Name: _____ TOC#____

SLIME FOR EVERYONE!

(Please answer all questions using complete sentences.)

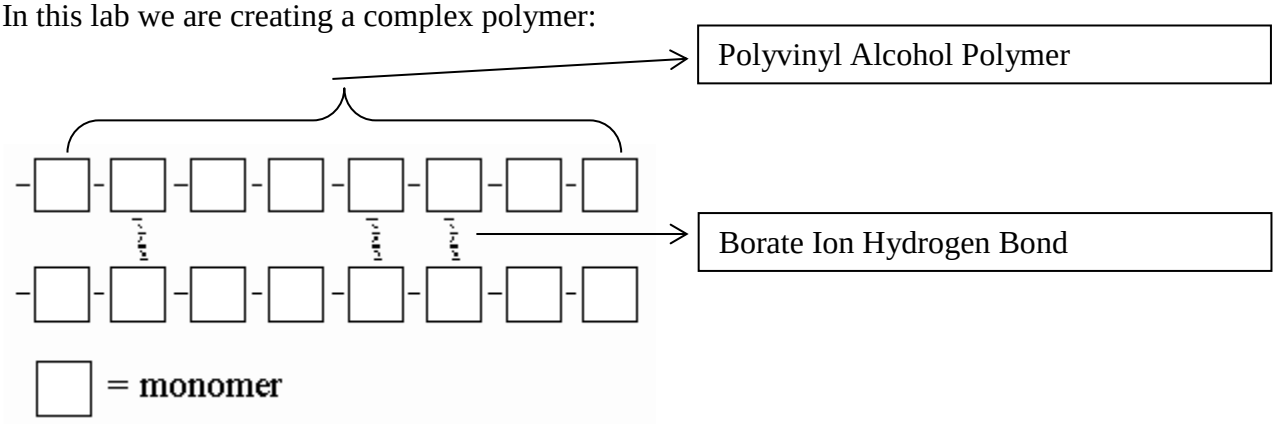
Introduction: You'll have a "slimey" good time with this laboratory! Simply mix two clear, colorless solutions together and watch the mixture instantly gel into a smooth, viscous, elastic ball of slime. This slime is created by linking many long-chain polymers together.

Chemical Concept: Monomers undergo **polymerization** and cross linking to form complex **polymers**.

Background: Slime can be made following a variety of different recipes. One very popular recipe, which we will use in this activity, involves the combination of aqueous solutions of polyvinyl alcohol and sodium borate. After preparing a cross-linked polyvinyl alcohol-borate gel (SLIME), you can make observations of the interesting properties of the slime.

Recall that **polymers** are any number of various chemical compounds made of smaller, identical molecules, **monomers**, linked together. The process by which molecules are linked together to form polymers is called **polymerization.** Some polymers, like cellulose, occur naturally, while others, like nylon, are artificial. Polymers have extremely high molecular weights, make up many of the tissues of organisms, and have extremely varied and versatile uses in industry, such as in making plastics, concrete, glass, and rubber.

In this lab we are creating a complex polymer:



Each box is a monomer which linked together creates the polymer Polyvinyl Alcohol (PVA).
We will be creating a *cross-linked* complex polymer (SLIME!) by adding Sodium Borate to PVA. Borate ions form hydrogen bonds that link polyvinyl alcohol polymers into SLIME!

Materials:

Polyvinyl Alcohol 4% Solution 50 mL	Sheet of paper
Sodium Borate 4% Solution 5 mL	Water Soluble Marker
Graduated Cylinder 50 mL	Wood Stick, for stirring
Graduated Cylinder 10 mL	Food Coloring (optional)
250 mL Beaker	50 mL Beaker

Safety precautions: Do not ingest the material and use it only for intended purposes. Do not allow slime to remain on clothing or other surfaces. Slime if colored with food coloring will stain many surfaces. Clean up slime as soon as possible. Wash hands thoroughly with soap and water before leaving the laboratory.

Name: _____ TOC#____

PART 1: Understanding Procedures

Please complete a flowchart of these directions before you begin ANY OTHER PART.

Procedures	**Flow Chart**
1. Answer questions 1 and 2 in Part II below. 2. Using a graduated cylinder, measure 50 mL (use 50mL graduated cylinder) of 4% polyvinyl alcohol solution and pour it into a 250 mL beaker. 3. With your group take observations of the PVA in Part II below. 4. Add a few drops of food coloring if desired and stir with wooden stick. 5. Measure 5 mL (use 10mL graduated cylinder) of 4% sodium borate solution, pour into a 50 mL beaker. 6. With your group take observations of the PVA in Part II below. 7. Slowly pour and constantly stirring quickly, add the sodium borate solution to the beaker containing the polyvinyl alcohol solution. The mixture will gel almost immediately, but keep stirring vigorously until the mixture has a semi-solid smooth consistency. 8. Complete Analysis of Slime questions on the next page. 9. Follow correct disposal in PART 5.	

PART 2. Background and Pre-Observations

1. What is the relationship between monomers and polymers?

2. What is Polymerization?

3. What do the two reactants look like (Polyvinyl Alcohol and Sodium Borate)? Be detailed in your observations.

Polyvinyl Alcohol	Sodium Borate

PART 3: Preparation of Slime

Following the procedures, create the slime and the proceed to PART 4.

Name: _____ TOC#____

PART 4: Analysis of Slime

1. Observe and record the physical properties of slime (use your 4 senses to observe: see, touch, smell, hear-do NOT taste)

2. Knead the slime into an elastic, semi rigid mass or ball. Hold a small part of the ball and watch it flow and stretch without breaking. Try stretching and pulling the slime quickly. What happens? Can you mold the slime back together in one piece? **Why** do you think this occurs?

3. Place the gel back in the cup. What do you observe? Place the slime on the table. What happens to its shape? Record observations.

4. Rinse your 50 mL beaker and fill it with water. Break off a small piece of the slime and place it in the water. What do you observe? **Why** do you think this occurs?

5. Draw a picture or write your name on a SEPARATE piece of paper with a water-soluble marker. Press the ball of slime onto the paper for only a **split second**, as the slime will stick to the paper if left on too long. What happens? Repeat, this time writing your name backwards. What do you observe?

Name: _____ TOC#____

6. What other physical properties of the slime do you observe? Record these.

7. What other experiments can you perform to test the properties of slime? Describe these experiments.

8. Please describe the process by which these polymers can be created or destroyed. What is an important molecule in each of these reactions?

Part 3. Disposal of Slime:

1. The slime CANNOT leave the classroom. Please place you slime in the communal slime bucket and we will build a giant slime ball.
2. Make sure any large chunks of slime are removed from all beakers and placed in the trash. **DO NOT PUT ANY SLIME IN THE SINK.**
3. Clean the beakers with soap and water. Dry thoroughly for the next class.
4. Dispose of the wooden sticks and any paper towel.
5. Wash your lab tables with soap and water.
6. Wash your hands, it is not safe for you to ingest this material.
7. Failure of your group to do this will not receive a stamp for this lab.