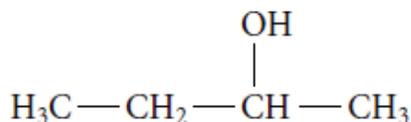


Naming and Drawing Alcohols (Student textbook page 45)

75. Name the alcohol.



What Is Required?

You must name the alcohol.

What Is Given?

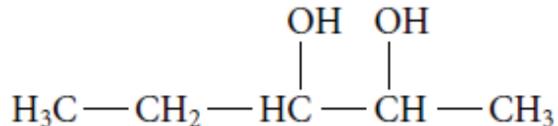
You are given the structural formula for the alcohol.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The hydroxyl group is attached to a hydrocarbon chain that has four carbon atoms. Therefore, the parent alkane is butane.
Identify the suffix.	The numbering of the carbon atoms in the main chain must start at the end nearest the functional group. There is one hydroxyl group and it is bonded to carbon atom 2. The suffix is -2-ol.
Identify the prefix.	There are no other functional groups attached to the hydrocarbon chain, so there is no prefix.
Write the name.	The suffix begins with a vowel, so omit the -e on the end of the parent alkane. The name of the alcohol is butan-2-ol.

Check Your Solution

There are four carbon atoms in the main chain, with a hydroxyl group on carbon atom 2 and no other functional groups attached. The name correctly reflects the structure.

76. Name the alcohol.



What Is Required?

You must name the alcohol.

What Is Given?

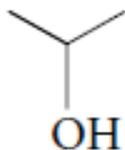
You are given the structural formula for the alcohol.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The hydroxyl groups are attached to a hydrocarbon chain that has five carbon atoms. Therefore, the parent alkane is pentane.
Identify the suffix.	The numbering of the carbon atoms in the main chain must start at the end nearest the functional group. Therefore, there are hydroxyl groups on carbon atoms 2 and 3. The suffix is -2,3-diol.
Identify the prefix.	There are no other functional groups attached to the hydrocarbon chain, so there is no prefix.
Write the name.	The suffix begins with a consonant, so do not remove the -e on the end of the parent alkane. The name of the alcohol is pentane-2,3-diol.

Check Your Solution

There are five carbon atoms in the main chain, with two hydroxyl groups—one on carbon atom 2 and one on carbon atom 3. The name correctly reflects the structure.

77. Name the alcohol.



What Is Required?

You must name the alcohol.

What Is Given?

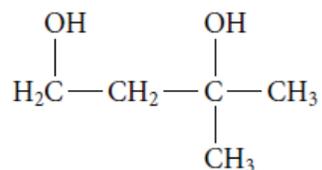
You are given the structural formula for the alcohol.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The hydroxyl group is attached to a hydrocarbon chain that has three carbon atoms. Therefore, the parent alkane is propane.
Identify the suffix.	The numbering of the carbon atoms in the main chain must start at the end nearest the functional group. In this case, the hydroxyl group is in the centre so numbering could begin at either end. The hydroxyl group is on carbon atom 2. The suffix is -2-ol.
Identify the prefix.	There are no other functional groups attached to the hydrocarbon chain, so there is no prefix.
Write the name.	The suffix begins with a vowel, so omit the -e on the end of the parent alkane. The name of the alcohol is propan-2-ol.

Check Your Solution

There are three carbon atoms in the main chain, with a hydroxyl group on carbon atom 2 and no other functional groups. The name correctly reflects the structure.

78. Name the alcohol.



What Is Required?

You must name the alcohol.

What Is Given?

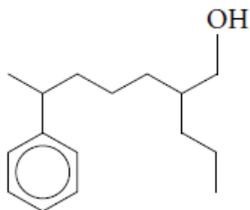
You are given the structural formula for the alcohol.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The hydroxyl groups are attached to a hydrocarbon chain that has four carbon atoms. Therefore, the parent alkane is butane.
Identify the suffix.	The numbering of the carbon atoms in the main chain must start at the end nearest a functional group. Thus, there are hydroxyl groups on carbon atoms 1 and 3. The suffix is -1,3-diol.
Identify the prefix.	There is a methyl group attached to carbon atom 3, so the prefix is 3-methyl-.
Write the name.	The suffix begins with a consonant, so do not remove the -e on the end of the parent alkane. The name of the alcohol is 3-methylbutane-1,3-diol.

Check Your Solution

There are four carbon atoms in the main chain, with two hydroxyl groups—one on carbon atom 1 and one on carbon atom 3—and a methyl group on carbon atom 3. The name correctly reflects the structure.

79. Name the alcohol.

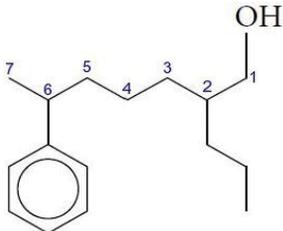


What Is Required?

You must name the alcohol.

What Is Given?

You are given the structural formula for the alcohol.

Plan Your Strategy	Act on Your Strategy
Identify the root.	<p>The hydroxyl group is attached to a hydrocarbon chain that has seven carbon atoms. Therefore, the parent alkane is heptane. The numbering of the carbon atoms in the main chain must start at the end nearest the hydroxyl group.</p> 
Identify the suffix.	There is a hydroxyl group on carbon atom 1. The suffix is -1-ol.
Identify the prefix.	There is a propyl group attached to carbon atom 2, and a phenyl group attached to carbon atom 6. Hydrocarbon side groups are listed alphabetically in the prefix, so the prefix is 6-phenyl-2-propyl-.
Write the name.	The suffix begins with a vowel, so omit the -e on the end of the parent alkane. The name of the alcohol is 6-phenyl-2-propylheptan-1-ol.

Check Your Solution

There are seven carbon atoms in the main chain, with a hydroxyl group on carbon atom 1, a propyl group on carbon atom 2, and a phenyl group on carbon atom 6. The name correctly reflects the structure.

80. Draw the condensed structural formula for the following alcohol.
ethanol

What Is Required?

You must draw the condensed structural formula for an alcohol.

What Is Given?

You are given the name of the alcohol.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The root is ethan-, so there are two carbon atoms in the main chain.
Draw and number the main chain.	$\begin{array}{c} \text{C} \text{---} \text{C} \\ \text{1} \quad \text{2} \end{array}$
Identify the suffix and draw the side groups.	The suffix is -ol, so the hydroxyl group must be on carbon atom 1. $\begin{array}{c} \text{OH} \\ \\ \text{C} \text{---} \text{C} \\ \text{1} \quad \text{2} \end{array}$
Identify the prefix and draw the side groups.	There is no prefix, so there are no additional side groups.
Add enough hydrogen atoms to give each carbon atom four bonds.	$\begin{array}{c} \text{OH} \\ \\ \text{H}_2\text{C} \text{---} \text{CH}_3 \\ \text{1} \quad \text{2} \end{array}$

Check Your Solution

The main chain has two carbon atoms, there is a hydroxyl group on carbon atom 1, and all of the carbon atoms have four bonds. The structure is in agreement with the name.

81. Draw the condensed structural formula for the following alcohol.
propan-1-ol

What Is Required?

You must draw the condensed structural formula for an alcohol.

What Is Given?

You are given the name of the alcohol.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The root is propan-, so there are three carbon atoms in the main chain.
Draw and number the main chain.	$\begin{array}{c} \text{C} \quad \text{---} \quad \text{C} \quad \text{---} \quad \text{C} \\ 1 \quad \quad 2 \quad \quad 3 \end{array}$
Identify the suffix and draw the side groups.	<p>The suffix is -1-ol, so the hydroxyl group is on carbon atom 1.</p> $\begin{array}{c} \text{OH} \\ \\ \text{C} \quad \text{---} \quad \text{C} \quad \text{---} \quad \text{C} \\ 1 \quad \quad 2 \quad \quad 3 \end{array}$
Identify the prefix and draw the side groups.	There is no prefix, so there are no additional side groups.
Add enough hydrogen atoms to give each carbon atom four bonds.	$\begin{array}{c} \text{OH} \\ \\ \text{H}_2\text{C} \quad \text{---} \quad \text{CH}_2 \quad \text{---} \quad \text{CH}_3 \\ 1 \quad \quad 2 \quad \quad 3 \end{array}$

Check Your Solution

The main chain has three carbon atoms, there is a hydroxyl group on carbon atom 1, and all of the carbon atoms have four bonds. The structure is in agreement with the name.

82. Draw the condensed structural formula for the following alcohol.
butane-1,3-diol

What Is Required?

You must draw the condensed structural formula for an alcohol.

What Is Given?

You are given the name of the alcohol.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The root is but-, so there are four carbon atoms in the main chain.
Draw and number the main chain.	$\begin{array}{cccc} \text{C} & - & \text{C} & - & \text{C} & - & \text{C} \\ 1 & & 2 & & 3 & & 4 \end{array}$
Identify the suffix and draw the side groups.	<p>The suffix is -1,3-diol, so there are hydroxyl groups on carbon atoms 1 and 3.</p> $\begin{array}{cccc} & & & \text{OH} \\ & & & \\ \text{HO} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} \\ & & 1 & & 2 & & 3 & & 4 \end{array}$
Identify the prefix and draw the side groups.	There is no prefix, so there are no additional side groups.
Add enough hydrogen atoms to give each carbon atom four bonds.	$\begin{array}{cccc} & & & \text{OH} \\ & & & \\ \text{HO} & - & \text{CH}_2 & - & \text{CH}_2 & - & \text{HC} & - & \text{CH}_3 \\ & & 1 & & 2 & & 3 & & 4 \end{array}$

Check Your Solution

The main chain has four carbon atoms, there are hydroxyl groups on carbon atoms 1 and 3, and all of the carbon atoms have four bonds. The structure is in agreement with the name.

83. Draw the condensed structural formula for the following alcohol.
3,4-dimethylhexan-2-ol

What Is Required?

You must draw the condensed structural formula for an alcohol.

What Is Given?

You are given the name of the alcohol.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The root is hexan-, so there are six carbon atoms in the main chain.
Draw and number the main chain.	$\begin{array}{cccccc} \text{C} & - & \text{C} \\ 1 & & 2 & & 3 & & 4 & & 5 & & 6 & & \end{array}$
Identify the suffix and draw the side groups.	<p>The suffix is -2-ol, so there is a hydroxyl group on carbon atom 2.</p> $\begin{array}{cccccc} & & \text{OH} & & & & & & & & & & \\ & & & & & & & & & & & & \\ \text{C} & - & \text{C} \\ 1 & & 2 & & 3 & & 4 & & 5 & & 6 & & \end{array}$
Identify the prefix and draw the side groups.	<p>The prefix is 3,4-dimethyl-, so there are two methyl groups attached to the main chain--one on carbon atom 3 and one on carbon atom 4.</p> $\begin{array}{cccccc} & & \text{OH} & & \text{CH}_3 & & \text{CH}_3 & & & & & & \\ & & & & & & & & & & & & \\ \text{C} & - & \text{C} \\ 1 & & 2 & & 3 & & 4 & & 5 & & 6 & & \end{array}$
Add enough hydrogen atoms to give each carbon atom four bonds.	$\begin{array}{cccccc} & & \text{OH} & & \text{CH}_3 & & \text{CH}_3 & & & & & & \\ & & & & & & & & & & & & \\ \text{CH}_3 & - & \text{CH} & - & \text{CH} & - & \text{CH} & - & \text{CH}_2 & - & \text{CH}_3 \\ 1 & & 2 & & 3 & & 4 & & 5 & & 6 & & \end{array}$

Check Your Solution

The main chain has six carbon atoms, there is a hydroxyl group on carbon atom 2, and there are methyl groups on carbon atoms 3 and 4. All carbon atoms in the structure have four bonds. The structure is in agreement with the name.

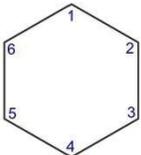
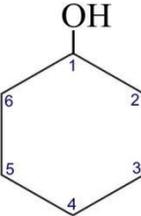
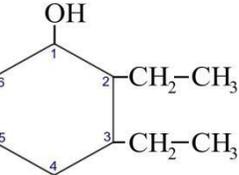
84. Draw the condensed structural formula for the following alcohol.
2,3-diethylcyclohexanol

What Is Required?

You must draw the condensed structural formula for an alcohol.

What Is Given?

You are given the name of the alcohol.

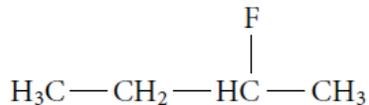
Plan Your Strategy	Act on Your Strategy
Identify the root.	The root is cyclohexan-, so a six carbon aliphatic ring is the main chain.
Draw and number the main chain.	
Identify the suffix and draw the side groups.	<p>The suffix is -ol, so there is a hydroxyl group on carbon atom 1.</p> 
Identify the prefix and draw the side groups.	<p>The prefix is 2,3-diethyl-, so there are two ethyl groups attached to the ring—one on carbon atom 2 and one on carbon atom 3.</p> 
Add enough hydrogen atoms to give each carbon atom four bonds.	<p>When drawing a cyclic structure, the carbon and hydrogen atoms in the main ring are not included. It is assumed that all of the bonds are carbon atoms and that they all have enough hydrogen atoms to give each carbon atom four bonds. The structure is complete.</p>

Check Your Solution

The main chain is a cyclic ring with six carbon atoms, there is a hydroxyl group on carbon atom 1, and there are ethyl groups on carbon atoms 2 and 3. The structure is in agreement with the name.

Naming and Drawing Haloalkanes (Student textbook page 49)

85. Name the following haloalkane.



What Is Required?

You must name a haloalkane.

What Is Given?

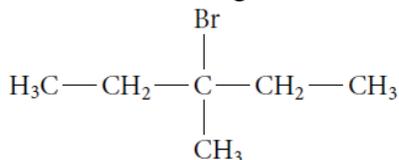
You are given the structure.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The chain has four carbon atoms, so the root is butane.
Identify the prefix.	Number the main chain, starting at the end nearest the halogen functional group. $\begin{array}{ccccccc} & & & & \text{F} & & \\ & & & & & & \\ \text{H}_3\text{C} & - & \text{CH}_2 & - & \text{HC} & - & \text{CH}_3 \\ & 4 & 3 & & 2 & & 1 \end{array}$ <p>There is a fluorine atom on carbon atom 2. The prefix is 2-flouro-.</p>
Name the compound.	2-fluorobutane

Check Your Solution

The halogen received numbering priority, and the number technique provides the lowest possible series of numbers.

86. Name the following haloalkane.



What Is Required?

You must name a haloalkane.

What Is Given?

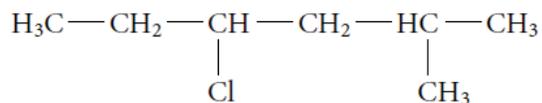
You are given the structure.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The chain has five carbon atoms, so the root is pentane.
Identify the prefix.	<p>Number the main chain, starting at the end nearest the halogen functional group. In this case, the halogen atom has the same numbering whether numbered left to right or right to left.</p> $\begin{array}{c} \text{Br} \\ \\ \text{H}_3\text{C}-\underset{\text{1}}{\text{CH}_2}-\underset{\text{2}}{\text{C}}-\underset{\text{3}}{\text{CH}_2}-\underset{\text{4}}{\text{CH}_2}-\underset{\text{5}}{\text{CH}_3} \\ \\ \text{CH}_3 \end{array}$ <p>There is a bromine atom on carbon atom 3 and a methyl group on carbon atom 3. The prefix is 3-bromo-3-methyl-.</p>
Name the compound.	3-bromo-3-methylpentane

Check Your Solution

The halogen received numbering priority and the number technique provides the lowest possible series of numbers.

87. Name the following haloalkane.



What Is Required?

You must name the haloalkane.

What Is Given?

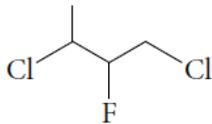
You are given the structure.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The chain has six carbon atoms, so the root is hexane.
Identify the prefix	The halogen atom has numbering priority, so the structure should be numbered starting at the end nearest the halogen. $\begin{array}{ccccccc} \mathbf{1} & \mathbf{2} & \mathbf{3} & \mathbf{4} & \mathbf{5} & \mathbf{6} \\ \text{H}_3\text{C} & - & \text{CH}_2 & - & \text{CH} & - & \text{CH}_2 & - & \text{HC} & - & \text{CH}_3 \\ & & & & & & & & & & \\ & & & & \text{Cl} & & & & \text{CH}_3 & & \end{array}$ <p>There is a chlorine atom on carbon atom 3 and a methyl group on carbon atom 5. The prefix is 3-chloro-5-methyl-.</p>
Name the compound.	3-chloro-5-methylhexane

Check Your Solution

The halogen received numbering priority, and the number technique provides the lowest possible series of numbers.

88. Name the following haloalkane.



What Is Required?

You must name a haloalkane.

What Is Given?

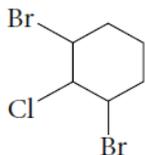
You are given the structure.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The chain has four carbon atoms, so the root is butane.
Identify the prefix.	Number the main chain, starting at the end nearest a halogen functional group. The halogens have the lowest numbering when the structure is numbered from right to left. There is a chlorine atom on carbon atoms 1 and 3 and a fluorine atom on carbon atom 2. The prefix is 1,3-dichloro-2-fluoro-.
Name the compound.	1,3-dichloro-2-fluorobutane

Check Your Solution

The halogen received numbering priority, and the number technique provides the lowest possible series of numbers.

89. Name the following haloalkane.

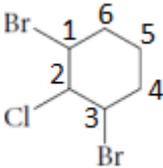


What Is Required?

You must name a haloalkane.

What Is Given?

You are given the structure.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The structure is based on a six-membered ring, so the root is cyclohexane.
Identify the prefix.	<p>The numbering should start with a halogen atom and then continue next to the halogen atom so that the sum of the numbers in the prefix is as small as possible.</p>  <p>There is a bromine atom on carbon atom 1 and 3 and a chlorine atom on carbon atom 2. The prefix is 1,3-dibromo-2-chloro-.</p>
Name the compound.	1,3-dibromo-2-chlorocyclohexane

Check Your Solution

The halogen received numbering priority, and the number technique provides the lowest possible series of numbers.

90. Draw the condensed structural formula for the following haloalkane.
1-iodopropane

What Is Required?

You must draw a condensed structural formula for a haloalkane.

What Is Given?

You are given the name.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The root is propane, so there are three carbon atoms in the main chain.
Draw and number the main chain.	$\begin{array}{c} \text{C} - \text{C} - \text{C} \\ 1 \quad 2 \quad 3 \end{array}$
Identify the prefix and add the side groups and hydrogen atoms.	The prefix is 1-iodo, so there is an iodine atom on carbon 1. $\begin{array}{c} 1 \quad 2 \quad 3 \\ \text{CH}_2 - \text{CH}_2 - \text{CH}_3 \\ \\ \text{I} \end{array}$

Check Your Solution

The length of the main chain and the position of the side group agree with the name.

91. Draw the condensed structural formula for the following haloalkane.
2-chloro-1-fluoroethane

What Is Required?

You must draw a condensed structural formula for a haloalkane.

What Is Given?

You are given the name.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The root is ethane, so there are two carbon atoms in the main chain.
Draw and number the main chain.	$\begin{array}{c} \text{C} - \text{C} \\ 1 \quad 2 \end{array}$
Identify the prefix and add the side groups and hydrogen atoms.	<p>The prefix is 2-chloro-1-fluoro-, so there is a chlorine atom on carbon 2 and a fluorine atom on carbon 1.</p> $\begin{array}{c} 1 \qquad \qquad 2 \\ \text{H}_2\text{C} \text{---} \text{CH}_2 \\ \qquad \qquad \\ \text{F} \qquad \qquad \text{Cl} \end{array}$

Check Your Solution

The length of the main chain and the position of the side groups agree with the name.

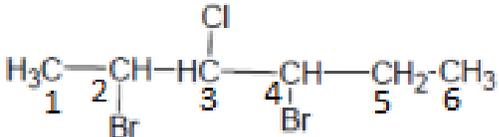
93. Draw the condensed structural formula for the following haloalkane.
2,4-dibromo-3-chlorohexane

What Is Required?

You must draw a condensed structural formula for a haloalkane.

What Is Given?

You are given the name.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The root is hexane, so there are six carbon atoms in the main chain.
Draw and number the main chain.	$\begin{array}{cccccc} \text{C} & - & \text{C} \\ 1 & & 2 & & 3 & & 4 & & 5 & & 6 \end{array}$
Identify the prefix and add the side groups and hydrogen atoms.	<p>The prefix is 2,4-dibromo-3-chloro, so there is a bromine atom on carbon 2 and 4 and a chlorine atom on carbon 3.</p> 

Check Your Solution

The length of the main chain and the position of the side groups agree with the name.

94. Draw the condensed structural formula for the following haloalkane.
1,4-difluoro-3-propylcycloheptane

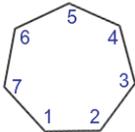
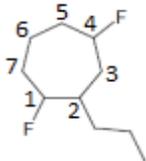
NOTE: Name should be 1,4-difluoro-2-propylcycloheptane

What Is Required?

You must draw a condensed structural formula for a haloalkane.

What Is Given?

You are given the name.

Plan Your Strategy	Act on Your Strategy
Identify the root.	The root is cycloheptane, so the structure is based on a seven-membered ring.
Draw and number the main chain.	
Identify the prefix and add the side groups and hydrogen atoms.	<p>The prefix is 1,4-difluoro-2-propyl, so there is a fluorine atom on carbon 1 and 4 and a propyl group on carbon 3.</p> 

Check Your Solution

The size of the ring and the position of the side groups agree with the name.

95. Identify any errors in the following names by drawing a line structure. Give the correct name for each haloalkane.

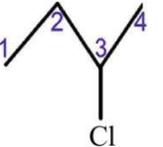
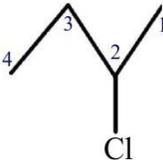
- a. 3-chlorobutane
- b. 4-chloro-3-bromohexane
- c. 2,4-dichlorocyclopentane
- d. 3-chloro-2,2-dimethylbutane

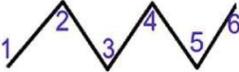
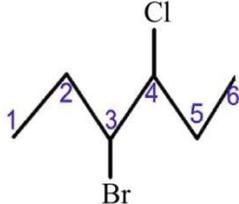
What Is Required?

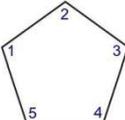
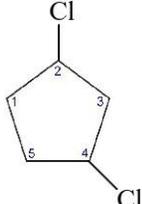
You must draw the line structure according to the name given and then determine the correct name.

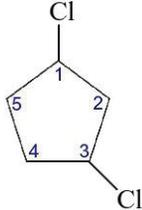
What Is Given?

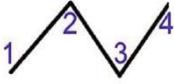
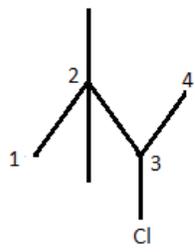
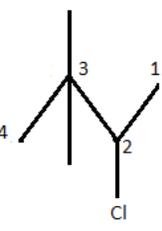
You are given an incorrect name for the structure.

Plan Your Strategy	Act on Your Strategy
a. 3-chlorobutane Identify the root.	The root is but- so the main chain has four carbon atoms.
Identify the suffix.	The suffix is -ane so the main chain has all single bonds. 
Identify the prefix and draw the side groups.	The prefix is 3-chloro- so there is a chlorine atom on carbon atom 3. 
Identify any errors in the name.	The numbering does not begin at the end nearest the functional group.
Correct the naming.	Reverse the numbering and change the prefix to 2-chloro-.  The correct name is 2-chlorobutane.

Plan Your Strategy	Act on Your Strategy
b. 4-chloro-3-bromohexane Identify the root.	The root is hex- so the main chain has six carbon atoms.
Identify the suffix.	The suffix is -ane so the main chain has only single bonds. 
Identify the prefix and draw the side groups.	The prefix is 4-chloro-3-bromo- so there is a chlorine atom on carbon atom 4 and a bromine atom on carbon atom 3. 
Identify any errors in the name.	The prefixes are not written alphabetically. The structure is correct.
Correct the naming.	The correct name is 3-bromo-4-chlorohexane.

Plan Your Strategy	Act on Your Strategy
c. 2,4-dichlorocyclopentane Identify the root.	The root is cyclopent- so the main chain is a five membered ring.
Identify the suffix.	The suffix is -ane so the ring has only single bonds. 
Identify the prefix and draw the side groups.	The prefix is 2,4-dichloro- so there is a chlorine atom on carbon atoms 2 and 4. 
Identify any errors in the name.	The numbering does not start at a functional group.

Correct the naming.	<p>Start the numbering at a chlorine atom and number the ring in the direction of the second chlorine atom.</p>  <p>The correct name is 1,3-dichlorocyclopentane.</p>
---------------------	--

Plan Your Strategy	Act on Your Strategy
<p>d. 3-chloro-2,2-dimethylbutane Identify the root.</p>	<p>The root is but- so the main chain has four carbon atoms.</p>
<p>Identify the suffix.</p>	<p>The suffix is -ane so the main chain has only single bonds.</p> 
<p>Identify the prefix and draw the side groups.</p>	<p>The prefix is 3-chloro-2,2-dimethyl- so there is a chlorine on carbon atom 3 and two methyl groups on carbon atom 2.</p> 
<p>Identify any errors in the name.</p>	<p>The numbering does not start at the end nearest the halogen side group.</p>
<p>Correct the naming.</p>	<p>Reverse the numbering.</p>  <p>The chlorine atom is now on carbon atom 2 and the methyl groups are on carbon atom 3. The correct name is 2-chloro-3,3-dimethylbutane</p>

Check Your Solution

The new names all use correct numbering of the main chain by giving priority to the carbons with the halogen side group and order the prefixes alphabetically.