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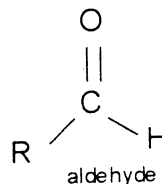
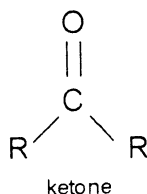
Organic Lab 6

Carbonyl Groups - Aldehydes and Ketones

Carbon's ability to share more than one electron with an atom is often exploited by greedy oxygen atoms. Oxygen will form double bonds with carbon nearly as easily as carbon does with itself. These carbon-oxygen double bonds are called **carbonyl groups**. There are two types of carbonyl groups:

Aldehydes are carbonyl groups that contain at least one hydrogen atom. They have the general formula RCHO.

Ketones are carbonyl groups that are joined to two other carbons. They have the general formula RCOR.



For aldehydes, compounds are named by finding the longest hydrocarbon chain and adding an **-al suffix** to the end of the parent chain. Another way of looking at an aldehyde is that it is a primary carbonyl group. One piece of good news – aldehydes don't have to be numbered. Can you think of a reason why? Another piece of good news: aldehydes and ketones with the same number of carbons are isomers of one another. You will verify this for yourself later.

For ketones, you find the longest hydrocarbon chain and add a **-one suffix** to the end. The ketone, with two hydrocarbon groups surrounding its carbon, is a secondary carbonyl group. Ketone groups do need to be numbered.

Make models of methanal (formaldehyde) and ethanal. Draw their structures below, and include their chemical formulas.

Name	
Formula	

The first ketone requires at least three carbons. Looking at the basic structure for this group, come up with a reason why this is so.

The first ketone is usually called by its common name, **acetone**. Until recently acetone was the active ingredient in nail polish removers. Aldehydes and ketones have the virtue of being slightly polar. The oxygen is slightly negative and the carbon slightly positive. They are relatively comfortable with both polar substances like water, *and* non-polar substances like nail polish. Like ethers, aldehydes and ketones have properties in between hydrocarbons and alcohols.

Draw and name the first two ketones in the box below, along with their chemical formulas. Directly underneath, write the corresponding aldehyde and its chemical formula.

3 carbons

4 carbons

ketone name	ketone name
formula	formula
aldehyde name	aldehyde name
formula	formula

How are the ketones and aldehydes related to each other?

Draw and name all of the isomers of pentanal and pentanone below.

What is their chemical formula? _____

name	name	name

Write condensed structural formulas for the following:

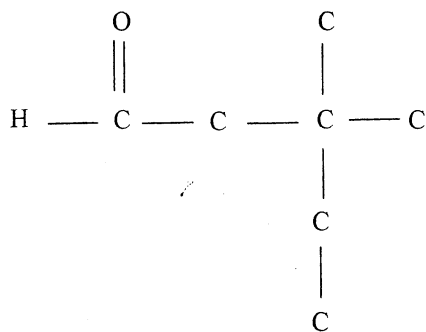
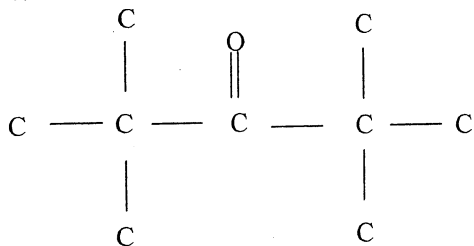
1. 3-hexanone _____

2. hexanal _____

3. 2,4 pentadione _____

Write the name of the following structures (hydrogens not shown)

4.



5.

6. $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_2\text{CH}_3$ _____

7. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CHO}$ _____

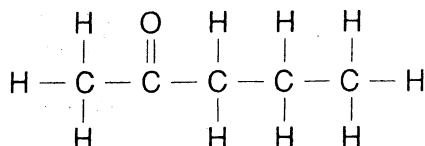
8. There are several pairs of isomers in compounds 1-7 Which ones are they?

9. Draw and name an isomer of compound #4 below.

name

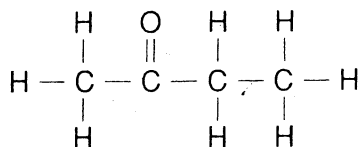
26-2 Practice Problems

1. Name the molecule represented by the following structural formula:

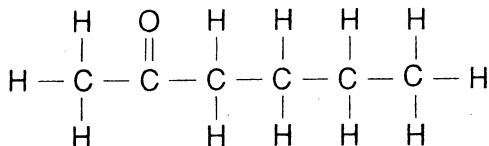


2. Name the molecule represented by the following condensed structural formula:
 $\text{CH}_3(\text{CH}_2)_5\text{CHO}$

3. Name the molecule represented by the following structural formula:



4. Name the molecule represented by the following structural formula:



5. Write the condensed structural formula for pentanal.

6. Name the molecule represented by the following condensed structural formula:
 $\text{CH}_3\text{CH}_2\text{CO}(\text{CH}_2)_5\text{CH}_3$

7. Write the condensed structural formula for hexanal.

8. Name the molecule represented by the following condensed structural formula:
 $\text{CH}_3(\text{CH}_2)_6\text{CHO}$

9. Write the condensed structural formula for 3-heptanone.

10. Name the molecule represented by the following condensed structural formula:
 $\text{CH}_3(\text{CH}_2)_7\text{CHO}$