Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Class:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Student Worksheet**

***What are the changes that take place in developing Clarkia unguiculata seedlings?***

***(Cultivating Clarkia unguiculata in the classroom)***

**Safety**

Always be careful when handling sharp objects and any type. chemical.

**Introduction**

Your team has been hired to investigate the effects of climate change on flowering plants. Your team leader (your teacher) will show you a video of how seeds develop into a seedling. You and your partner’s task is to grow and observe a Clarkia Unguiculata from a seed to its flowering stage. Each stage of development must be carefully observed and noted. The flowers that develop will later be used in the second part of this experiment. Good Luck!

**Question:** What are the changes that take place in a seed as it develops into a flowering plant?

**Materials**

* 5-10 Clarkia seeds
* Petri dish
* Ruler
* scissors
* masking tape
* electronic scale
* Wooden sticks
* Plastic cup
* Potting soil
* pen/pencil
* 3 fertilizer pellets(optional)

**Design Challenge:**

Draw a diagram of a seedling developing and label each of its parts (p.621).

Why do you think this design will mix the two colors?

**Procedure A (Day 1-5)**

1. Obtain a clean petri dish from your instructor.
2. Using masking tape or a marker put your name and your partner’s name on both sides of your petri dish.
3. Trace a circle the size of your petri dish on a folded paper towel.
4. Draw a + on your towel dividing it into four sections and number the sections 1-4. Place the towel in the bottom side of your petri dish.
5. Thoroughly wet the paper with a spray water bottle or squirt water bottle. But be careful not to over water.
6. Place one seed in each of the grids that you drew on the paper towel.
7. Weigh your petri dish and write down the initial weight in your data table.
8. Place the cover on the petri dish. Place the petri dish where your teacher designated for your class.
9. Each day from today forward you must observe and weigh your seeds and write down all your observations.

**Record Your Observations** (more copies of this data sheet may be required)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Seed #s** | **Length(mm)** | **Weight(g)** | **Observations (color, shape, texture, etc.)** |
| **10/9** |  | **0** | **25g** | **Small, black, roundish, rough** |
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**Procedure B (Day 6-15)**

1. Obtain a cup from your instructor and put your name and your partner’s name on it with masking tape.
2. Fill the cup to about ½ an inch from the top with potting soil. Gently wet the soil with your water bottle.
3. Take a pencil and make a hole about one inch in depth in the center of the potting soil.
4. Once your seedling has reached an acceptable length it is time to transfer it to a cup with soil. It should be at least one to two inches in length and no longer able to fit in the petri dish.
5. Carefully select one or two of your seedlings and using your tweezers pick up your seedlings from the stem. Place only the roots of your seedling inside the one inch hole (Be sure not to damage the roots).
6. Now gently cover the roots with soil. Water your plant, measure it and weigh it. This last procedure should now be repeated every day at the same approximate time.

**Analyze the Results**

1. What percentage of your original seeds actually germinated? Why do you think you got this result? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What could you have done differently to obtain better results?

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**Draw Conclusions**

1. Where you able to get any of your seeds to germinate? Explain why you think they did, or why they did not? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. What where some of the changes that you were able to observe in your seeds?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What was the purpose of the petri dish and the paper towels? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Where did the change in the mass or extra mass of your plants come from? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Why is it important to study this type of process in Biology? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Explain how different germination techniques could be useful in other biotechnology applications. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Graph your results for the growth and weight in time on the following grid.

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