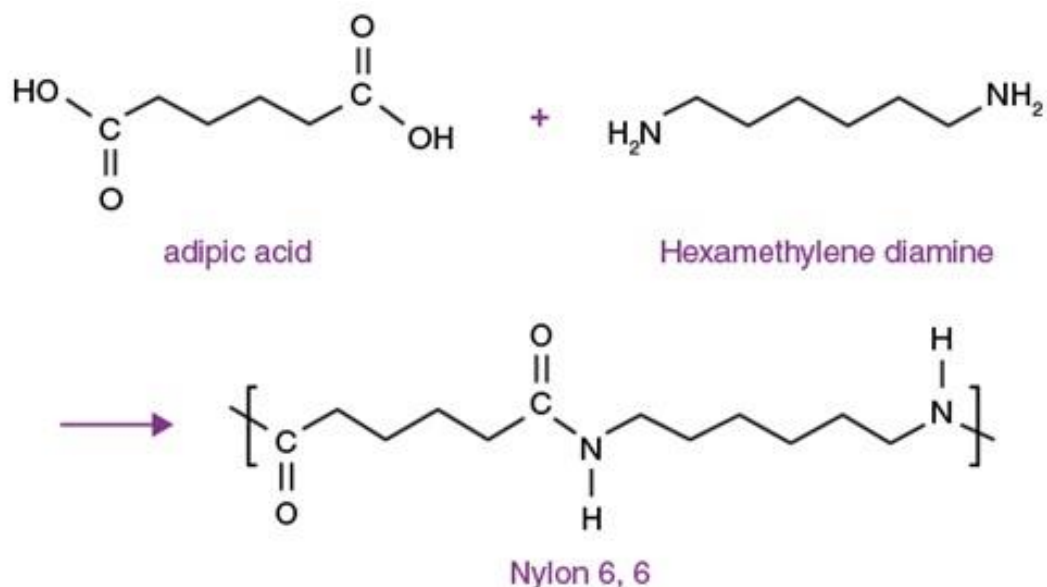


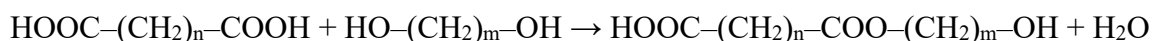
M.Sc. Sem I, CC-2, Physical Chemistry

Examples of Condensation Polymerization:

Nylon and Polyester are some of the most common examples of products of this type of polymerization.



In the figure given above, there is a reaction between adipic acid monomer and hexamethylene diamine monomer which gives the final product as polyamide and a by-product which is a water molecule.



Another form of condensation polymerization is the reaction between a dibasic acid and a glycol where the polymer formed is known as polyester. The by-product again here is water which is mostly removed.

Difference Between Nylon and Polyester:

Nylon and polyester are essential in chemistry and help students understand various practical and theoretical applications related to this topic. These polymers play a crucial role in the textile industry and in the study of synthetic fibers in chemistry classrooms and daily life.

What is Nylon and Polyester in Chemistry?

A nylon is a synthetic polyamide, while polyester is a synthetic polyester. Both are man-made polymers, created through chemical reactions involving monomers.

This concept appears in chapters related to polymers, synthetic fibers, and types of polymerizations, making it a foundational part of your chemistry syllabus.

Molecular Formula and Composition:

- The molecular formula of nylon-6,6 is $(C_{12}H_{22}N_2O_2)_n$, formed from hexamethylenediamine and adipic acid.
- Polyester, commonly PET (polyethylene terephthalate), has the repeating unit $(C_{10}H_8O_4)_n$.
- Both nylon and polyester are classified as synthetic polymers: nylon is a polyamide and polyester is a polyester derived from dicarboxylic acids and diols.

Preparation and Synthesis Methods:

Nylon is made by condensation polymerization, typically by reacting a diamine (like hexamethylenediamine) with a dicarboxylic acid (like adipic acid), giving off water in the process.

Polyester is prepared through condensation between ethylene glycol (a diol) and terephthalic acid, also releasing water as a by-product. Both processes are industrially carried out using high temperature and sometimes catalysts to speed up the reaction.

Physical Properties of Nylon and Polyester:

- Nylon is usually white, silky, and shiny, and has a melting point around 265°C (for nylon 6,6).
- It is strong, elastic, and absorbs water to some extent. Polyester is generally tougher, more resistant to wrinkles, has a melting point near 250°C , and absorbs very little water, making it hydrophobic.
- Both materials are lightweight, durable, and resistant to many chemicals.

Chemical Properties and Reactions:

- Nylon can be hydrolyzed by strong acids or bases, breaking its amide bonds. Polyester is susceptible to hydrolysis by strong bases (alkali), but resists most acids due to its ester linkages.
- Both show high stability against sunlight and weathering, but nylon is more prone to yellowing and reduction in strength on sunlight exposure compared to polyester.