

## Organic Nomenclature (Carbonyl-Containing Compounds) Lecture Guide

### Purpose

The purpose of this worksheet is to guide you through the lecture and highlight important topics. This lecture guide will help to increase your knowledge and familiarity with properties and nomenclature of organic molecules containing a carbonyl group.

**Student Learning Outcomes:** After completing this lecture guide, you will be able to:

- Distinguish between common classes of organic molecules containing carbonyl groups.
- Formulate names of organic molecules containing carbonyl groups.
- Construct chemical structures of molecules with carbonyl functional groups.
- Identify carbonyl functional groups present in organic compounds.

### Criteria

This worksheet is optional and will not count as a grade.

1. A \_\_\_\_\_ is another name for a carbon-oxygen double bond. When this group is present in a molecule, it changes the type and properties of the compound. The class of organic compounds vary depending on the group bonded to the carbon of the carbon-oxygen double bond.
2. \_\_\_\_\_ are organic molecules that have a \_\_\_\_\_ attached to the carbon of the carbonyl group and a condensed notation of R-CHO. When naming these molecules using the IUPAC naming system, the parent name is determined by replacing the -e in the alkane name with the \_\_\_\_\_ suffix. When numbering the parent chain, the carbonyl carbon is always assigned to \_\_\_\_\_.
3. In the common naming system of an aldehyde, the name is determined based on the number of carbon atoms followed by the \_\_\_\_\_ suffix. If the molecule has one carbon, the name is \_\_\_\_\_ and the name \_\_\_\_\_ represents an aldehyde with two carbon atoms.

4. \_\_\_\_\_ are organic molecules that have a \_\_\_\_\_ attached to the carbon of the carbonyl group and a condensed notation of  $R-CO-R'$ . When naming these molecules using the IUPAC naming system, the parent name is determined by replacing the -e in the alkane name with the \_\_\_\_\_ suffix. When numbering the parent chain, the carbonyl carbon is always assigned to \_\_\_\_\_.
5. A \_\_\_\_\_ is an organic molecule that has a \_\_\_\_\_ attached to the carbon of the carbonyl group and a condensed notation of  $R-COOH$ . When naming these molecules using the IUPAC naming system, the parent name is determined by replacing the -e in the alkane name with the \_\_\_\_\_ suffix. When numbering the parent chain, the carbonyl carbon is always assigned to \_\_\_\_\_.
6. Carboxylic acids tend to be \_\_\_\_\_ soluble in water than alkanes of comparable sizes. This change is due to the presence of strong \_\_\_\_\_ between the partial charges on the oxygen and hydrogen atoms.
7. Carboxylic acids can also participate in acid-base reactions. These molecules are \_\_\_\_\_ that can react with water to produce the \_\_\_\_\_ and hydronium ions.
8. In the common naming system of a carboxylic acid, the name is determined based on the number of carbon atoms followed by the \_\_\_\_\_ suffix. If the molecule has one carbon, the name is \_\_\_\_\_ and the name \_\_\_\_\_ represents a carboxylic acid with two carbon atoms.

9. An \_\_\_\_\_ is a carboxylic acid derivative formed by replacing the hydrogen from the hydroxyl portion of a carboxylic acid with a carbon group. These molecules have the condensed notation of  $R-COOR'$ . When naming this class of organic molecules using the IUPAC naming system, the parent name is determined by replacing the -e in the alkane name with the \_\_\_\_\_ suffix. When numbering the parent chain, the carbonyl carbon is always assigned to \_\_\_\_\_.
10. Esters tend to have \_\_\_\_\_ boiling points than alkanes of comparable sizes. This change is due to the presence of a more polar molecule that has stronger intermolecular forces. However, these molecules have \_\_\_\_\_ boiling points than alcohols and carboxylic acids of comparable sizes.
11. When naming esters, the longest continuous chain that includes the carbon of the carbonyl group represents the \_\_\_\_\_ and the group bonded to the oxygen of the functional group represents the \_\_\_\_\_.
12. An \_\_\_\_\_ is a carboxylic acid derivative formed by replacing the hydroxyl portion of a carboxylic acid with an amine. These molecules have multiple condensed notations depending on the type of amine:  $R-CONH_2$ ,  $R-CONHR$ ,  $R-CONR_2$ . When naming this class of organic molecules using the IUPAC naming system, the parent name is determined by replacing the -e in the alkane name with the \_\_\_\_\_ suffix. When numbering the parent chain, the carbonyl carbon is always assigned to \_\_\_\_\_.