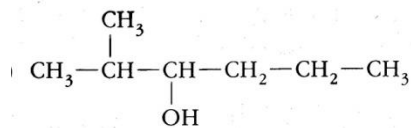
- (a) The carbon chain contains four carbon atoms with all single carbon-carbon bonds, thus the main name is butan-. The ending for an -OH group is -ol and the functional group is located on the second carbon in the chain. Thus the name is 2-butanol.
- (b) The carbon chain contains three carbon atoms with all single carbon-carbon bonds, thus the main name is propan-. The ending for an -OH group is -ol and the functional group is located on the first carbon in the chain (counting from the right). This gives a partial name of 1-propanol. There is a methyl group on carbon atom 2 (from the right). Thus the name is 2-methyl-1-propanol.
- (c) The carbon chain contains three carbon atoms with all single carbon-carbon bonds, thus the main name is propan-. The ending for an -OH group is -ol and the functional group is located on the second carbon in the chain. This gives a partial name of 2-propanol. There is a methyl group on carbon atom 2. Thus the name is 2-methyl-2-propanol.

2.

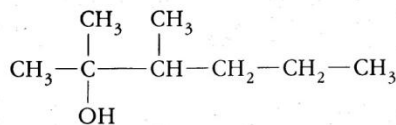
- (a) There is a six-carbon atom chain and the alcohol, -ol, function is on the third carbon atom. The formula is:



- (b) There is a six-carbon atom chain and the alcohol, -ol, function is on the third carbon atom. In addition, there is a CH₃- group on carbon atom 2. The formula is:

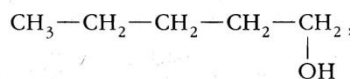


- (c) There is a six-carbon atom chain and the alcohol, *-ol*, function is on the second carbon atom. In addition, there are two CH_3 - groups, one on carbon atom 2, and the other on carbon 3. The formula is:

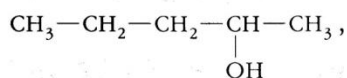


3. In each case, the $-\text{OH}$ group is shown below the carbon chain to make the pattern more apparent. If you constructed additional structures, you will see that they are, in fact, one of those shown below.

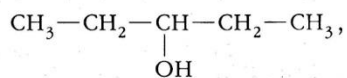
- (a) The first possibility is a five-carbon atom chain with the alcohol, *-ol*, function on the first carbon atom. The formula is:



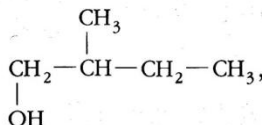
- (b) The second possibility is a five-carbon atom chain with the alcohol, *-ol*, function on the second carbon atom. The formula is:



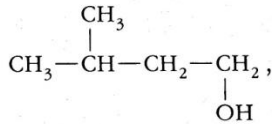
- (c) The third possibility is a five-carbon atom chain with the alcohol, *-ol*, function on the first carbon atom. The formula is:



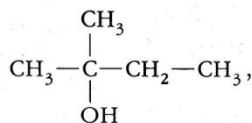
- (d) The fourth possibility is a four-carbon atom chain with the alcohol, *-ol*, function on the first carbon atom and the CH_3 - group on the second carbon atom. The formula is:



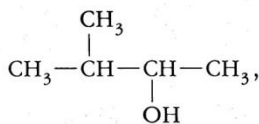
- (e) The fifth possibility is a four-carbon atom chain with the alcohol, *-ol*, function on the first carbon atom (from the right) and the CH_3 - group on the third carbon atom. The formula is:



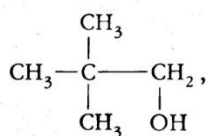
- (f) The sixth possibility is a four-carbon atom chain with the alcohol, *-ol*, function on the second carbon atom and the CH_3 - group also on the second carbon atom. The formula is:



- (g) The seventh possibility is a four-carbon atom chain with the alcohol, *-ol*, function on the second carbon atom and the CH_3 - group on the third carbon atom. The formula is:



- (h) The eighth possibility is a three-carbon atom chain with the alcohol, *-ol*, function on the first carbon atom and the two CH_3 - groups on the second carbon atom. The formula is:



4.

- (a) The carbon chain contains five carbon atoms with all single carbon-carbon bonds, thus the main name is pentan-. The ending for an $-\text{OH}$ group is *-ol* and the functional group is located on the first carbon atom in the chain. Thus the name is 1-pentanol.
- (b) The carbon chain contains five carbon atoms with all single carbon-carbon bonds, thus the main name is propan-. The ending for an $-\text{OH}$ group is *-ol* and the

functional group is located on the second carbon atom in the chain (counting from the right). Thus the name is 2-pentanol.

- (c) The carbon chain contains five carbon atoms with all single carbon-carbon bonds, thus the main name is propan-. The ending for an -OH group is *-ol* and the functional group is located on the third carbon atom in the chain (counting from either direction). Thus the name is 3-pentanol.
- (d) The carbon chain contains four carbon atoms with all single carbon-carbon bonds, thus the main name is butan-. The ending for an -OH group is *-ol* and the functional group is located on the first carbon atom in the chain (counting from the right). This gives a partial name of 1-butanol. There is a methyl group on carbon atom 2. Thus the name is 2-methyl-1-butanol.
- (e) The carbon chain contains four carbon atoms with all single carbon-carbon bonds, thus the main name is butan-. The ending for an -OH group is *-ol* and the functional group is located on the first carbon atom in the chain (counting from the right). This gives a partial name of 1-butanol. There is a methyl group on carbon atom 3. Thus the name is 3-methyl-1-butanol.
- (f) The carbon chain contains four carbon atoms with all single carbon-carbon bonds, thus the main name is butan-. The ending for an -OH group is *-ol* and the functional group is located on the second carbon atom in the chain. This gives a partial name of 2-butanol. There is a methyl group also on carbon atom 2. Thus the name is 2-methyl-2-butanol.
- (g) The carbon chain contains four carbon atoms with all single carbon-carbon bonds, thus the main name is butan-. The ending for an -OH group is *-ol* and the functional group is located on the second atom carbon in the chain (counting from the right). This gives a partial name of 2-butanol. There is a methyl group on carbon atom 3. Thus the name is 3-methyl-2-butanol.
- (h) The carbon chain contains three carbon atoms with all single carbon-carbon bonds, thus the main name is propan-. The ending for an -OH group is *-ol* and the functional group is located on the first carbon atom in the chain (counting from the right). This gives a partial name of 1-propanol. There are two methyl groups on carbon atom 2 (from the right). Thus the name is 2,2-dimethyl-1-propanol.

5. The longer carbon chain contains four carbon atoms with all single carbon-carbon bonds, thus the main name is butan-. The functional group -O- has the name *-oxy-* and there is an ethyl group bonded to the other side of the oxygen atom. The preferred name is ethoxybutane. The traditional name is ethyl butyl ether.
6. The longer carbon chain contains two carbon atoms with all single carbon-carbon bonds, thus the main name is ethan-. The functional group -O- has the name *-oxy-* and there is a methyl group bonded to the other side of the oxygen atom. The preferred name is methoxyethane. The traditional name is methyl ethyl ether.
- 7.
- (a) The carbon chain contains four carbon atoms with all single carbon-carbon bonds, thus the main name is butan-. The ending for a -CHO group is *-al* and the functional group is located on the first carbon atom in the chain (counting from the right). This gives a partial name of 1-butanal, or simply, butanal, as the aldehyde function has to be on the end of the carbon-atom chain. There is a methyl group on carbon atom 3. Thus the name is 3-methylbutanal.
- (b) The carbon chain contains five carbon atoms with all single carbon-carbon bonds, thus the main name is pentan-. The ending for a =O group is *-one* and the functional group is located on the second carbon atom in the chain. This gives a partial name of 2-pentanone. There is a methyl group on carbon atom 3. Thus the name is 3-methyl-2-pentanone.
- 8.
- (a) The carbon chain contains five carbon atoms with all single carbon-carbon bonds, thus the main name is pentan-. The ending for a =O group is *-one* and the functional group is located on the second carbon atom in the chain. This gives a partial name of 2-pentanone. There is a methyl group on carbon atom 4. Thus the name is 4-methyl-2-pentanone.
- (b) The carbon chain contains three carbon atoms with all single carbon-carbon bonds, thus the main name is propan-. The ending for a -CHO group is *-al* and the functional group is located on the first carbon atom in the chain (counting from the right). This gives a partial name of 1-propanal, or simply, propanal, as the aldehyde function has to be on the end of the carbon-atom chain. There are two methyl groups on carbon atom 2. Thus the name is 2,2-dimethylpropanal.

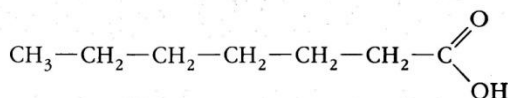
9.

- (a) The carbon chain contains three carbon atoms with all single carbon-carbon bonds, thus the main name is propan-. The ending for a -COOH group is *-oic acid* and the functional group is located on the first carbon atom in the chain (counting from the right). This gives a partial name of 1-propanoic acid, or simply, propanoic acid, as the carboxylic acid function has to be on the end of the carbon-atom chain. Thus the name is propanoic acid.
- (b) The carbon chain contains four carbon atoms with all single carbon-carbon bonds, thus the main name is butan-. The ending for a -COOH group is *-oic acid* and the functional group is located on the first carbon atom in the chain (counting from the right). This gives a partial name of 1-butanoic acid, or simply, butanoic acid, as the carboxylic acid function has to be on the end of the carbon-atom chain. There are two methyl groups, one on carbon atom 2, the other on carbon atom 3. Thus the name is 2,3-dimethylbutanoic acid.

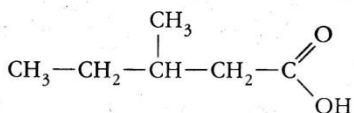
10.

- (a) The carbon chain contains five carbon atoms with all single carbon-carbon bonds, thus the main name is pentan-. The ending for a -COOH group is *-oic acid* and the functional group is located on the first carbon atom in the chain (counting from the right). This gives a partial name of 1-pentanoic acid, or simply, pentanoic acid, as the carboxylic acid function has to be on the end of the carbon-atom chain. Thus the name is pentanoic acid.
- (b) The carbon chain contains three carbon atoms with all single carbon-carbon bonds, thus the main name is propan-. The ending for a -COOH group is *-oic acid* and the functional group is located on the first carbon atom in the chain (counting from the right). This gives a partial name of 1-propanoic acid, or simply, propanoic acid, as the carboxylic acid function has to be on the end of the carbon-atom chain. There are two methyl groups, both on carbon atom 2. Thus the name is 2,2-dimethylpropanoic acid.

11. There is a seven-carbon atom chain and the carboxylic acid, *-oic acid*, function is on the end carbon atom. The formula is:



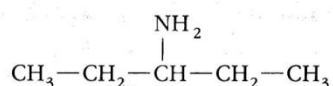
12. There is a five-carbon atom chain and the carboxylic acid, *-oic acid*, function is on the end carbon atom and the CH_3- group is on the third carbon atom (from the right). The formula is:



- 13.
- The stem carbon chain contains one carbon atom, thus the main name is methan-. The ending for a $-\text{COO}-$ group is *-oate*. This gives a partial name of methanoate. The substituent carbon chain contains two carbon atoms and is named ethyl. Thus the name is ethyl methanoate.
 - The stem carbon chain contains two carbon atoms, thus the main name is ethan-. The ending for a $-\text{COO}-$ group is *-oate*. This gives a partial name of ethanoate. The substituent carbon chain contains one carbon atom and is named methyl. Thus the name is methyl ethanoate.
 - The stem carbon chain contains three carbon atoms, thus the main name is propan-. The ending for a $-\text{COO}-$ group is *-oate*. This gives a partial name of propanoate. The substituent carbon chain contains three carbon atoms and is named propyl. Thus the name is propyl propanoate.
- 14.
- The stem carbon chain contains four carbon atoms, thus the main name is butan-. The ending for a $-\text{COO}-$ group is *-oate*. This gives a partial name of butanoate. The substituent carbon chain contains five carbon atoms and is named pentyl. Thus the name is pentyl butanoate.
 - The stem carbon chain contains two carbon atoms, thus the main name is ethan-. The ending for a $-\text{COO}-$ group is *-oate*. This gives a partial name of ethanoate. The substituent carbon chain contains eight carbon atoms and is named octyl. Thus the name is octyl ethanoate.

15. The carbon chain contains three carbon atoms with all single carbon-carbon bonds, thus the main name is propane. The amine, *amino-*, substituent is on the first carbon atom (from the right). Thus the name is 1-aminopropane.

16. There is a five-carbon atom chain and the amine, *amino-*, substituent is on the third carbon atom. The formula is:

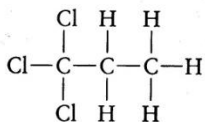


17.

- (a) The carbon chain contains one carbon atom, thus the main name is methane. There are three iodine, *iodo-*, substituents. Thus the name is triiodomethane
- (b) The carbon chain contains two carbon atoms with all single carbon-carbon bonds, thus the main name is ethane. The chlorine, *chloro-*, substituent is on the first carbon atom (from the right). Thus the name is chloroethane (no need for 1-, as it is unambiguous).
- (c) The carbon chain contains four carbon atoms with all single carbon-carbon bonds, thus the main name is butane. There is one chlorine, *chloro-*, substituent on each of the four carbon atoms. Thus the name is 1,2,3,4-tetrachlorobutane.

18.

- (a) There is a three-carbon atom chain and the three chlorine, *chloro-*, substituents are all on carbon atom 1. The formula is:



- (b) There is a five-carbon atom chain and the bromine, *bromo-*, substituent is on carbon atom 3. The formula is:

