Name _____ **Per.** _____ **Date** _____

Chapter 2- Make Up Lab
Chemicals of Life

Read about the following experiment and results. When finished, fill in all tables and answer the questions.

Students will be identifying the 4 major macromolecules based on chemical reactions and their observations of color changes.

Observation Note

1. **Iodine mixed with a carbohydrate will turn the solution from a yellowish brown to a dark purple.**
2. **Biuret mixed with a protein will turn the solution from a light blue to a purple.**
3. **Sudan III mixed with a lipid will create 2 layers in the solution. The top layer containing the lipid will be pale pink-orange.**
4. **Diphenylamine mixed with a nucleic acid and placed in a hot water bath will turn the solution purple if DNA is present and green if RNA is present.**
5. **Indicator - a substance, when added to an unknown, will cause a color change.**
6. **Unknown- a substance that you are trying to determine its composition.**
7. **Solution- is the indicator mixed with the unknown.**

Given 5 unknown substances, A - E, each student will identify one of the 4 major macromolecules, Carbohydrates, Lipids, Proteins, and Nucleic Acids.

Test #1- Identification of Carbohydrates

During this test, a student labels 5 microcentrifuge tubes (1A, 1B, 1C, 1D, and 1E). The number represents the test being performed and the letter represents the unknown substance that needs to be identified. After labeling the microcentrifuge tubes, the student adds 12 drops of Unknown A into microcentrifuge tube 1A, 12 drops of Unknown B into microcentrifuge tube 1B, 12 drops of Unknown C into microcentrifuge tube 1C, 12 drops of Unknown D into microcentrifuge tube 1D, and 6 drops of Unknown E into microcentrifuge tube 1E. Next the student adds 4 drops of iodine indicator to each microcentrifuge tube and observes the color change. The student observed the following: the solutions in microcentrifuge tube 1A, 1B, 1D, and 1E were orange/brown, while the solution in microcentrifuge tube 1C was purple/black. After making their observations, the student recorded their results in the Testing Unknowns Table. The student used a "+" to indicate a positive test result for the presence of a carbohydrate and a "-" to indicate a negative test result for the presence of a carbohydrate.

Test #2- Identification of Proteins

During this test, a student labels 5 microcentrifuge tubes (2A, 2B, 2C, 2D, and 2E). The number represents the test being performed and the letter represents the unknown substance that needs to be identified. After labeling the microcentrifuge tubes, the student adds 12 drops of Unknown A into microcentrifuge tube 2A, 12 drops of Unknown B into microcentrifuge tube 2B, 12 drops of Unknown C into microcentrifuge tube 2C, 12 drops of Unknown D into microcentrifuge tube 2D, and 6 drops of Unknown E into microcentrifuge tube 2E. Next the student adds 8 drops of biuret indicator to each microcentrifuge tube and observes the color change. The student observed the following: the solutions in microcentrifuge tube 2A, 2C, 2D, and 2E were light blue, while the solution in microcentrifuge tube 2B was purple. After making their observations, the student recorded their results in the Testing Unknowns Table. The student used a "+" to indicate a positive test result for the presence of a protein and a "-" to indicate a negative test result for the presence of a protein.

Test #3- Identification of Lipids

During this test, a student labels 5 microcentrifuge tubes (3A, 3B, 3C, 3D, and 3E). The number represents the test being performed and the letter represents the unknown substance that needs to be identified. After labeling the microcentrifuge tubes, the student adds 12 drops of Unknown A into microcentrifuge tube 3A, 12 drops of Unknown B into microcentrifuge tube 3B, 12 drops of Unknown C into microcentrifuge tube 3C, 12 drops of Unknown D into microcentrifuge tube 3D, and 6 drops of Unknown E into microcentrifuge tube 3E. Next the student adds 10 drops of Sudan III indicator to each microcentrifuge tube, shakes each microcentrifuge tube vigorously and observes the color change. The student observed the following: the solutions in microcentrifuge tube 3A, 3B, 3D, and 3E were orange/red through out the solution, while the solution in microcentrifuge tube 3D showed 2 distinct layers. The top layer was a pale pink color, while the bottom layer was clear. After making their observations, the student recorded their results in the Testing Unknowns Table. The student used a "+" to indicate a positive test result for the presence of a lipid and a "-" to indicate a negative test result for the presence of a lipid.

Test #4- Identification of Nucleic Acids

During this test, a student labels 5 microcentrifuge tubes (4A, 4B, 4C, 4D, and 4E). The number represents the test being performed and the letter represents the unknown substance that needs to be identified. After labeling the microcentrifuge tubes, the student adds 12 drops of Unknown A into microcentrifuge tube 4A, 12 drops of Unknown B into microcentrifuge tube 4B, 12 drops of Unknown C into microcentrifuge tube 4C, 12 drops of Unknown D into microcentrifuge tube 4D, and 6 drops of Unknown E into microcentrifuge tube 4E. Next the student adds 14 drops of diphenylamine to each microcentrifuge tube, places the microcentrifuge tubes in a hot water bath for 20 minutes and observes the color change. The student observed the following: the solutions in microcentrifuge tube 4A, 4B, 4C, and 4D were light milky white or clear, while the solution in microcentrifuge tube 4E was blue/purple. After making their observations, the student recorded their results in the Testing Unknowns Table. The student used a "+" to indicate a positive test result for the presence of a nucleic acid and a "-" to indicate a negative test result for the presence of a nucleic acid.

1 What is the **purpose** of this experiment?

2 List all of the **materials** the students used in this experiment.

3 List the **procedures** the student followed for Part 1- Testing for Carbohydrates. Be sure to number your procedures.

4 List the **procedures** the student followed for Part 2- Testing for Proteins. Be sure to number your procedures.

5 List the **procedures** the student followed for Part 3- Testing for Lipids. Be sure to number your procedures.

6 List the **procedures** the student followed for Part 4- Testing for Nucleic Acids. Be sure to number your procedures.

Data:

Testing Unknowns Table

Unknown	Carbohydrate	Protein	Lipid	Nucleic Acid
A				
B				
C				
D				
E				

Analysis Questions

1 For each macromolecule, write the name of the monomer and polymer.

Carbohydrates monomer: _____

polymer: _____

Proteins monomer: _____

polymer: _____

Lipids monomer: _____

polymer: _____

Nucleic Acids monomer: _____

polymer: _____

2 For each test, which microcentrifuge tubes did you determine contained carbohydrates, proteins, lipids, and nucleic acids?

3 How were students able to determine the identity of each unknown?

4 What do you think Unknown A was? What was the purpose of having an Unknown A?

5 In the real world, when would performing these analysis tests for macromolecules be beneficial to you and others?