**Lesson 2: Lab 1 Bioplastic Standard Procedure**

*Explore the Problem*:

**PROBLEM STATEMENT:**

Can we make a bioplastic in a high school chemistry lab that would function as a cell phone case?

**LEARNING OBJECTIVES:**

* Describe the chemical and physical changes involved in turning starch into bioplastic
* Follow a standard procedure for making a bioplastic
* Compare/contrast the properties of bioplastics made with and without a plasticizer
* Explain how the use of an acid and a base affect the properties of a bioplastic

**MATERIALS:**

### Bioplastics Lab 1 handout, safety goggles, aprons, distilled water, corn starch, glycerol, 0.1 M HCl, 0.1 M NaOH, 100 or 150 mL beakers, 10 mL graduated cylinders, electronic balances, hot plates, glass stirring rods (or wooden stir sticks), plastic petri dishes, labeling tape, sharpie markers, Beral plastic pipets, drying oven, pH paper, one quart sized plastic bag for each team to store samples in.

**LESSON PREPARATION:**

* Students will work in assigned teams of 3-4.
* Print lab handouts, 1 for each student.
* Using 1 M stock solutions (or other concentrated stocks) of HCl and NaOH, make up sufficient volume of 0.1 M solutions for your classes. Each lab group needs approximately 10 mL of each solution.
* Set up lab containers with necessary supplies for each team (two 10 mL graduated cylinders, two labeled pipets—NaOH and HCl, four 100 or 150 mL beakers, four glass stirring rods, four plastic or glass petri dish bottoms)
* On each lab station, set up:
  + Electronic balance
  + Plastic Ziploc container of cornstarch, labeled with a picture of corn
  + Distilled water bottle
  + Hot plate
* On central lab table, make available:
  + pH strips or Hydrion pH paper
  + Sharpies + labeling tape
  + Glycerol, stored in plastic tray to contain sticky spills (NOTE: Glycerol is extremely flammable)
  + 1 L bottles of 0.1 M NaOH and HCl, stored in plastic trays to contain spills (NOTE: strong, concentrated acid and base)
* On carts or counters, set up storage trays for each class and lab group. Here is a model for one period:

Group E

Group A

Group F

Group B

Group G

Group C

Group H

Group D

**TIME REQUIRED: TWO OR THREE 50-MINUTE PERIODS**

* Provide students with one class period to complete the prelab work, or assign for homework.
* The lab is easily completed in one class period.
* If the samples are dried on the lab counters, it may take up to 5 days before samples are sufficiently dry to examine.
* If a drying oven is used (set to about 55 °C), samples will be ready to examine in about 2 days.
* Part of one class period will be used for students to record observations and to answer the analysis and conclusion questions in their lab notebooks.

**PROCEDURE:**

***Day 1 (full 50 minute period)***

* Use the Bioplastic Lessons 2&3 PPT to introduce the learning targets for the lesson.
* Provide about 10 minutes for students to review the lab procedure.
* Explain that in groups of 3-4, each student will be responsible for doing one of the four trials (see lab sheet). The group members can decide who is responsible for each trial. Delete trial 4 for groups of 3.
* Provide about 30 minutes of time in class for students to complete the pre-lab assignment (see lab sheet), or assign for homework.

***Day 2 (full 50 minute period)***

* On the day of the lab, spend about 5 minutes going through safety and other procedures. See the PPT for lab tips.
* Students can finish the lab in 40 minutes if they familiarized themselves with the procedure by completing the pre-lab flowchart. Store the labeled petri dishes on trays, or carts, or other designated areas.

***Day 3 (approximately 30 minutes)***

* Hand out Bioplastics Lab 1 Observations sheet.
* Students will make observations of their plastic samples. They will record observations on their Observations sheet.
* Encourage students to visit other lab groups to observe plastic samples. They should record observations on the Observations sheet, and answer the analysis questions.
* Students should label a plastic bag with their period, lab group and Lab 1. They should label each plastic sample with the trial number (use a sharpie to write directly on the sample).

**ACCOMMODATIONS:**

Assist visually impaired students with reading pipets and graduated cylinders. Team up IEP students with a peer—assign the same trial to both students. Review the names of equipment with ELL students by drawing labeled pictures of each piece of equipment on a central white board.

**EXTENSION:**

No extensions for this introductory lab.