Seed Germination **Science 1206** **Name :**

LAB #2

Plants grow in many different conditions all over the world. Small, beautiful wildflowers grow high on many mountains, corn and wheat grow best in the mid-west region of America, citrus fruits do very well in warm climates, and maple trees grow nicely in climates with very cold winters. Plants start out as seeds. With the proper water, light, and temperature, seeds become sprouts and start to grow. This process is called **germination**. Different types of seeds grow best under different conditions. Some seeds should be planted very early in the spring, and others should be planted later in the year. Some seeds thrive in wet conditions, while others grow best in drier areas.

In this Gizmo™, you can explore different growing environments for three fictional types of seeds (called Seed A, Seed B, and Seed C). You will run experiments in which you adjust the amount of water, the amount of light, and the temperature of the seeds' environment. The simulation will show you how many seeds sprout after five days under the conditions you selected. What conditions lead to the best rate of germination? Your answer could be different for different seeds.

Website **www.explorelearning .com** Login : **mpsh1** Password : **sc1206**

Search : **seed germination** Then, **Launch Gizmo**

Factors Affecting Germination Rate

1. Select A, B or C for **Seed type**. (If the seed buttons are greyed out, click the **Reset** ( ) button first.) Use the sliders to set the **Water** to 10 drops/hr, **Light** to 50%, and **Temperature** to 20°C (68°F). (You can quickly set a slider to a specific number by typing the number into the box to the right of the slider, and then pressing the **ENTER** key.) Press the **Play** ( ) button and watch as seeds sprout over 5 days. (Don't worry, the simulation does not really take 5 days!)

a. Look at the **Description** tab. Out of the 100 seeds, how many have sprouted? How many have not yet sprouted? Write this down, along with the water, light, and temperature conditions you used. Reset and repeat for two more trials, using the same conditions.

Initial Conditions		Seed Status	Trial #1	Trial #2	Trial #3	Average
Experiment #1						
Water	10 drops/hour	Type (A, B, or C)				
Light	50%	Number of seeds				
Temperature	20 ^{0}C	Number of sprouts				

b. Click on the **Graph** tab. The line that starts at zero shows the number of seeds that had sprouted over time. The line that starts at 100 shows the number of seeds that had not yet sprouted.

i) Does the sprouts line increase or decrease from left to right? Why?

ii) Does the seeds (not sprouted) line increase or decrease?

iii) Have a look at the **Graph** tab. Press the **Play** button and watch the graph while the simulation plays. Why are both lines flat for a while at the beginning of the experiment?

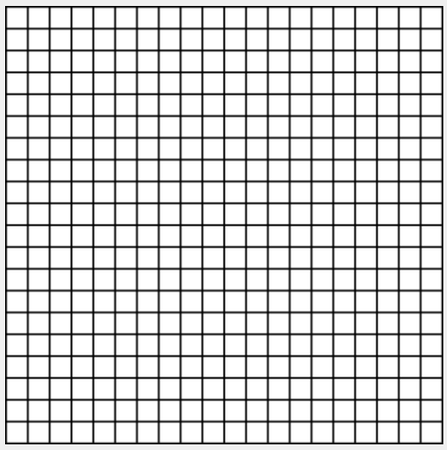
iv) After the lines started moving, you should have seen that they moved together. Explain why.

v) Did you always get the same result when you performed the experiment several times using the same initial conditions? Why do you think it is important to perform this experiment more than once?

2.Conduct a new series of experiments with the same Seed Type where the temperature is kept at 20°C and the light is kept at 50%, but the amount of water given to the seeds varies. Start with a water supply of 20 drops/hour, and run the simulation three times. Write down your results each time. Then, do the same (three trials) for 40 drops of water per hour, then 50, and so on, until you reach 100 drops per hour. Be sure to write down your data for each trial.

Initial Conditions		Seed Status	Trial #1	Trial #2	Trial #3	Average
Experiment #2						
Water	20 drops/hour	Type				
Light	50%	Number of seeds				
Temperature	20 ^{0}C	Number of sprouts				
Experiment #3						
Water	30 drops/hour	Type				
Light	50%	Number of seeds				
Temperature	20 ^{0}C	Number of sprouts				
Experiment #4						
Water	40 drops/hour	Type				
Light	50%	Number of seeds				
Temperature	20 ^{0}C	Number of sprouts				
Experiment #5						
Water	50 drops/hour	Type				
Light	50%	Number of seeds				
Temperature	20 ^{0}C	Number of sprouts				
Experiment #6						
Water	60 drops/hour	Type				
Light	50%	Number of seeds				
Temperature	20 ^{0}C	Number of sprouts				

a. Make a graph of your results. Put the amount of water on the horizontal axis and the average number of sprouts on the vertical axis. For each experiment you ran, plot a point on the graph.



b. Why is the number of seeds plotted on the y-axis and the amount of water plotted on the x-axis?

c. Look at your graph. What effect does the amount of water supplied to the seeds have on the number of sprouts that emerge for this Seed Type? Explain.

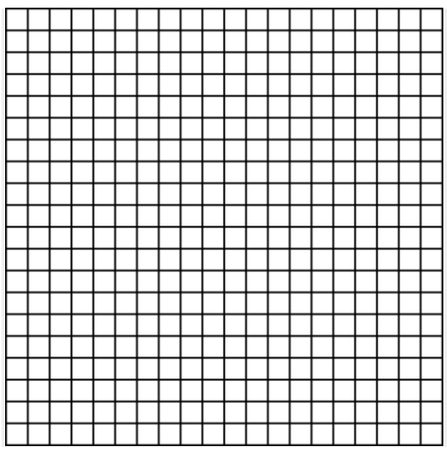
d. What amount of water produced the largest number of sprouts?

e. In this series of experiments, only the amount of water supplied to the seeds was changed. Why do you think the values of light and temperature were kept the same during these experiments?

3. Conduct a similar series of experiments with the same Seed Type where the temperature is kept at 20°C and the amount of water is kept at 50 drops/hr, but the amount of light supplied to the seeds is varied. Start with 20% as the amount of light supplied to the seeds, and run the simulation three times. Write down your results each time. Then, do the same (three trials) for 30% light, then 40%, and so on, until you reach 100% light. Be sure to write down your data for each trial.

Initial Conditions		Seed Status	Trial #1	Trial #2	Trial #3	Average
Experiment #1						
Water	50 drops/hour	Type				
Light	20%	Number of seeds				
Temperature	20 ^{0}C	Number of sprouts				
Experiment #2						
Water	50 drops/hour	Type				
Light	40%	Number of seeds				
Temperature	20 ^{0}C	Number of sprouts				
Experiment #3						
Water	50 drops/hour	Type				
Light	60%	Number of seeds				
Temperature	20 ^{0}C	Number of sprouts				
Experiment #4						
Water	50 drops/hour	Type				
Light	80%	Number of seeds				
Temperature	20 ^{0}C	Number of sprouts				
Experiment #5						
Water	50 drops/hour	Type				
Light	100%	Number of seeds				
Temperature	20 ^{0}C	Number of sprouts				

a. Graph your results.



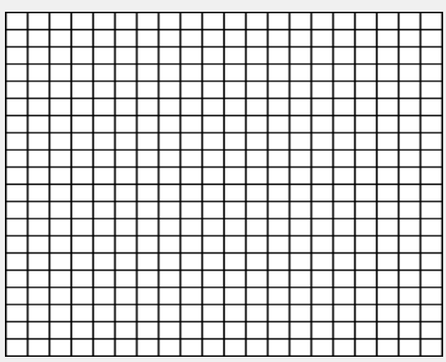
b. Did light have any effect on the number of sprouts for your Seed Type? Explain.

c. Why might light *not* be a very important factor for some types of seeds?

4. Conduct another series of experiments with the same Seed Type to test the effects of **temperature** on **germination rate**. Be sure to keep the amount of light constant at 50% and the amount of water constant at 50 drops/hr. Experiment with temperatures of 0°C, 5°C, 10°C, and so on, up through 35°C

Initial Conditions		Seed Status	Trial #1	Trial #2	Trial #3	Average
Experiment #1						
Water	50 drops/hour	Type				
Light	50%	Number of seeds				
Temperature	0 ^{0}C	Number of sprouts				
Experiment #2						
Water	50 drops/hour	Type				
Light	50%	Number of seeds				
Temperature	5 ^{0}C	Number of sprouts				
Experiment #3						
Water	50 drops/hour	Type				
Light	50%	Number of seeds				
Temperature	10 ^{0}C	Number of sprouts				
Experiment #4						
Water	50 drops/hour	Type				
Light	50%	Number of seeds				
Temperature	15 ^{0}C	Number of sprouts				
Experiment #5						
Water	50 drops/hour	Type				
Light	50%	Number of seeds				
Temperature	20 ^{0}C	Number of sprouts				
Experiment #6						
Water	50 drops/hour	Type				
Light	50%	Number of seeds				
Temperature	25^{0}C	Number of sprouts				
Experiment #7						
Water	50 drops/hour	Type				
Light	50%	Number of seeds				
Temperature	30 ^{0}C	Number of sprouts				
Experiment #8						
Water	50 drops/hour	Type				
Light	50%	Number of seeds				
Temperature	35 ^{0}C	Number of sprouts				

a. Make a graph of your results.



b. What effect does the room temperature have on the number of sprouts that emerge for this Seed Type? Explain.

c. What temperature produced the highest germination rate?

5. In this experiment, you will try to produce the highest germination rate you can. Set up the conditions so that you are using the "best" amount of water, "best" amount of light, and "best" temperature for germination. (Use the values you found to be best in your experiments.) Run the simulation three times. Write down your data each time.

Experiment « BEST »			Trial #1	Trial #2	Trial #3	Average
Water		Type				
Light		Number of seeds				
Temperature		Number of sprouts				

a.On average, how many sprouts did you end up with under these conditions? How does the average value compare to the measurements you made in previous experiments? Explain.