**DNA Extraction – Lab Protocol Design**

**Background**

Protocols are established procedures adopted by a lab or group of labs for producing quality results that can be replicated by others. These detailed step-by-step instructions insure that scientists are doing all the actions necessary to get good results. Protocols are constantly evolving based on new technology and/or scientific discoveries. Different labs researching the same thing may use different protocols based on the equipment and resources available.

For the next few days, your lab will be developing its own protocol for isolating DNA from fruit. You will be using your team’s knowledge about cells and DNA to collaborate on a protocol design. Remember that any good protocol has information on equipment, times, amounts, and temperatures.

As a member of the lab, you will be expected to closely collaborate with the other members of your lab. Working with others is essential to improving the quality of the science done by the group. Lab meetings are focused on three main concepts:

• Communication – sharing your information with others.

• Collaboration – working together with others towards a goal.

• Skepticism – evaluating information critically and looking for evidence and reasoning behinds claims.

Your lab has been divided into working teams. Each team will develop an initial protocol for testing. Afterwards, each team will present their findings during a lab meeting. By using communication, collaboration, and skepticism, the lab will use the knowledge gained from all the teams’ results to develop and test a final protocol.

**DAYS ONE & TWO – EXTRACTING DNA**

1. In your notebook, record any information about cells and DNA that might be important know when extracting DNA.

2. Discuss with your team the question: “How can we figure out how to get DNA out of cells?”

3. Collaborate with your team to determine what resources you will need and how/in what order you will use them.

4. Once all members of your team have agreed on a method, record your planned protocol.

5. Have Mr. Mundy sign off on your initial protocol confirming that all members of your team agree.

6. Fill out the Communication/Collaboration Check-In before you begin testing.

**Initial Protocol Testing**

7. Obtain all the materials you need. Work through your initial protocol for the rest of the class time. Write notes on any changes, observations, or clarifications in your lab notebook.

8. Once finished, record your results. Do you believe that you extracted DNA? If so, what does it look like? If not, why do you think you did not get it?

9. Label your test tube with your group name and date. Store in the refrigerator. Keep your results to compare with the other groups’ results during the next meeting.

10. For homework, consider changes you would make to your protocol and why you would make those changes.

**DAYS THREE & FOUR – LAB MEETING**

1. With your team, you will prepare to give an informal presentation of your findings during a lab meeting. Each group should prepare to communicate a summary of their protocol and how well their method of extraction worked out. In your group, discuss the following questions and record your answers in your lab notebook:

a. What was your protocol?

b. What can you conclude about the effectiveness of your method? (claim)

c. How do your results support your conclusion and why? (evidence and reasoning)

d. What worked with your protocol? What did not?

2. Share the responsibility of presenting with all members of your lab team.

3. After each presentation, there will be some time to ask questions of the team. Remember any norms of discourse or rules set for communicating during lab meetings and class discussions.

**Lab Meeting**

4. As each team presents their findings, consider whether the team used a “scientific” approach to developing their protocol.

a. Was their design informed by their understanding of the cell?

b. Is their protocol detailed enough for anyone to be able to repeat it and obtain the same results? This characteristic is called “being replicable”.

5. Also, consider how other groups’ protocols differ from yours. What can you learn from the other groups that you did not know or did not consider?

6. Using the Lab Meeting Data Sheet, make notes on how each team’s protocol differed. During the discussion write down any interesting questions, responses, or comments that you feel would be important to note.

7. After all groups have presented, the class will collaborate in developing a new protocol using the knowledge gained from each team’s initial testing. Record the new protocol in your lab notebook.

### **New Protocol Testing**

8. Return to your team and run the new class-developed protocol.

9. In your lab notebook, write down any observations.

10. Store the lab results in the refrigerator with your team name and date.

## **DAY FIVE - EVALUATE**

1. Compare the results from the class-developed protocol with your initial results.
2. Complete the Post-Assessment.
3. Discuss your final results as a class.