Student Worksheet or Guide

Title of Lesson/Activity: Plants to Replace Plastic - Cellulose Films Lab Activity

Introduction: Cellulose (a polymer found in the cell walls of plants) can be used to create more renewable films to replace plastic films in packaging. This lab will allow students to design and conduct an experiment to solve real-world problems.

Pre-lab: (if needed)

1. Have students read Why is Plastic Bad for the Environment Article as a hook. Students can complete a 3-2-1 Graphic Organizer (3 Things I Learned, 2 Things I Found Interesting, 1 Question I still have), annotate/highlight facts that surprised them, or just discuss with a partner/group.
2. Give students Cellulose Films Lab – Student Handout. In lab groups, students will choose 3 different concentrations they want to test to create the best film following the procedure in the Cellulose Films Lab – Student Handout.

Materials: (***per group*** or per student**)

- 1 Cellulose Films Lab – Student Handout **per student
- ***~3g of Carboxymethyl Cellulose (CMC) Powder***
- ***Water***
- ***3 petri dishes***
- ***3 beakers (25mL or 50mL)***
- ***1 stirring rod/spoon***
- ***3 sheets weigh paper***
- ***1 Graduated cylinder (10mL, 20mL, or 25mL)***
- ***1 Electric scale/balance (reads to 0.01g; can be shared between groups)***
- ***1 pair of tweezers/forceps***
- ***1 pipette***

Directions or Procedure for the Activity:
See the Procedure section in the **Cellulose Films Lab – Student Handout**

Results or Analyze Results:
See the Results section in the **Cellulose Films Lab – Student Handout**

Draw Conclusions:
See the Conclusions section in both handouts:

- **Cellulose Films Lab – Student Handout**
- **Cellulose Films Lab – Teacher Handout WITH ANSWER KEY**

Cleanup:

1. Dispose of cellulose films, weigh paper, and plastic spoons (if used instead of scoopula) into normal trash.
2. Wash all lab and glassware (beakers, graduated cylinders, scoopulas, petri dishes) with water and hang on a drying rack or leave on a paper towel to air dry.

Assessment:
Can grade Pre-lab and Conclusion questions on Cellulose Films Lab – Student Handout

- **Cellulose Films Lab – Student Handout**
- **Cellulose Films Lab – Teacher Handout WITH ANSWER KEY**

Safety Information:

- All chemicals in this lab are kitchen-friendly and not hazardous. General lab safety rules should be followed such as:
    - No horseplay or rough housing.
    - Do not eat or drink in lab.
    - Maintain a clean work area.
    - Gloves, aprons, and eye protection should be worn when working with glass and chemicals*. (*All chemicals used in this lab are kitchen-friendly and not hazardous.)
    - Any broken glass should be disposed of in sharps box.