Name: Date:



**Student Designed Experiment:**

**Applying the Scientific Method**

**Introduction:** In order to understand the world around us, scientists apply the scientific method to answer questions and solve problems. Performing an experiment is an important part to the scientific method. A hypothesis must first be proposed, and this hypothesis must be tested through the use of a controlled experiment. Designing a good controlled experiment is not always an easy task.

In this lab, you will design and carry out a controlled experiment. As you know, seeds are in a dormant state until the proper conditions for growth are present. There are many factors that contribute to the germination of a seed, but in this experiment, you will test the effect of different quantities of water on seed germination. From the materials that are provided for you, you will apply the scientific method as you design and carry out your experiment.

**Purpose:**

1. To learn to apply the steps of the scientific method to answer a question or to solve a problem.

2. To learn to design and implement a controlled experiment.

**Procedure:**

You have been provided with the following materials:   
- Plant seeds   
- Petri dishes

- Graduated cylinders

- Water.   
Additional materials may be provided if you ask for approval for them before writing up your experiment.

Follow the steps below to design a controlled experiment to show the effect of different quantities of water on the germination of plant seeds.

**Stating the Hypothesis:** Before you begin the experiment, you must state a hypothesis for your experiment. This is a statement that predicts the possible outcome of the experiment. It must be stated in a way that is “testable.”

1. State your hypothesis: if \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_then\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. What is the independent variable in your experiment? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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3. What is the dependent variable in your experiment? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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4. What are some controlled variables in your experiment?

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5. Why do these variables need to be kept constant?

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**Designing the Experiment:**

6. List the steps in your method: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Teacher Approval: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Recording your information:** As a scientist carries out an experiment, they must record large amounts of data. Design and draw a data table that will be suitable to record your data. Over the next several days, as observations are made, record your data in your data table.

7. Data Table:

**It is a common practice to display the data in a graphic or pictorial form to make the viewing and analyzing of the data easier and more accurate.**

8. Use the grid below to make a graph of the data you have obtained.

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**Form a Conclusion:** At the completion of the experiment, the data must be analyzed, and a conclusion must be formed.

9. Based on the data you obtained, what conclusion can you reach regarding the amount of water required for seed germination?

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14. Does your data support your hypothesis? Explain. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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15. What additional variables could be tested? Make a list of other variables that you might test.

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16. A good scientist repeats the experiment over and over again. Why is it necessary to repeat the experiment?

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17. What final step must the scientist carry out? Why is this important? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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18. How do your results compare with the results obtained by your classmates? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Analysis Questions:**

19. Based on the results of your experiment, what recommendations would you make to a farmer about watering seeds?

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20. Why was it necessary to test many seeds in each container? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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5. A scientist wanted to use a particular strain of bacteria in his research to test a new medication. Before beginning his research on the new medication, he needed to know the best type of agar to use in his Petri dishes. Agar is a gelatin-like substance into which various nutrients have been dissolved. Since bacteria feed on different substances, they will prefer and grow best on particular types of agar. The scientist tested several different types of agar to see which type of agar would provide the best growth rate for his bacterial strain. The results are shown in the table below.

|  |  |
| --- | --- |
| **Type of Agar** | **Number of Bacterial Colonies** |
| Nutrient Agar | 57 |
| Tryptic Soy Agar | 75 |
| Blood Agar | 225 |
| Luria Bertani Agar | 45 |

1. What is the independent variable?

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b) What is the dependent variable? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) List some controlled variables. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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d) What conclusion can be reached about this strain of bacteria by the data shown in the data table?

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