

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



## How Science Works

Grade 2

Module 1

*Class Question:*

**What variables affect how much liquid a soil can absorb?**

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.
- **Sand:** A soil that contains very small pieces of rocks.
- **Vermiculite:** A soil that contains mica (a highly absorbent natural material).
- **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.
- **Subtraction:** The amount (difference) between two numbers.
- **Compact:** To put force on something to make it smaller.
- **Loose:** Not fit together tightly/closely.
- **Engineer:** A person that uses their understanding of science to design things that can solve problems.
- **Landslide:** When part of a mount of cliff falls down. This usually happens after rainstorms.
- **Slope:** A measure of the steepness of a line, hill, or other object
- **Soil Consistency:** The ability of soil to stick to itself.



Graduated  
Cylinder

## Technique

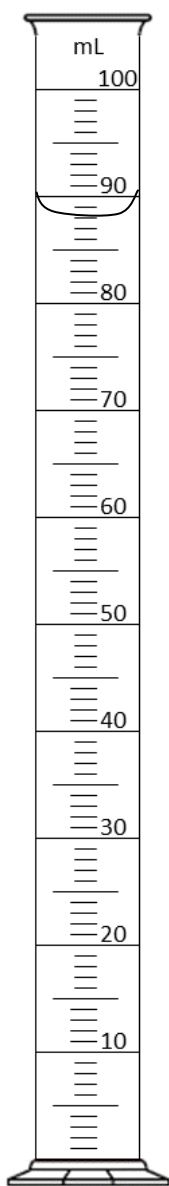
### Graduated Cylinders

Graduated cylinders are used to measure volumes of liquids.

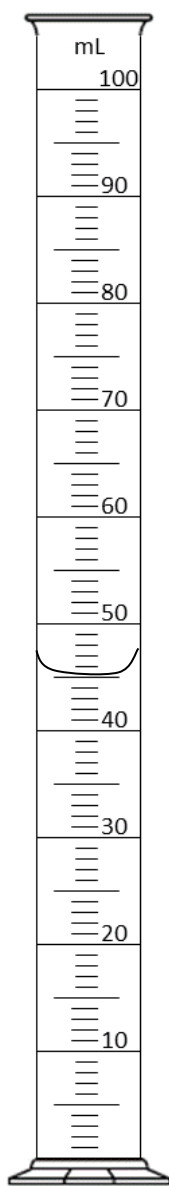
How to read a graduated cylinder:

1. Put your finger on the bottom of the dip also known as the meniscus.
2. Move your finger down to the next labeled number.
3. Count up to the meniscus.
4. The final volume is the sum of the labeled number and the counted number.

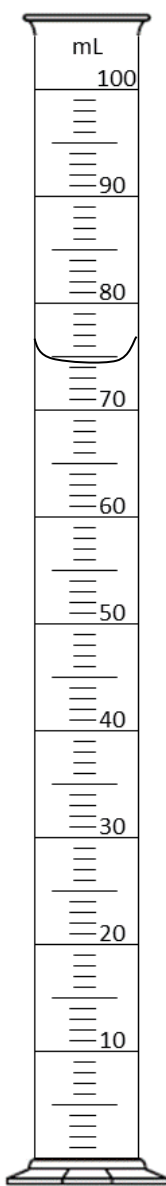
How much water is in each graduated cylinder?



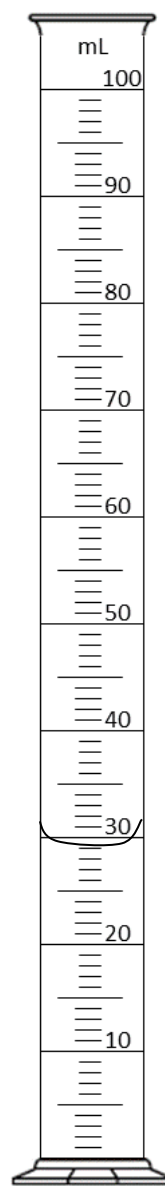
**A**



**B**



**C**



**D**

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## 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 lighter than a bowling ball. | Observation | Not an Observation |
| 2. | The object is only one color.              | Observation | Not an Observation |
| 3. | The object is thicker than a broom handle. | Observation | Not an Observation |
| 4. | The object is silly.                       | Observation | Not an Observation |
| 5. | The object has lines.                      | Observation | Not an Observation |
| 6. | The object can be bent so both ends touch. | Observation | Not an Observation |
| 7. | The object came from the grocery store.    | Observation | Not an Observation |

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
Soil	Soil Amount Soil Type	Liquid Amount (mL)
Liquid	Liquid Thickness	Liquid Amount (mL)

### QUESTION

Question our group will investigate:

- If we change the \_\_\_\_\_,   
insert changing variable (independent variable)  
 what will happen to the amount of liquid that the soil absorbs?  
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: container type/cup).

Container Type / Cup	/
/	/

## PROCEDURE

Step 1

Step 2

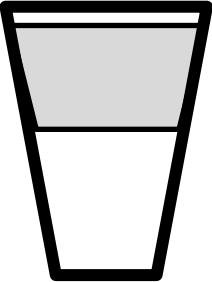
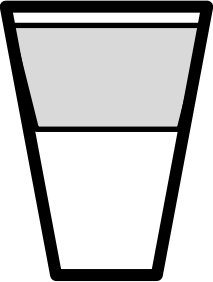
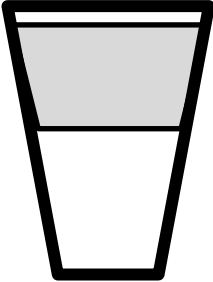
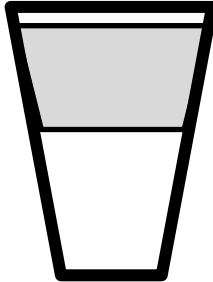
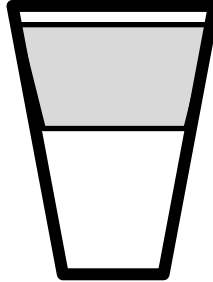
Step 3

Step 4

## RESULTS

*Table*

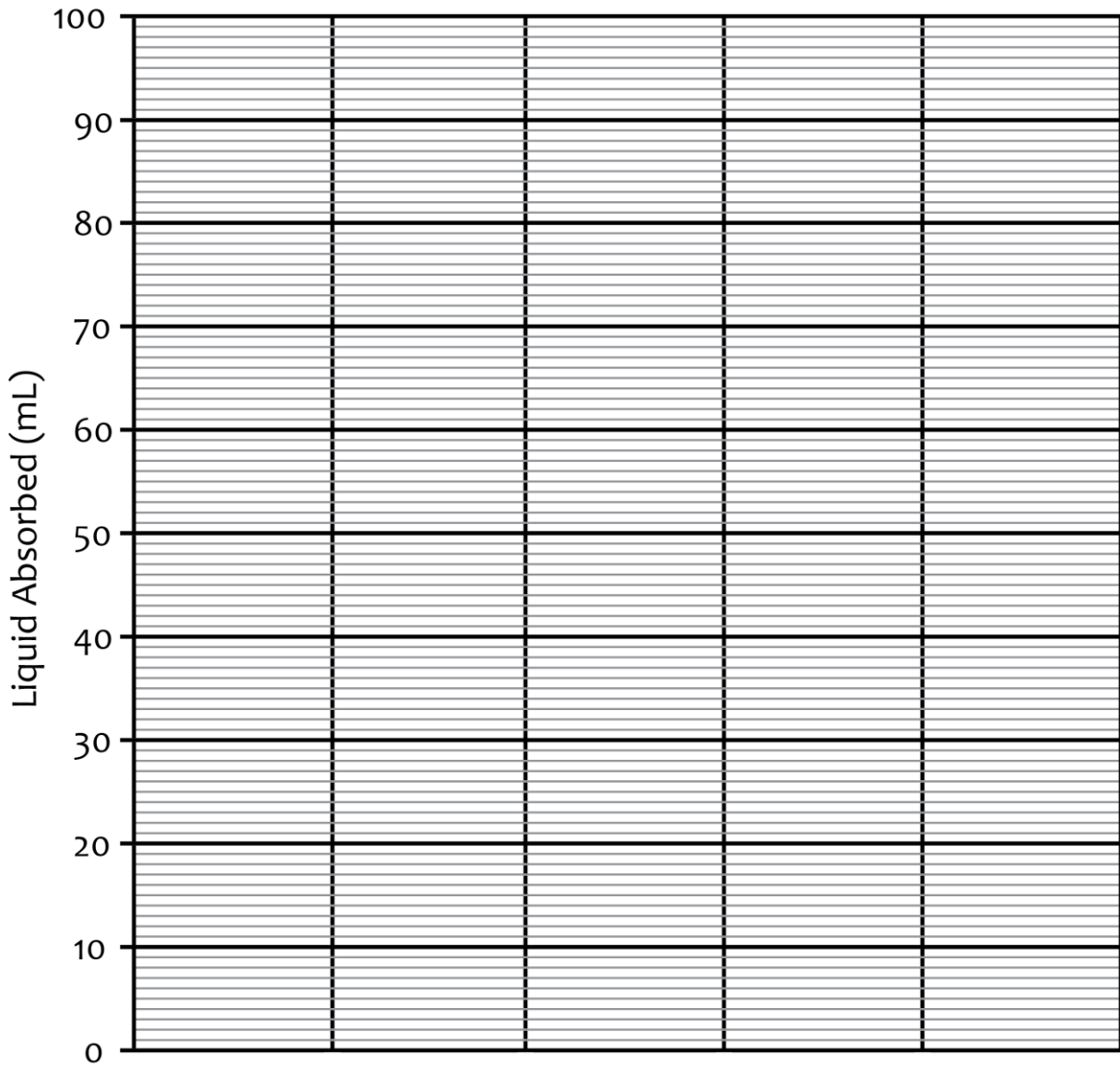
Fill out the table for each of your trials. For the variables that remain constant, write the value in trial A. Then, draw an arrow through each box to indicate the variable is a control.

Variables		Trial A	Trial B	Trial C	Trial D	Trial E
Container Type:		<b>Cup</b>	→			
Soil Type:						
Soil Amount:						
Liquid Thickness:						
Liquid Amount:						
Data		Trial A	Trial B	Trial C	Trial D	Trial E
Measurements:		Fill in the amount of liquid in the large cup and the amount of liquid absorbed by the soil.				
	Liquid Amounts (mL):					
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 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

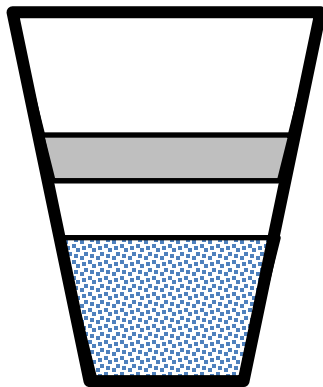


I acted like a scientist when \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

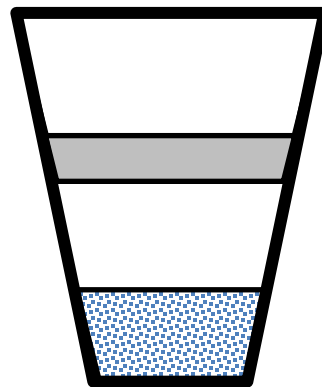
### TIE TO STANDARDS

1. Absorb: The ability to \_\_\_\_\_ liquid.
2. 100 ml of water was poured over each cup, circle the soil that absorbed the most liquid.

**A**

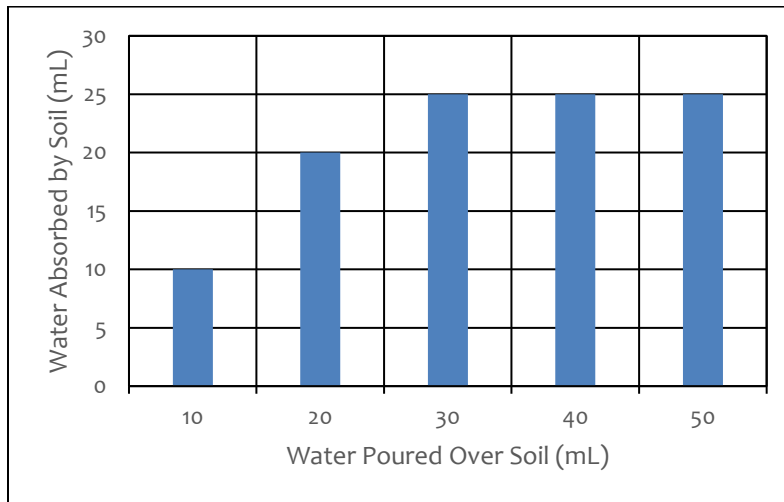


**B**



3. The <sup>Heavier</sup> the soil the more likely a landslide.  
<sub>Lighter</sub>
4. Read Finding 1 from the poster.

Possible Factor 1: Liquid Amount (for 1 small cup of potting soil)



5. Is there a limit to the amount of water that soil can absorb?

YES

NO

6. 1 small cup of potting soil can hold \_\_\_\_\_ of water.

7. How much water can 2 cups of soil absorb? \_\_\_\_\_



8. Adding water to soil makes the soil \_\_\_\_\_ .  
Heavier  
Lighter

9. The \_\_\_\_\_ water in the soil the more likely a landslide.  
More  
Less

10. Read Finding 2 from the poster.

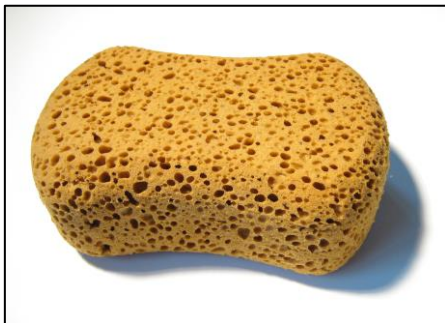
Possible Factor 2: Soil Type

11. Label the following soil types from least to most absorbent. Label the least absorbent soil as 1 and the most absorbent soil as 3.

\_\_\_\_\_ Small Rocks      \_\_\_\_\_ Large Rocks      \_\_\_\_\_ Sand

12. \_\_\_\_\_ affects how much water a soil type can absorb.

13. Sand holds <sup>More</sup> water than large rocks making wet sand <sup>Heavier</sup> than wet large rocks which results in wet sand having <sup>Less</sup> landslides than wet large rocks.



14. \_\_\_\_\_ affects how much water a soil type can absorb.

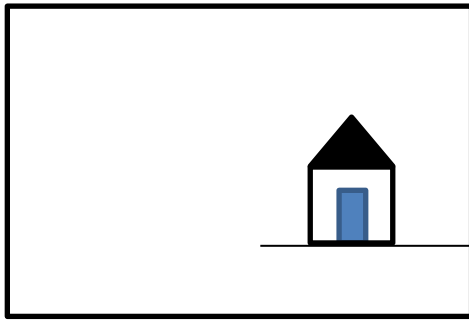
15. Vermiculite holds <sup>More</sup> water than sand making wet vermiculite <sup>Heavier</sup> than wet sand, which results in wet vermiculite having <sup>Less</sup> landslides than wet sand.

16. Read Finding 3 from the poster.

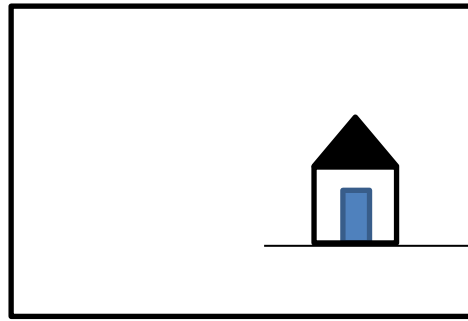
Other Possible Factors:

17. Another factor that affects landslides is the \_\_\_\_\_ of the soil.

18. Draw a picture where a landslide is more and less likely to happen



Landslide More Likely to Happen

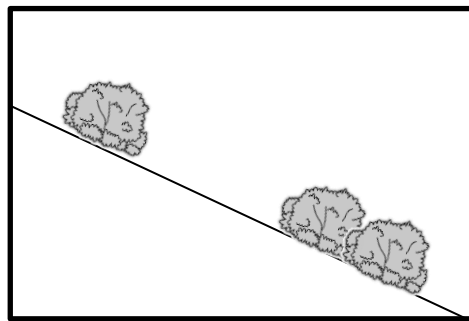


Landslide Less Likely to Happen

19. The \_\_\_\_\_ the slope the more likely a landslide.

20. Read Finding 4 from the poster.

21. Draw a picture of why plants help prevent landslides.



22. Another factor that affects landslides is the ability of soil to \_\_\_\_\_

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23. The more plants the \_\_\_\_\_ the soil sticks to itself, the \_\_\_\_\_ the soil  
 Weaker \_\_\_\_\_ Weaker  
 consistency and the \_\_\_\_\_ likely a landslide.  
 More \_\_\_\_\_  
 Less \_\_\_\_\_

24. Read Finding 5 from the poster.

*Possible Ways to Prevent Landslides*



25. What factor does this address? \_\_\_\_\_



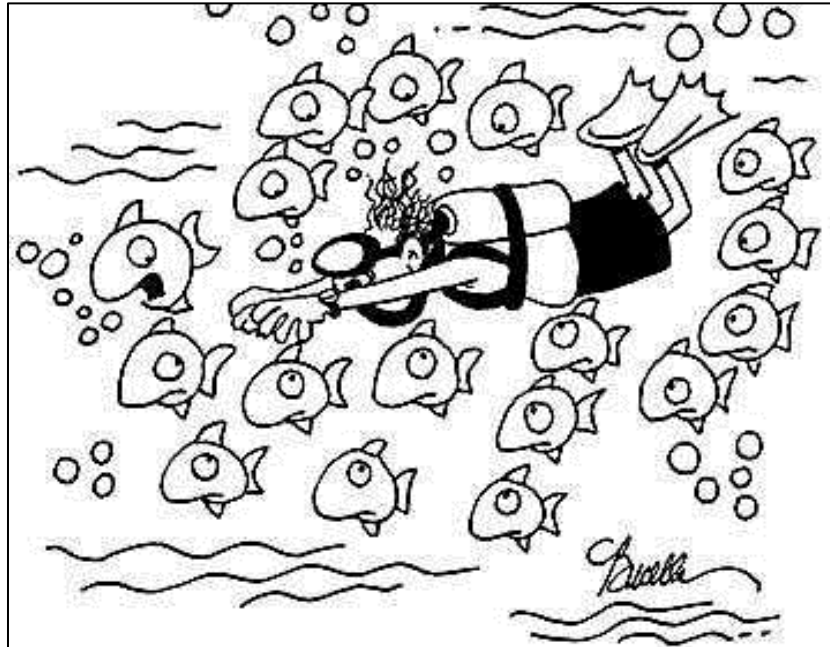
26. What factor does this address? \_\_\_\_\_

## 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 person is wearing a diving mask.  | Observation | Not an Observation |
| 2. | The fish only have one fin each.      | Observation | Not an Observation |
| 3. | The person is smaller than a fish.    | Observation | Not an Observation |
| 4. | Snorkeling is fun.                    | Observation | Not an Observation |
| 5. | There are more fish than people.      | Observation | Not an Observation |
| 6. | The person's shorts are black.        | Observation | Not an Observation |
| 7. | The person and fish are in the ocean. | Observation | Not an Observation |

## WORD SEARCH

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

Absorb  
Dropper  
Engineer  
Experiment  
Inference

Landslide  
Milliliter  
Observation  
Opinion  
Procedure

Sand  
Science  
Soil  
Subtraction  
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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