

Organic Nomenclature (Functional Groups) 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 functional groups that include heteroatoms.

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

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

Criteria

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

1. _____ are atoms bonded in a particular way to represent a specific class of compound. Some of these groups will contain _____, which are atoms other than carbon and hydrogen. Examples include oxygen, nitrogen, and sulfur.
2. Molecules that contain a halogen substituent are referred to as _____ or alkyl halides. When naming these molecules, the suffix of the halogen is changed. The -ine suffix is dropped and replaced with _____. For example, instead of chlorine, the substituent would be named as _____.
3. _____ are organic molecules that contain the _____ (–OH) group. When naming these molecules, the parent name is determined by replacing the –e in the alkane name with the _____ suffix. For example, if the parent name for the alcohol contains four carbon atoms, instead of butane, it is called _____.

4. The carbon that the hydroxyl group is attached to can be referred to as the alcoholic carbon.

Alcohols can be classified based on the number of carbon atoms bonded to the alcoholic carbon. In a primary alcohol, there are _____ carbon bonded to the alcoholic carbon. If two carbon atoms are bonded to the alcoholic carbon, it is referred to as a _____ alcohol and if three carbon atoms are attached, it represents a _____ alcohol.

5. The number and location of the hydroxyl group can provide insight into the molecule. If a molecule has two hydroxyl groups, it is referred to as a _____. Other examples include the triol, which contains _____ hydroxyl groups and the _____ which contains many hydroxyl groups.

6. Alcohols tend to be _____ soluble in water than alkanes of comparable sizes. This change is due to the presence of _____ in alcohols. However, as the number of carbon atoms in the alcohol increases, its solubility in water _____.

7. The _____ represents a molecule that has the hydroxyl group directly attached to the carbon of a benzene ring. In these molecules, carbon 1 is always assigned to the carbon of the ring where the _____ is bonded.

8. A _____ represents a molecule that has the sulfhydryl group (-SH). When naming these molecules, the parent name is determined by adding _____ to the end of the parent name.

9. _____ are organic molecules that contain an oxygen bonded to two carbon groups. Those carbon groups can represent alkyl groups (carbon-chains) or aromatic groups.
10. Organic molecules that are derived from ammonia (NH_3) are called _____. These compounds are formed when one or more hydrogen from ammonia is replaced with a carbon group. If one carbon group is attached to the nitrogen, the molecule represents a _____ amine. If two carbon groups are attached to the nitrogen, the molecule represents a _____ amine, and a _____ amine occurs when the three carbon groups are attached.
11. When using the common naming system to name amines, the name is determined by the identity of the _____ followed by the word _____.
12. Amines 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. Of the various types of amines, _____ amines can form hydrogen bonds but _____ cannot.
13. Amines can also participate in acid-base reactions. An amine is a _____ that can react with water to produce a _____ and hydroxide. When the amine reacts with a strong base, it produces an _____.