**Worksheet**

Before the experiment:

What is the **Independent Variable** we are testing (what are we changing)?

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What is the **Dependent Variable** we are testing (what are we observing)?

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What are our **Control Variables** (what are we keeping the same between groups)?

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How many **replicates** are we testing for each group?

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It’s important to keep good records when doing an experiment. Document which substances you will be testing (you may have two or three):

**Substance A** : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Substance B**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Substance C**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

During the experiment:

**Fill in the table each day with your seed counts.** Each day, all bags should have 10 total seeds.

**Table 1. Seed Toxicity Test Results**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Bag # | **Substance** | **Response** | | | | | |
| Day 1  # of seeds… | | Day 2  # of seeds… | | Day 3  # of seeds… | |
| Germinated | Not  Germinated | Germinated | Not  Germinated | Germinated | Not  Germinated |
| 1 | Water (Control) |  |  |  |  |  |  |
| 2 | Substance A |  |  |  |  |  |  |
| 3 | Substance B |  |  |  |  |  |  |
| 4 | Substance C |  |  |  |  |  |  |

**Record observations from the experiment.** Where did you keep the seed bags? Did any of the seeds do anything unusual, like change color?

After the experiment:

**Construct a plot for your data using the space below.**

1. For each substance, draw a bar on the graph below up to the number of seeds that were germinated on Day 3.

**Effect of Chemical Treatments on Radish Seed Germination** (graph title)

10

9

1

5

3

0

6

4

2

**Number of Seeds Germinated (Day 3)** (y axis)

8

7

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Substance A  Substance B  Substance C  Water (Control)  **Treatment** (x axis) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Discussion Questions:**

1. What was the purpose of this experiment?
2. What did you observe? Provide two observations for each day of the experiment.
3. Were there differences between chemical treatments? Which chemical caused the lowest number of seeds to germinate (was most toxic to the seeds)?
4. What are the important graph elements in the above graph? What do all of the labels in **BOLD** text tell us?
5. Why do we need a Control treatment (in this case: water) to compare chemical treatments to?
6. Why do we need replicates in our experiments?
7. Why do we need Control Variables (the things we keep the same between treatment groups)?
8. What are some of the potential sources of error in our experiment? Experimental error can relate to human actions, the tools we use, or the environment surrounding our experiment.
9. If you did this experiment again, describe how you might reduce the experimental error. Would you also try to test different substances? If so, what would you choose to test?