

Teaching Notes – Macromolecular Math

Learning Goals

Through this worksheet, students should understand that our foods are composed of the macromolecules that are discussed in introductory classes and that the structures and compositions are related to the function of these macromolecules.

Learning Objectives

After this worksheet, students should be able to ...

- Understand and discuss the basic makeup of different types of macromolecules
- Describe the chemical bonds that are important in macromolecular structure(s)
- Associate chemical bonds with structure of polypeptides

This worksheet was inspired by assignments that similarly used Nutrition Fact sheets (see <https://www.cpalms.org/Public/PreviewResourceLesson/Preview/163244>) to introduce macromolecules. The questions in the worksheet were developed through teaching an introductory cell and molecular biology course and focusing on the general descriptions, structures and chemical bonds involved in macromolecules.

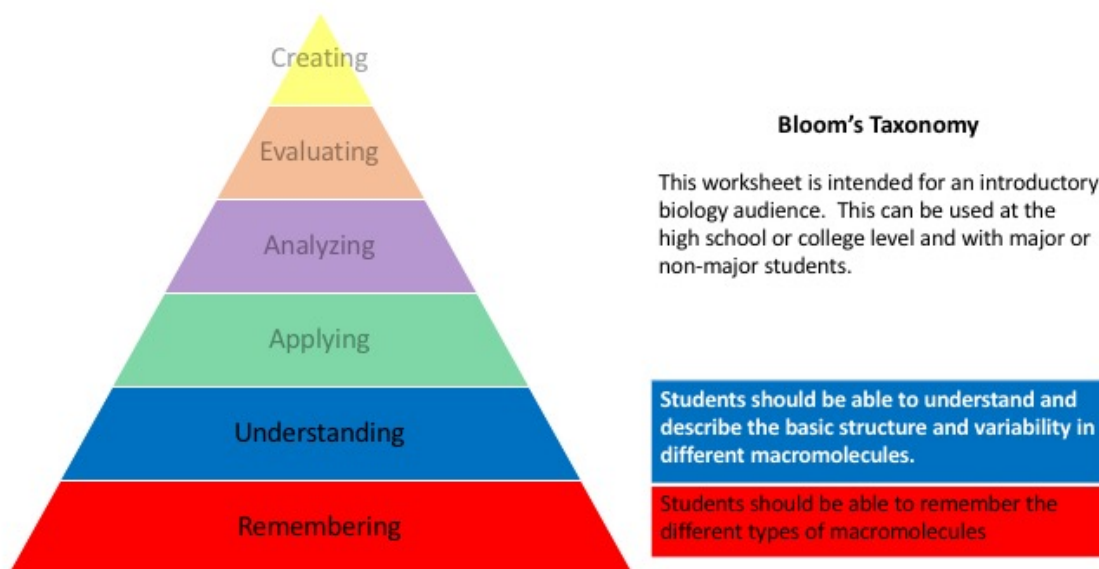


Figure 1. Bloom's Taxonomy pyramid. The faded sections of Bloom's taxonomy are not addressed in this worksheet, but learning goals for Understanding and Remembering are indicated.

Previous knowledge

This worksheet serves as a review for the basic structures of macromolecules (polypeptides, lipids, carbohydrates and nucleic acids). It has been used as a worksheet following a discussion of all four types of biological macromolecules. The worksheet is organized in a manner which would allow instructors to utilize a section on one of the four types of macromolecules separate from the other sections, possibly allowing more flexibility in usefulness.

- Section 1 – lipids
- Section 2 – polypeptides
- Section 3 – carbohydrates
- Section 4 – nucleic acids
- Section 5 – small molecules

The material covered in this worksheet is generally included in most introductory biology courses when discussing macromolecules and chemical bonds. This information should be covered prior to using this worksheet as a supplement to class.

The math at the beginning of each section is not intended to be accurate, but to encourage students to understand the parts of the individual macromolecules as well as how to carefully read the question. It is also difficult to break down all of the individual types of each macromolecule that can be represented in a population.

For example, there are many different types of triglycerides in foods. Tri-oleate glycerol has a molecular weight of approximately 900 g/mol. Calculating with Avogadro's number, this would represent about 6.7×10^{20} molecules of tri-oleate glycerol per g of material. Using the more simplistic sizes in the worksheet simplifies the math yet still provides an assessment of student understanding.

Delivery

This worksheet has been used in an introductory biology (cell and molecular biology) course as both an in-class assignment as well as a homework assignment. Students should be able to go through each section of the worksheet in 10-15 minutes of class time.