

MINISTRY OF EDUCATION
SECONDARY ENGAGEMENT PROGRAMME
GRADE 11
CHEMISTRY

WEEK 10

LESSON 1

Topic: Macromolecules

Sub-topic: Polymers and Monomers

Objective: Given the information, students will:

- Draw the structures of at least 3 monomer units of polymers.
- List at least 5 examples of polymers based on their source.

Macromolecules are formed from many repeating small molecules that are connected by covalent bonds. Each macromolecule is an entity or a unit.

Polymers are macromolecules formed by linking together thousands of small molecules called monomers, usually in chains. Polymers are formed by polymerization.

Monomers are small molecules that are linked to form long-chain molecules with high molar masses. A polymer is formed as a result of monomers linking. If you think of a monomer as being a bead, then you can think of the polymer as the necklace, a series of beads strung together.

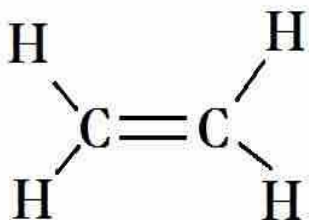
Types of Monomers

The nature of the monomer used determines the molar mass of the polymer formed. There are two distinct types of monomers – **unsaturated monomers** and **bifunctional monomers**.

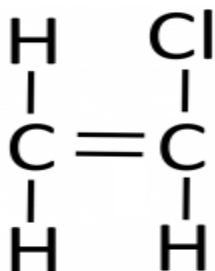
Unsaturated Monomers

These are the unsaturated hydrocarbons, which include the alkenes and alkynes. The structures below show ethene and some of its derivatives.

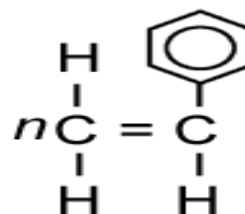
Examples of Unsaturated Monomers



Ethene



Chloroethene

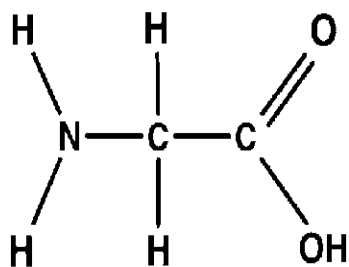


Phenylethene

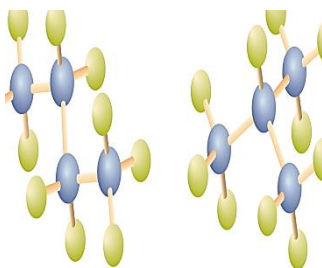
Bifunctional Monomers

These are molecules that contain two functional groups. The functional groups in the bifunctional monomer can be the same or different. Many bifunctional monomers contain the two identical functional groups. The monomers rarely bond with each other, so usually two different bifunctional monomers undergo condensation reaction to form the polymer.

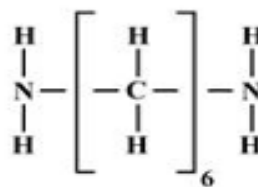
Examples of Bifunctional Monomers



Glycine amino acid



ethane-1,2-diol

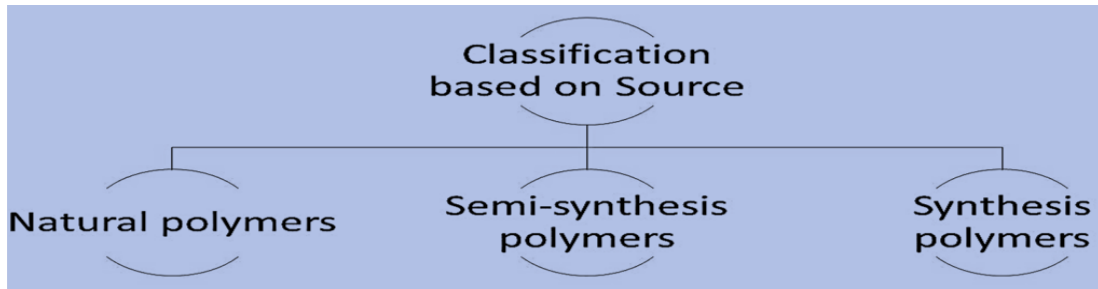


hexane-1,6-diamine

Classification of Polymers

Polymers can be grouped based on three sets of criteria.

1. Classification based on source



Natural polymers

The easiest way to classify polymers is their source of origin. Natural polymers are polymers which occur in nature and are existing in natural sources like plants and animals. Some common examples are Proteins (which are found in humans and animals alike), Cellulose and Starch (which are found in plants) or Rubber (which we harvest from the latex of a tropical plant).

Synthetic polymers

Synthetic polymers are polymers which humans can artificially create/synthesize in a lab. These are commercially produced by industries for human necessities. Some commonly produced polymers which we use day to day are Polyethylene (a mass-produced plastic which we use in packaging) or Nylon Fibers (commonly used in our clothes, fishing nets etc.)

Semi-Synthetic polymers

Semi-Synthetic polymers are polymers obtained by modifying natural polymers artificially in a lab. These polymers are formed by chemical reactions (in a controlled environment) and are of commercial importance. Example: Vulcanized Rubber (Sulphur is used in cross bonding the polymer chains found in natural rubber) Cellulose acetate (rayon) etc.