



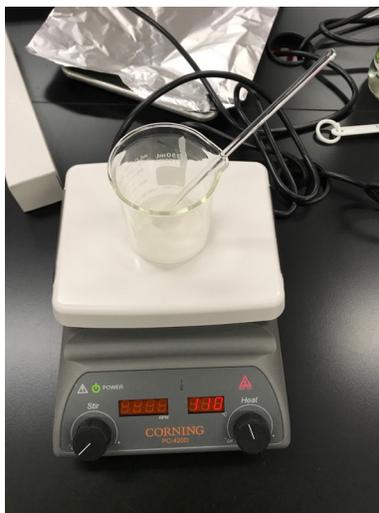
The Chemistry of Clothes

Biopolymers, Inc.

Student Worksheet, Part 1

Materials you will need:

- Safety goggles
- Beakers
- Glass stirring rods
- Assorted teaspoons and tablespoons
- Petri dishes or aluminum foil
- Hot plate
- Assorted starches
- Glycerine
- Assorted optional additives



Introduction: Plastic is durable and long-lasting, making it useful for packaging things like food, but not so good for the environment. Plastic in landfills can take hundreds of years to degrade, and plastic debris in the ocean is a threat to marine life. Traditional plastic is made from petroleum, but there is a movement now to make plastics from more renewable—and in some cases biodegradable—organic sources, like vegetable fats. These **'bioplastics,'** or **biopolymers**, can come in various forms with various physical properties. Knowing what kind of biopolymer would work best for a particular use is a creative design challenge!

Design Challenge: *You have just started your own biopolymer company. The purpose of your company is to design and engineer plastic-like materials that are more environmentally-friendly than traditional petroleum-based plastics. In order to do this, you will need to test out different recipes for **biopolymers** to learn how combining different ingredients in varying proportions changes the physical properties of the biopolymers. In Part 2 of this Design Challenge, you will apply what you learn from this materials testing stage to designing your products.*

Procedure

- Put on your safety goggles.
- Turn your hot plate up to medium-high-high heat (100-120 degrees Celsius). Be careful not to touch the top of the hot plate!
- Start by combining 1 tablespoon of a starch with one teaspoon of glycerine in a beaker. You can mix in an additional additive if you like. Record your recipe in your data table and any notes or observations. Place the beaker on the hot plate and stir the contents while they heat up.
- When the contents in the beaker start to become thick and gooey, pour them into a labeled petri dish or a mold made from aluminum foil to cool.
- Record any notes or observations you had about the heating process in your data table.
- Repeat this process with various combinations of starches, glycerine, and additives. Be sure to record your test recipes in your data table.
- Clean your beakers and stirring rods by rinsing them with water and washing them with dish soap.

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Biopolymers, Inc. Data Table, Part 1



| Biopolymer recipe | Notes about recipe mixing | Notes about heating | Notes about pouring/ molding | Other notes and observations |
|-------------------|---------------------------|---------------------|---------------------------------|------------------------------|
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