The aim of this assignment is to understand the importance of definitions in technical writing and to know the right amount of detail in a definition for a particular audience. For this assignment, three definitions are included: Parenthetical, sentence, and expanded, with each successive definition adding more precise and useful information and increasing in complexity. For my assignment I will attempt to define what a polymer is to the layman and what polymers are used for, as well as some historical background.

**Parenthetical Definition:**

A polymer (a plastic or rubbery material made of repeating units) can be used to make useful everyday materials like plastic wrap, containers, and clothing.

**Sentence Definition:**

A polymer is a long chain chemical compound with potentially useful properties that is created by reacting many smaller repeating units.

**Expanded Definition:**

What is a polymer?

A polymer is any chemical compound, either natural or synthetic, that is derived from small repeat units (known as monomers) which are reacted with each other to form a long chain material that exhibits potentially desirable properties (ex. elasticity, resistance to corrosive chemical, electric conductivity, etc.). The words "polymer" and "monomer" come from the Greek words poly and *mono*, meaning many and single, and from meros, meaning parts. Thus a polymer is made of many parts of monomer, the single part that is repeated in the structure.

What is the history of polymers?

The concept of polymers goes back very far, but their first proper use in industry was as a replacement for ivory billiard balls and developed by the American inventor John Hyatt in 1870 as a mixture of modified cellulose and a compound that made it more mold-able. This first attempt at a plastic was also used for movie film, but was very flammable. The formal definition of a polymer was thought up by the German chemist Hermann Staudinger in 1920 as a large molecule with repeating units. This idea was dismissed by his peers who believed that Staudinger was simply not purifying his compounds well enough and even ridiculed him. However, due to advancement in technology and increasing evidence from him and his colleagues, Staudinger's hypothesis was proven correct. He was even awarded the Nobel Prize in Chemistry in 1953 for his contributions to polymer science. After this revelation, industrial production of polymeric materials increased exponentially with the introduction of  plastics, foams, rubbers, and resins throughout the 20th century, particularly during the 1940's to the late 1980's.

What is an example of a polymer?

Polymers are everywhere and there are many examples of them both in nature and in our everyday life. One type of polymer that many people would be familiar with is cellulose. Cellulose is a naturally occurring polysaccharide (polymeric sugar) where the repeating unit is glucose, a basic sugar and our main source of energy. This is actually what is used by plants that gives their cell walls structure, and we use cellulose in the form of paper and wood derivatives. Another natural example of a polymer would be a protein. Proteins are essentially hundreds (and even thousands) of amino acids (biological molecules that contain nitrogen and an acid group) linked together in a long chain, and this is known as a polypeptide. This polypeptide folds to become a protein which can have a particular function based on the sequence of amino acids in the chain. Another  economically important polymer is one you have most likely seen when you order takeout, known as polystyrene. This polymer is made by reacting a compound known as styrene (see Figure 1) to create long chains of polystyrene. If you blow fine gas bubbles through the liquid form of the polymer in a mold and allow it to solidify, you get a plastic foam that has great insulation; this product is known by most people as Styrofoam.

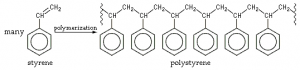
Figure 1. Formation of polystyrene, [](http://engl301-arts.sites.olt.ubc.ca/files/2015/09/Polystyrene_formation.png)

Figure 1. Formation of polystyrene, the polymer used to make Styrofoam. The squiggly lines indicate that the polymer chains continues.

What are polymers used for?

Polymers have many uses and are one of the most diverse classes of materials to date. Polymers can be split into two mains classes: structural and functional. Structural polymers are the materials that most people interact with everyday, and simply provide form and structure in devices or on their own. This can range from Tupperware for your lunches, plastic chairs in lecture halls, butadiene rubbers used to make car tires, and for polyester clothing. Functional polymers are more specialized and provide a certain chemical or physical property that can be incorporated into a device or even into humans. Examples of this include biodegradable plastics, electrical semiconducting polymers that can replace silicon to make plastic and/or flexible electronics, and for use in drug delivery that releases the drug dosages in stages.

**References:**

1. Brown, W. H., Foote, C. S., Iverson, B. L., and Anslyn, E. V. (2012). Organic Polymer Chemistry. In L. Lockwood, S. Kiselica, and E. Woods (Eds.), Organic Chemistry (pp. 1158-1184). Belmont, CA: Brooks/Cole.

2. Feldman, D. (2008). Polymer History. Designed Monomers and Polymers, 11, 1-15.

3. Mulhaupt, R. (2004). Hermann Staudinger and the Origin of Macromolecular Chemistry. Angewandte Chemie International Edition, 43, 1054-1063.

4. Addition Polymers (n.d.). In UC Davis ChemWiki. Retrieved from http://chemwiki.ucdavis.edu/Organic\_Chemistry/Polymers/Addition\_Polymers