

## Learning Guide for Lecture 3E – Plastics I

### Chem 1010

#### Introduction

In this lecture, we will answer the following questions:

What is a polymer?

What is a copolymer?

What are some natural polymers?

Can we make artificial polymers?

What are the two kinds of artificial polymers?

How are condensation polymers made?

#### What is a polymer?

The final subject that we will talk about in this unit is polymers.

polymer =

A polymer is a \_\_\_\_\_ formed from joining \_\_\_\_\_ together.

The small molecules that were joined together are called:

The process of joining small molecules together to make a polymer is called:

Polymers can be \_\_\_\_\_ of monomers long.

#### What is a copolymer?

Some polymers are made of only one kind of monomer.

monomers:

polymer:

Others are made by joining together two or more different monomers.

monomers:

polymer:

This kind of polymer is called a:

What are some natural polymers?

There are many natural polymers made by plants and animals.

chains of sugar molecules:

- 
- 

copolymer?

chains of amino acids:

- 

copolymer?

double chains of nucleotides:

- 

copolymer?

Can we make artificial polymers?

Chemists have learned to imitate nature to make artificial polymers.

We call materials made from these polymers \_\_\_\_\_.

What makes plastic so useful?

What are the two kinds of artificial polymers?

There are two ways in which monomers can be combined to make polymers.

condensation polymers

- 
- 

addition polymers

- 
- 

How are condensation polymers made?

When a \_\_\_\_\_ and an \_\_\_\_\_ react, they form an \_\_\_\_\_ and \_\_\_\_\_.



The OH is lost from the carboxylic acid, and one H is lost from the amine – they join together to make a water molecule.

The C from the carboxylic acid is joined to the N from the amine to make an amide.

Example:

invented in:

first used to:

replaced:

rationed during WWII because:

There are two ways to make nylon:

Nylon-6 is made from monomers which have a carboxylic acid on one end and an amine on the other.

The polymer is made by joining them end to end.

monomers:

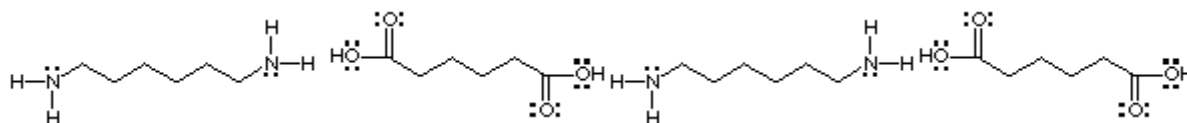


polymer:

Nylon-66 is made from two monomers, one with carboxylic acids on both ends, and one with amines on both ends.

These monomers are joined together by alternating them.

monomers:



polymer:

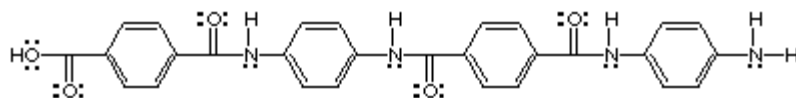
Example:

invented in:

used for:

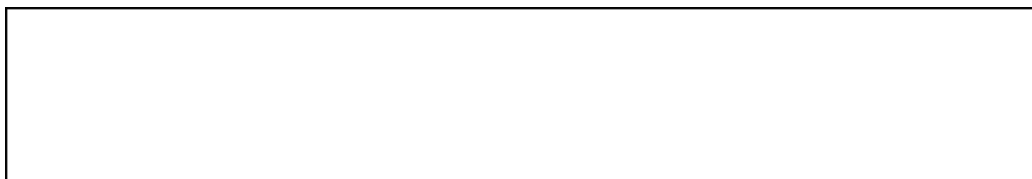
Kevlar also uses amide linkages, but with different monomers.

polymer:



monomers:

Polymers can also be made using alcohols in place of amines.

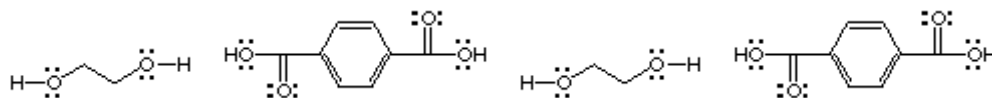


The OH from the carboxylic acid and the H from the alcohol join to form a water molecule.

The C from the carboxylic acid and the O from the alcohol join to form an ester.  
What would you call a polymer made from joining lots of esters together?

This material is made by joining the monomers shown below.

monomers:



polymer:

use to make: