Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_

**Accelerated Biology**

**The Scientific Method**

**Doing Science Experiments!**

Some people think of science as just a bunch of facts and diagrams. Really, it’s much more than that! Science is a process that helps scientists find out how the world works. Scientists do science to solve problems using a logical method. For this activity, you will be scientists and DO SCIENCE in order to help solve a problem and help people in the community make an informed decision. You will have an opportunity to design and run your own experiment. We have examined different steps of the scientific method. Now you will now apply these to your own experiment. Because scientists collaborate, you will be working in groups of four. However, once the experiment is complete, each student will be responsible for typing their own lab report!

You will be given 20 radish seeds, two Ziploc bags, paper towels, and a stapler with staples. Using these materials and any others you find necessary, you will design your own simple experiment to test the effect of a variable on the germination and growth of radish seeds. The data you collect from the experiment you conduct will be used to advise people within the community on their problem and offer suggestions.

**DAY 1**

Read over the problem you are assigned to help solve. *Paraphrase* it in the space provided below.

Before discussing it with your group, answer the following questions on your own.

1. What question are you going to answer?
2. What is the independent variable you need to test?
3. What are the dependent variables you should measure?
4. What will be the conditions of the control group?
5. What will be the conditions of the experimental group?
6. Make predictions for each group:
   1. Which seeds will germinate faster? Why do you think this?
   2. Which group of radishes will grow faster? Why do you think this?

When everyone is done writing, discuss your answers with your group. If you would like to make changes to your answers, do so now.

Homework – Look up information related to radish seed germination, growth, and your independent variable. Take notes on a separate piece of paper on anything you find that will be helpful in coming up with an educated hypothesis. Record the name of the website or other source you used.

**DAY 2**

Share your research findings with your group. Discuss what you think will happen in your experiment to both the germination and growth of the radish seeds.

With your group, create 2 hypotheses for your experiment using “If . . . then . . .” statements. One should relate to seed germination and the other to the growth of the plant.

Hypothesis One:

Hypothesis Two:

You already know your independent and dependent variables, but what variables need to be controlled? Remember that a variable is “able” to be “varied.” However, controlled variables (also called constants) are kept the same between the two groups. List at least 5 controlled variables for your experiment.

1.

2.

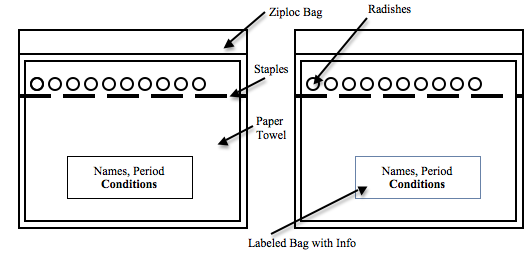
3.

4.

5.

Explain under the pictures the conditions that each group will be placed in.

**Experimental Group Control Group**



Check your design with your teacher. Once approved, set up your experiment. Be sure to label your bags with your names, class period and condition. Do NOT label the bags “control” and “experimental.”

Homework – Create a data table using a ruler or computer to record your data. Be sure to have room to record both how many seeds germinated each day and growth in length of the roots and the shoots. Be sure to include your units (METRIC☺). You will be measuring every day for 1 week. Leave room for the weekend, but you will not be recording weekend data, so put x’s in those boxes. Title your data table using a descriptive title that includes the independent and dependent variables.

**DAY 3**

Your teacher will check in your data tables for points. Then you will show and discuss them with your group. If one seems to be better organized than the rest, all group members should create a data table like that one to replace their own.

Find your bags and record the data in the data table. Do not lose this data table. Keep it in your binder.

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**Scenarios for Radish Lab**

**Group A**

Pine Valley Golf Club is one of the top 100 golf courses in the United States. It prides itself on maintaining beautiful landscaping and healthy green grass over its entire 620 acres. In order to do so the gardeners apply fertilizers on a daily basis, which have a high concentration of phosphates. Homeowners with adjacent yards have gardens and are concerned about the impact the fertilizer run off will have on the germination and growth of their seeds.

**Group B**

A University of Illinois student, Rob, misses his dog that he had to leave back at home. The dorm room won’t allow dogs or cats, so he buys a plant and puts it right by the window. He names it Herman and becomes quite attached to his new green friend. However, he notices about a month after buying it that it is starting to wilt and the leaves are turning brown. He remembers he had some sugar packets that he didn’t put in his coffee that morning and wonders if that would help give his poor plant the energy it needs to grow again and get strong. He doesn’t want to put sugar water on Herman without knowing what effect it may have. He purchases radish seeds to see what effect the sugar water would have on their germination and growth.

**Group C**

Monsanto is a fortune 500 company that employs 21,035 employees globally and has 404 facilities in 66 countries. It works with farmers around the world to make agriculture more productive and more sustainable. Their technologies enable farmers to get more from every acre of farmland. They are concerned about the farmers that live in and near major cities, because the pollution in these cities makes the rain there acidic. They want to find out whether radish seeds can be germinated and grown in these cities.

**Group D**

Cindy and her family love home grown vegetables with their meals. They decide to start their own garden in their backyard. They buy seeds for tomatoes, peppers, radishes and a variety of herbs like rosemary and oregano. She researches that she should water the seeds daily. Some of Cindy’s family members think that they should use distilled water rather than tap water to germinate and grow their garden seeds.

**Group E**

SuperShine Carwash has won the American Car Wash Association’s Landscape Award for the past 10 years. The owner is proud of this, but in this poor economy, planting so many plants is getting expensive. He wants to know whether growing plants from seed will work, as it would be cheaper than buying already growing flats of plants. The plot of land is downhill from the carwash, and is doused with soapy water often.

**Group F**

Charles Harrington III is a self–made multi–millionaire that is fed up with living in the city. He is contemplating buying a small island in the Caribbean where he can live with his family, away from the rest of the world. There are two available islands to choose from. One has the trees he likes, but there are no fresh water streams or ponds. The other is not as pretty, but has a fresh water stream. He is concerned about not having enough rainwater to irrigate plants that will feed his family. Having produce delivered to the island would be too impractical. He wants to know whether watering his seeds with seawater will work to allow him to grow healthy vegetables.

**Group G**

Stevenson High School is considering building a green house, however the space available is very limited. The plan is to grow vegetables that can be sold in the cafeteria. On the package of seeds, it says to plant them 2 inches apart. This would allow for many plants to be grown in the limited space. The school would like to know whether planting the seeds closer together is a possibility.

**Group H**

The Grown Right Seed Company normally plants seeds in May. They want to be able to harvest vegetables at different times of the year. To do this, they need to determine whether they can germinate the seeds a few weeks earlier than they normally do. One problem is that the temperature would be colder than in May. Before they try planting a whole filed of seeds early, they want to know if it is even a possibility to allow the seeds to germinate and grow in the colder temperature.

**Group I**

The Grown Right Seed Company wants to be able to harvest vegetables earlier in the growing season. To do this, they want to see whether they can germinate the seeds in February inside and move them outside when it is warmer. (Outside it is too cold in February for seeds to germinate.) In an unlit storage warehouse, they have room to start the seeds inside where it is warm. However, they do not have enough indoor lights to use while the seeds germinate and grow, before they are moved outside. Before they try starting many seeds in this warehouse, they want to know if it is even a possibility for seeds to germinate and grow in the dark.