

Group Color: \_\_\_\_\_



## How Science Works

Grade 2

Module 2

*Class Question:*

**What variables affect plant growth?**

Scientist (Your Name): \_\_\_\_\_

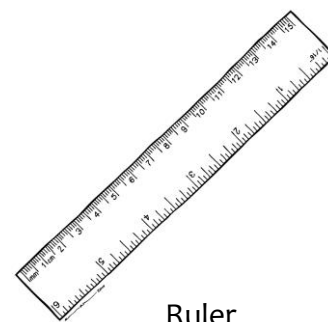
Teacher's Name: \_\_\_\_\_

SciTrek Volunteer's Name: \_\_\_\_\_

## VOCABULARY

**Science:** The study of the material world using human reason. The scientific method is the way humans reason and apply logic to data to help gain knowledge of the world.

- **Observation:** A description using your five senses. This could include contents, mass, size, color, temperature, smell, texture ...
- **Opinion:** Something you believe or feel. Not a fact or observation.
- **Inference:** A guess based on past experiences.
- **Experimental Set-Up:** The materials, changing variable, and controls that are needed for an experiment.
- **Experiment:** A test or trial to discover something unknown.
- **Procedure:** A set of steps to conduct an experiment.
- **Controls:** The variables that are not changed in an experiment.
- **Changing Variable (Independent Variable):** The variable that is purposely changed in an experiment.
- **Results/Data (Dependent Variable):** The measurements/observations of the experiment, which are influenced/determined by the changing variable.
- **Prediction:** What you expect to happen based off of previous measurements/observations.
- **Scientific Practices:** A series of activities that scientists participate in to both understand the world around them and to communicate their results with others. (The specific practice worked on in this module is observations.)
- **Technique:** A method for a specific task.
- **Absorb:** The ability to hold liquid.
- **Soil:** A top layer of earth.
- **Potting Soil:** A soil that contains a majority of dead plant materials with some rocks (sand) and no clay.
- **Vermiculite:** A soil that contains mica (a highly absorbent natural material).
- **Nutrient:** Something that can be added to the soil and/or the water to affect plant growth.
- **Dropper:** A piece of laboratory equipment used to add liquids one drop at a time.
- **Graduated Cylinder:** A piece of laboratory equipment used to measure the volume of a liquid.
- **Milliliter (mL):** A unit of volume used for liquids.
- **Ruler:** Piece of laboratory equipment used to measure the length of an item.
- **Millimeter (mm):** A unit of length.
- **Subtraction:** The amount (difference) between two numbers.



# SCIENTIFIC PRACTICE

## Observations

Observation: A description using your \_\_\_\_\_

Circle OBSERVATION if the statement is an observation you can make about the object. Circle NOT AN OBSERVATION if the statement is not an observation you can make about the object.



- |    |   |             |                    |
|----|---|-------------|--------------------|
| 1. | The object is smaller than a jump rope.       | Observation | Not an Observation |
| 2. | The object is made out of metal.              | Observation | Not an Observation |
| 3. | The object is hotter than boiling water.      | Observation | Not an Observation |
| 4. | The object is <u>simple</u> .                 | Observation | Not an Observation |
| 5. | The object has a pointed end.                 | Observation | Not an Observation |
| 6. | The object can be twisted at one end.         | Observation | Not an Observation |
| 7. | The object has been used to write many words. | Observation | Not an Observation |

Circles are your initial thought and boxes are the correct answer.
--

First choose/circle the factor that you would like to experiment with. Then, within that row, circle what you would like your changing variable to be. Finally, circle the measurement you will make.

Factor	Changing Variable	Measurement
Liquid	Water Amount	Plant Height (mm)
	Nutrient Amount	
Light	Light Amount	Plant Height (mm)

## QUESTION

Question our group will investigate:

- If we change the \_\_\_\_\_,  
insert changing variable (independent variable)  
 what will happen to the amount of plant growth?  
what you are measuring (dependent variable)

Fill out the materials page with your SciTrek volunteer before moving onto the experimental set-up.

## EXPERIMENTAL SET-UP

Changing Variable: \_\_\_\_\_

**Controls** (variables you will hold constant):

Write your controls and the values you will use in all your trials (control/value, Ex: seed type/fast plant).

Seed Type	/	Fast Plant	
_____		_____	_____
_____	/	_____	_____
_____		_____	_____
_____	/	_____	_____
_____		_____	_____

## TECHNIQUE

### *Rulers*

Rulers are used to measure lengths of different items.

*How to measure an item using a ruler:*

1. Line up the zero mark on the ruler with one end of the item.
2. Follow the item down the ruler.
3. Record the measurement to the nearest whole number on the ruler at the other end of the item.
4. Repeat.

What is the height and width of each item?

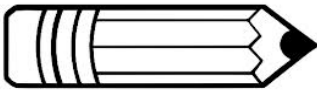
1.



Height: \_\_\_\_\_

Width: \_\_\_\_\_

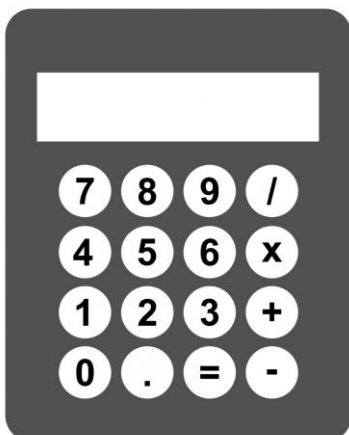
2.



Height: \_\_\_\_\_

Width: \_\_\_\_\_

3.



Height: \_\_\_\_\_

Width: \_\_\_\_\_


## PROCEDURE

Step 1	Step 2
Step 3	Step 4
Step 5	Step 6

## RESULTS

### Table

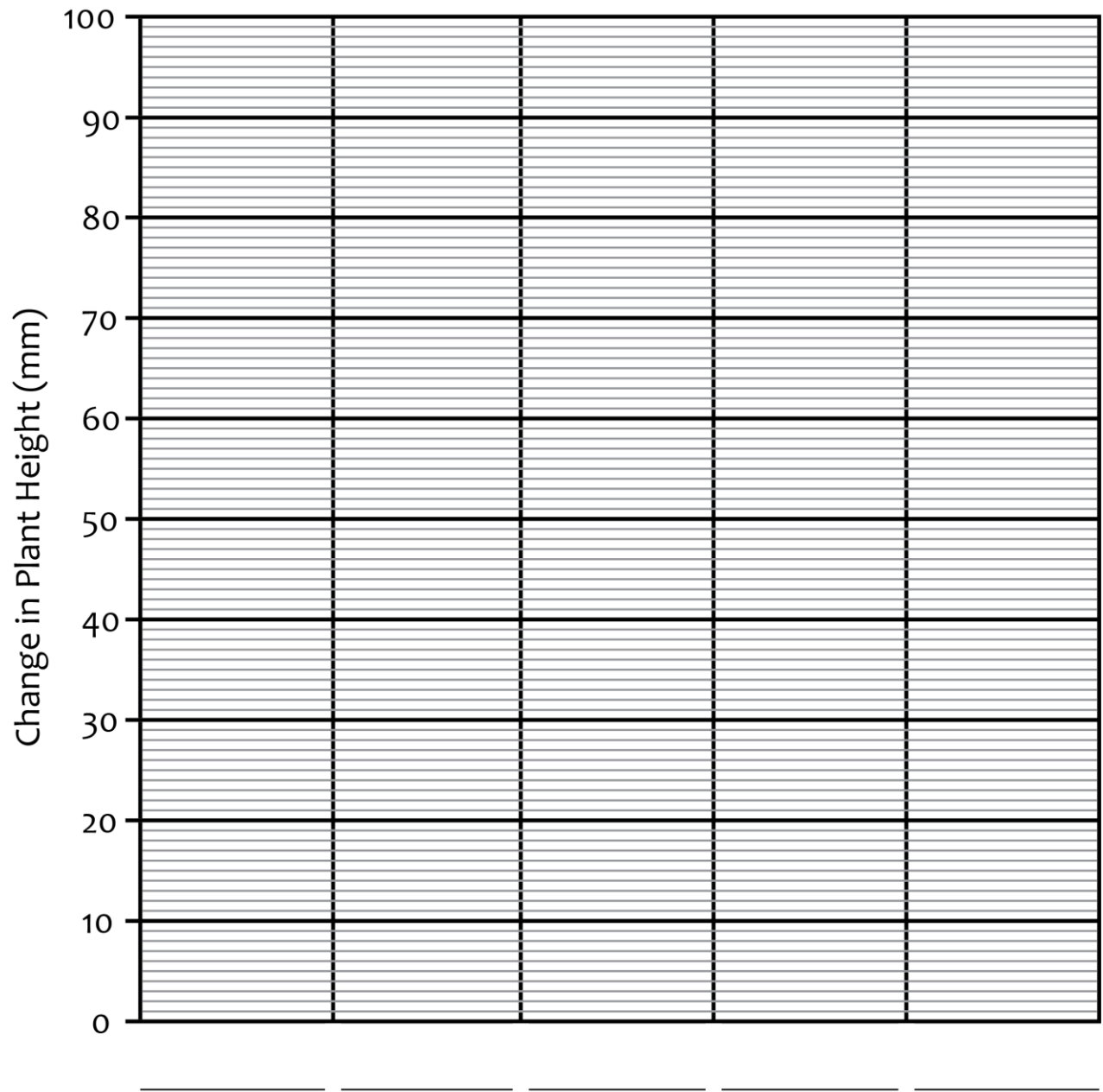
Fill out the table for each of your trials. For the variables that remain constant, write the value in *Trial A*. Then, draw an arrow through each box to indicate the variable is a control.

Variables		Trial A	Trial B	Trial C	Trial D	Trial E
Seed Type:		<i>Fast Plant</i>				
Soil Type:						
Liquid Amount:						
Light Amount:						
Nutrient Type:						
Nutrient Amount:						
Time:						
Data		Trial A	Trial B	Trial C	Trial D	Trial E
Measurements:	Initial Plant Height:					
	Final Plant Height:					
	Change in Plant Height:					
Observations:	Other:					

The independent variable is the changing variable and the dependent variables are the final measurements/observations.

## RESULTS

### Graph and Summary



My experiment shows \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



I acted like a scientist when \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### TIE TO STANDARDS

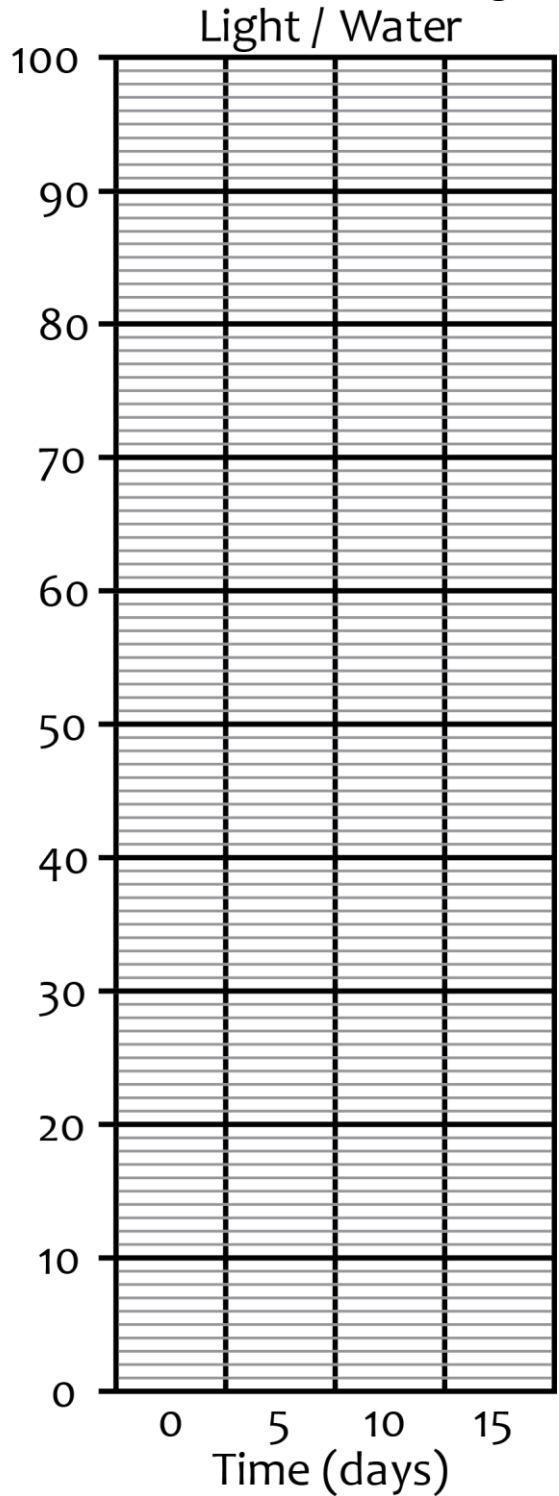
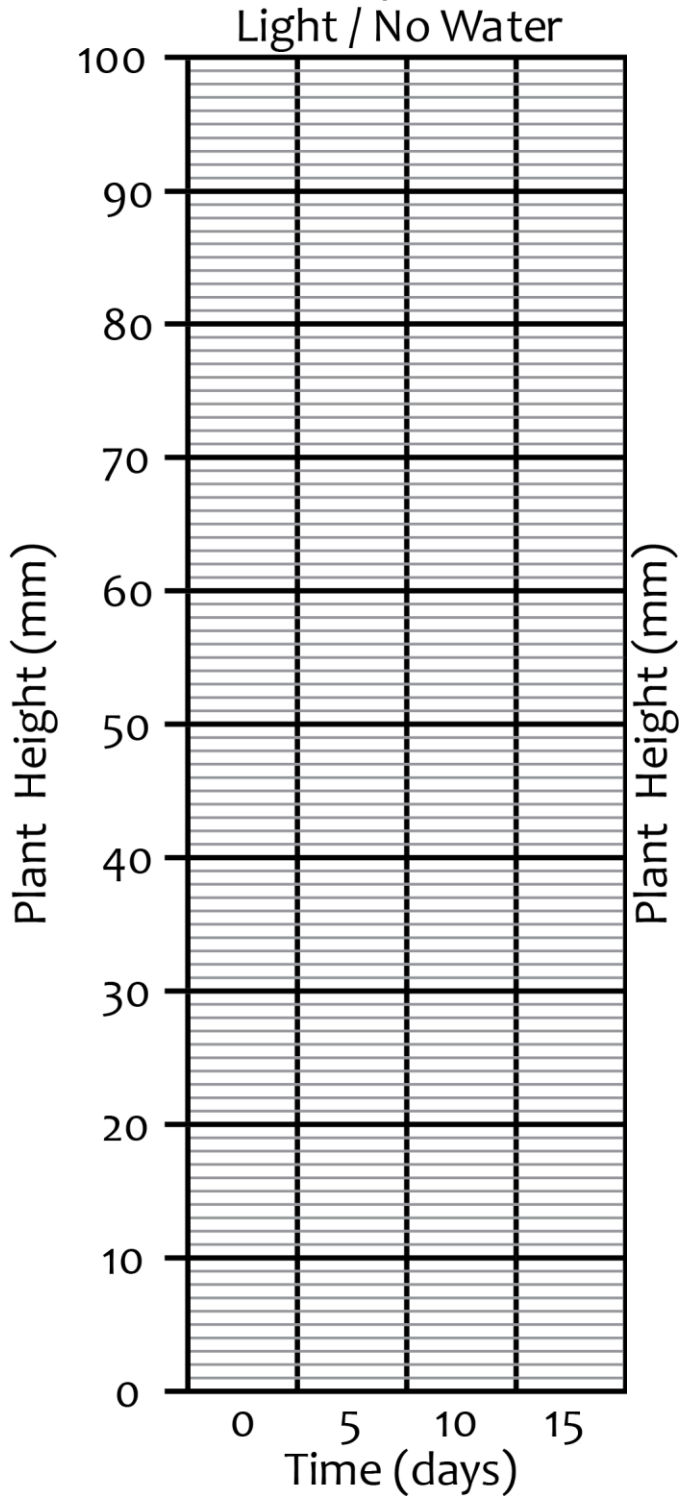
1. Is plant growth predictable?

You would like to grow the tallest plant, circle the values below that would allow you to do this. If the variable does not affect how tall the plant will grow then circle either.

Variable	Option 1	Option 2	Either
Soil Type:	Gravel	Potting Soil	Either
Water Amount (in Bottom Cup):	100 mL	200 mL	Either
Nutrients (Salt) Amount:	None	50 mL	Either

2. Do plants grow in the light?

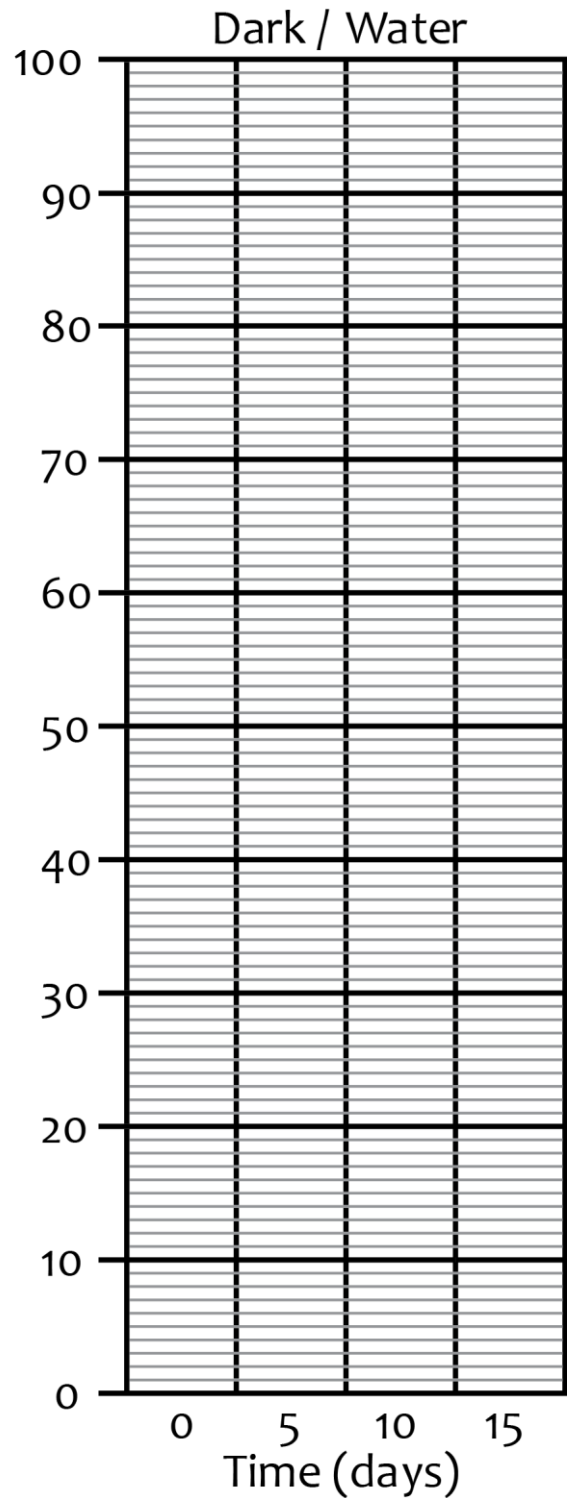
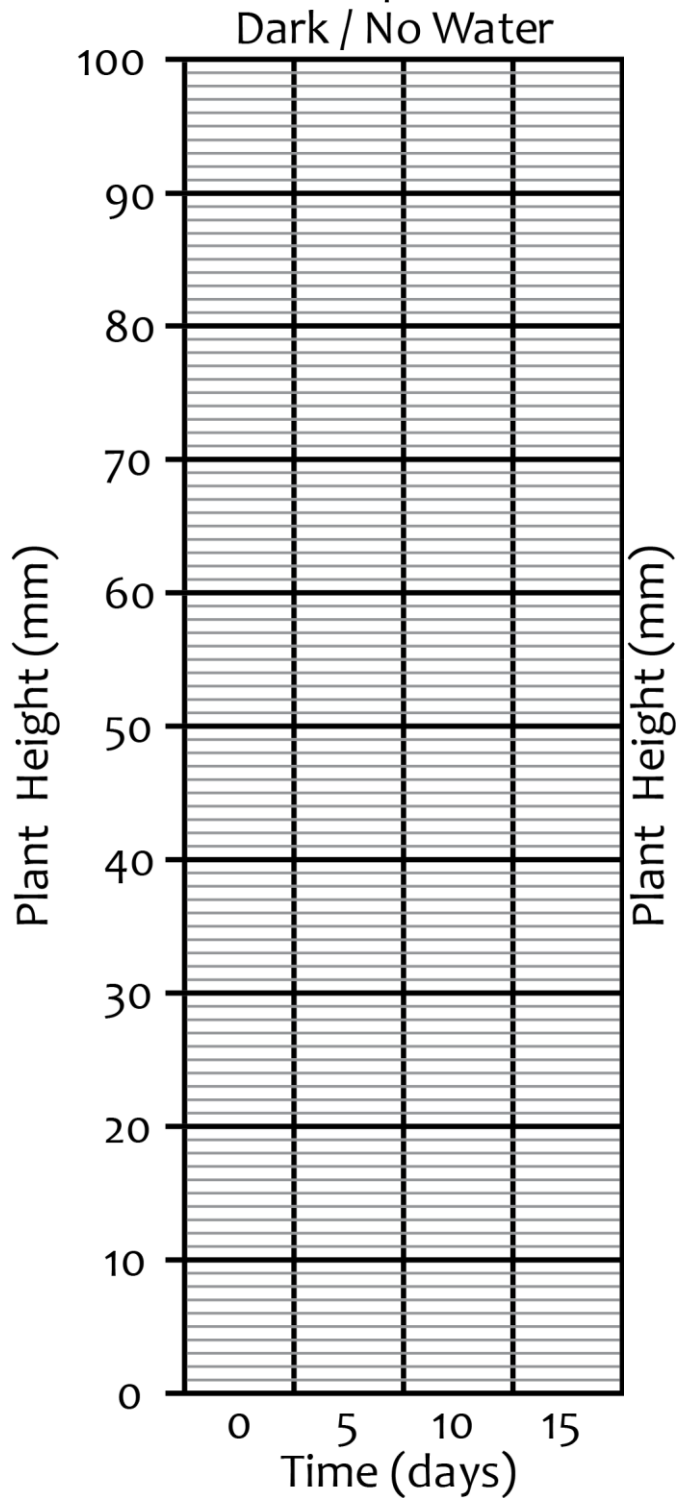
Plot the data for the plants with water and with no water in the light.



3. What did plants in the light need to grow? \_\_\_\_\_

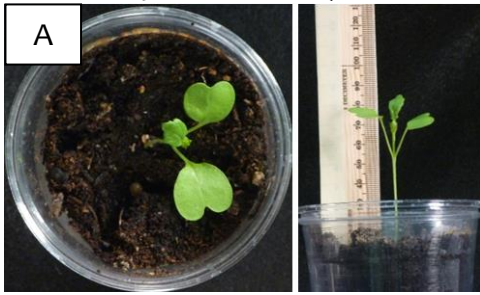
4. Do plants grow in the dark?

Plot the data for the plants with water and with no water in the dark.

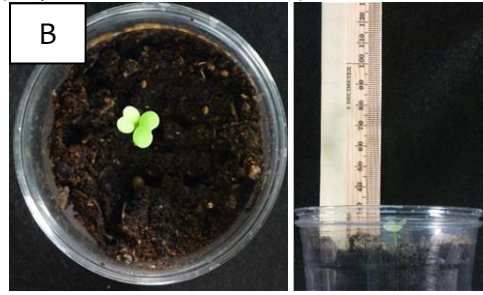


5. What did plants in the dark need to grow? \_\_\_\_\_

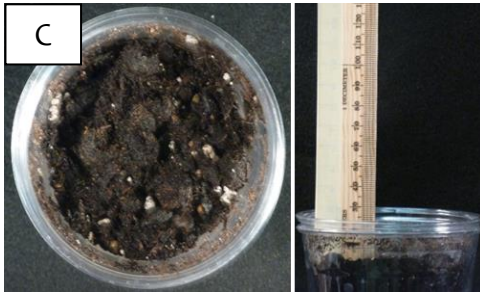
6. Label the following picture of plants in the light with water with the correct day number (0, 5, 10, or 15 days) on which they were taken.



Day \_\_\_\_\_



Day \_\_\_\_\_



Day \_\_\_\_\_



Day \_\_\_\_\_

7. Label the following picture of plants in the dark with water with the correct day number (0, 5, 10, or 15 days) on which they were taken.



Day \_\_\_\_\_



Day \_\_\_\_\_



Day \_\_\_\_\_



Day \_\_\_\_\_

8. Is water or light more important for plant growth?

WATER

LIGHT

9. Which would you predict to be taller at day 10, a plant in the light with water or a plant in the dark with water?

DARK

LIGHT

10. Which would you predict to be healthier (greenest and more leaves) at day 10, a plant in the light with water or a plant in the dark with water?

DARK

LIGHT

11. What conditions are needed in order for plants to live the longest life?

\_\_\_\_\_

12. What is a variable? \_\_\_\_\_

\_\_\_\_\_

13. What other variables might affect plant growth? (List at least 2)

1. \_\_\_\_\_

2. \_\_\_\_\_

## EXTRA PRACTICE

### Observations

Observation: A description using your \_\_\_\_\_

Circle OBSERVATION if the statement is an observation you can make about the picture. Circle NOT AN OBSERVATION if the statement is not an observation you can make about the picture.



- |    |   |             |                    |
|----|---|-------------|--------------------|
| 1. | The boy is smiling.                                   | Observation | Not an Observation |
| 2. | The boy is wearing a black shirt.                     | Observation | Not an Observation |
| 3. | The measuring cup is larger than the oil bottle.      | Observation | Not an Observation |
| 4. | Cooking is exciting.                                  | Observation | Not an Observation |
| 5. | There are equal number of measuring cups and bottles. | Observation | Not an Observation |
| 6. | The boy's hair is black.                              | Observation | Not an Observation |
| 7. | The boy is making something to eat.                   | Observation | Not an Observation |

## WORD SEARCH

N O I N I P O R P T P W  
 E Q P S Y L V U O N R N  
 O C A Q T U G L T E E O  
 W N N G Y E O E T I D I  
 D F I E N J R R I R I T  
 E X P E R I M E N T C A  
 D R O P P E R P G U T V  
 A B S O R B F Y S N I R  
 S T L U S E R N O O O E  
 R E T E M I L L I M N S  
 S C I E N C E W L X O B  
 E T I L U C I M R E V O

Absorb  
 Dropper  
 Experiment  
 Inference  
 Millimeter

Nutrient  
 Observation  
 Opinion  
 Prediction  
 Potting Soil

Results  
 Ruler  
 Sand  
 Science  
 Vermiculite



SciTrek is an educational outreach program that is dedicated to allowing 2<sup>nd</sup> - 12<sup>th</sup> grade students to experience scientific practices firsthand. SciTrek partners with local teachers to present student-centered inquiry-based modules that not only emphasize the process of science but also specific grade level NGSS performance expectations. Each module allows students to design, carry out, and present their experiments and findings.

For more information, please feel free to visit us on the web at [chem.ucsb.edu/scitrek/](http://chem.ucsb.edu/scitrek/) or contact us by e-mail at [scitrekelementary@chem.ucsb.edu](mailto:scitrekelementary@chem.ucsb.edu).

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