Get some extra practice...  

...drawing chemical structures

1. Draw the expanded structural formulae of each of the following:
   a. Butane
   b. Methanol
   c. Propyne
   d. Ethene
   e. Ethanoic acid
   f. Propanone

2. Draw the following expanded structural formulae in simplified form:
   a. [Chemical structure diagram]
   b. [Chemical structure diagram]
3. Draw simplified structural formulae for each of the following:

a. Propanoic acid

b. 1-hexanamine

c. Methyl ethanoate

d. Decane

e. Pentanal
4. Draw simplified structural formulae for each of the compounds listed in question 1.

5. What are the names of the compounds listed in question 2?

6. Using dashed and wedged bonds, draw the structure of methane.
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Chapter 6  Organic compounds 1: hydrocarbons as the framework of life
Chapter 7  Organic compounds 2: adding function to the framework of life

Answers

1. Draw the expanded structural formulae of each of the following:
   a. Butane
      
      \[
      \begin{array}{c}
      \text{H} \\
      \text{H} \text{C} \text{C} \\
      \text{H} \text{H} \text{C} \text{C} \\
      \text{H} \text{H} \text{H} \text{H}
      \end{array}
      \]
   
   b. Methanol
      
      \[
      \begin{array}{c}
      \text{H} \\
      \text{H} \text{C} \\
      \text{H} \text{O} \\
      \text{H}
      \end{array}
      \]
   
   c. Propyne
      
      \[
      \begin{array}{c}
      \text{H} \\
      \text{H} \text{H} \\
      \text{C} \text{C} \text{H}
      \end{array}
      \]
   
   d. Ethene
      
      \[
      \begin{array}{c}
      \text{H} \\
      \text{H} \text{C} \text{C} \\
      \text{H} \text{H}
      \end{array}
      \]
   
   e. Ethanoic acid
      
      \[
      \begin{array}{c}
      \text{H} \\
      \text{H} \text{C} \text{C} \text{O} \\
      \text{H} \text{O}
      \end{array}
      \]
   
   f. Propanone
      
      \[
      \begin{array}{c}
      \text{H} \\
      \text{H} \text{C} \text{C}
      \end{array}
      \]

2. Draw the following expanded structural formulae in simplified form:
   a. 
3. Draw simplified structural formulae for each of the following:

a. Propanoic acid

![Propanoic acid structure](image)

b. 1-hexanamine

![1-Hexanamine structure](image)

Remember: the ‘1’ tells us that the –NH₂ group is attached to the first carbon in the chain.

c. Methyl ethanoate

![Methyl ethanoate structure](image)
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d. Decane

\[ \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3 \]

e. Pentanal

\[ \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CO}-\text{H} \]

Remember: simplified formulae don’t show hydrogen atoms. In reality, however, the carbonyl carbon (to which the =O is attached) also has a H attached to complete the aldehyde group.

4. Draw simplified structural formulae for each of the compounds listed in question 1.

a. Butane

\[ \text{CH}_3\text{CH}_2\text{CH}_3 \]

b. Methanol

\[ \text{CH}_3\text{CH}_2\text{OH} \]

Remember: each end of a straight line in a simplified formula represents a CH$_3$ group

c. Propyne

\[ \text{CH}_{2}=\text{CH}=\text{CH}_2 \]

d. Ethene

\[ \text{CH}_2=\text{CH}_2 \]

e. Ethanoic acid

\[ \text{CH}_3\text{CO}-\text{OH} \]

f. Propanone

\[ \text{CH}_{3}\text{CO}-\text{CH}_2\text{CH}_3 \]

5. What are the names of the compounds listed in question 2?

a. Propanamide
b. Butanoic acid

c. Methoxymethane

d. Pent-2-ene
   Remember: we number the position of the double bond by using the carbon at the earliest position in the chain – in this case, carbon 2.
e. Heptan-3-ol

f. 2-methyl-2-heptanamine
   Remember: we need to look out for the longest carbon backbone in order to find the ‘base’ compound. In this case, there is a continuous seven-carbon chain, so the compound is based on heptane. The two ‘2-’ tell us that both the amine and methyl groups are attached to the second carbon. (An alternative would be to think that this was hexanamine (a six-carbon amine) with two methyl groups attached to the second carbon, but this misses the fact that the longest continuous chain is seven carbons long.)

6. Using dashed and wedged bonds, draw the structure of methane.