

Section 1.5: Aldehydes and Ketones

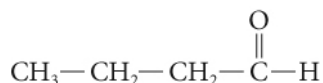
Tutorial 1 Practice, page 41–42

1. (a) First, determine the name of the base alkane. This compound has a 5-carbon parent chain, so it is based on the alkane pentane. The name of the corresponding aldehyde is pentanal.

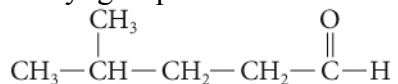
(b) First, determine the name of the base alkane. This compound has a 6-carbon parent chain, so it is based on the alkane hexane. The carbonyl group is located on carbon 1, and an ethyl group is located on carbon 4. This compound is 4-ethylhexanal.

(c) First, determine the name of the base alkane. This compound has a 5-carbon parent chain, so it is based on the alkane pentane. The carbonyl group is located on carbon 1, and a chlorine atom is located on carbon 4. This compound is 4-chloropentanal.

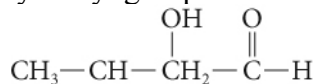
2. (a) Butanal is based on butane. The suffix *-al* indicates that the compound is an aldehyde, so has a carbonyl group at one end (carbon 1) of the carbon chain. Therefore, the structure of butanal is:



(b) 4-methylpentanal is based on pentane. The carbonyl group is located on carbon 1 and a methyl group is located on carbon 4. Therefore, the structure of 4-methylpentanal is



(c) 2-hydroxybutanal is based on butane. The carbonyl group is located on carbon 1, and a hydroxyl group is located on carbon 2. Therefore, the structure of 2-hydroxybutanal is



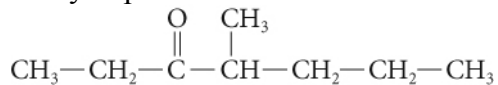
Tutorial 2 Practice, pages 42–43

1. (a) First, identify the parent alkane: butane. This compound is butanone.

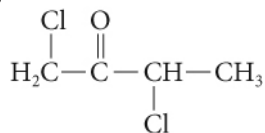
(b) First, identify the parent alkane: hexane. Then, number the carbon atoms to give the carbonyl group the lowest possible number. The carbonyl group is located on carbon 3, and a methyl group is located on carbon 2. This compound is 2-methylhexan-3-one.

(c) First, identify the parent alkane: cyclohexane. If there is one carbonyl group in a cyclic alkane, the carbon number at which the carbonyl group is located can be omitted. This compound is cyclohexanone.

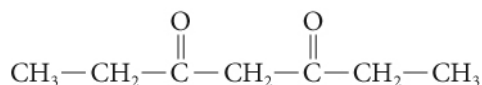
2. (a) First, draw the carbon chain for the parent alkane: heptane. Then, draw the carbonyl group attached to the appropriate carbon atom. Next, add the substituent group—methyl group—to its carbon atom. Therefore, the structure of 4-methylheptan-3-one is



(b) First, draw the carbon chain for the parent alkane: butane. Then, draw the carbonyl group attached to the appropriate carbon atom. Next, add the other substituent groups—two chlorine atoms—to their carbon atoms. Therefore, the structure of 1,3-dichlorobutan-2-one is



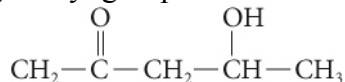
(c) First, draw the carbon chain for the parent alkane: heptane. Then, draw the carbonyl groups attached to the appropriate carbon atoms. Therefore, the structure of heptane-3,5-dione is



(d) First, draw the carbon chain for the parent alkane: cyclobutane. Then, draw the carbonyl group attached to the appropriate carbon atom. If there is one carbonyl group, it can be attached to any carbon atom. Therefore, the structure of cyclobutanone is

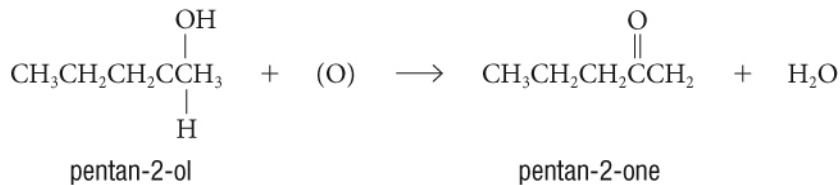


(e) First, draw the carbon chain for the parent alkane: pentane. Then, draw the carbonyl group attached to the appropriate carbon atom. Next, add the substituent group—hydroxyl group—to its carbon atom. Therefore, the structure of 4-hydroxypentan-2-one is

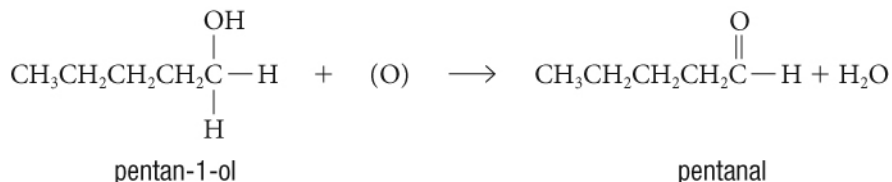


Tutorial 3 Practice, page 45

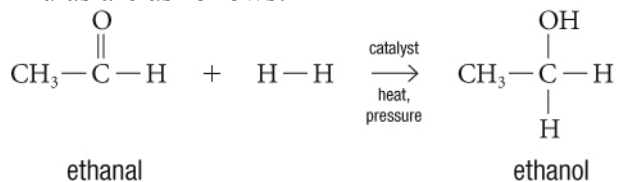
1. (a) Pentan-2-one can be formed by the controlled oxidation of pentan-2-ol. To prepare pentanone, pentan-2-ol would need to react with oxygen. The structural formulas are as follows:



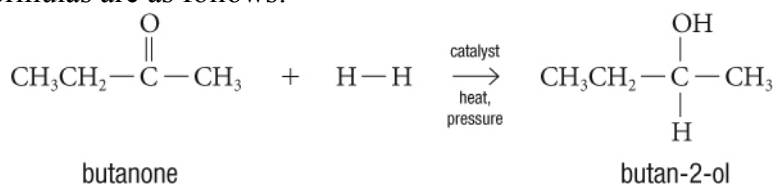
(b) Pentanal can be formed by the controlled oxidation of pentan-1-ol. To prepare pentanal, pentan-1-ol would need to react with oxygen. The structural formulas are as follows:



2. (a) Ethanal is an aldehyde. The hydrogenation of an aldehyde produces a primary alcohol. Therefore, the hydrogenation of ethanal will produce ethanol. The structural formulas are as follows:



(b) Butanone is a ketone. The hydrogenation of a ketone produces a secondary alcohol. Therefore, the hydrogenation of butanone will produce butan-2-ol. The structural formulas are as follows:



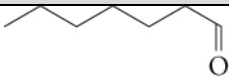
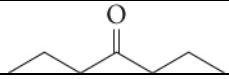
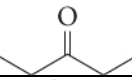
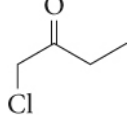
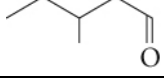
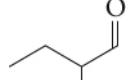
3. (a) The products of the controlled oxidation of hexan-1-ol are hexanal and water.

(b) The products of the controlled oxidation of hexan-2-ol are hexan-2-one and water.

(c) The products of the controlled oxidation of 2-methylpentan-2-ol are 2-methylpentan-2-one and water.

Section 1.5 Questions, page 46

1. Table 1

Name	Condensed structure	Line diagram or structural formula	Type of compound
heptanal	CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CHO		aldehyde
heptan-4-one	CH ₃ CH ₂ CH ₂ COCH ₂ CH ₂ CH ₃		ketone
pentan-3-one	CH ₃ CH ₂ COCH ₂ CH ₃		ketone
1-chlorobutan-2-one	CH ₂ ClCOCH ₂ CH ₃		ketone
3-methylpentanal	CH ₃ CH ₂ CH(CH ₃)CH ₂ CHO		aldehyde
2-methylbutanal	CH ₃ CH ₂ CH(CH ₃)CHO		aldehyde

