

# Investigating Soil

## Student Activity Sheet

Name: \_\_\_\_\_

Date: \_\_\_\_\_

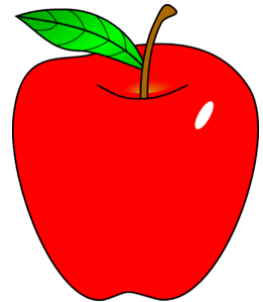
### Part 1: The Importance of topsoil - Earth as an Apple

Define: Topsoil \_\_\_\_\_

Predict: What percentage of the earth's surface is covered by topsoil? \_\_\_\_\_%

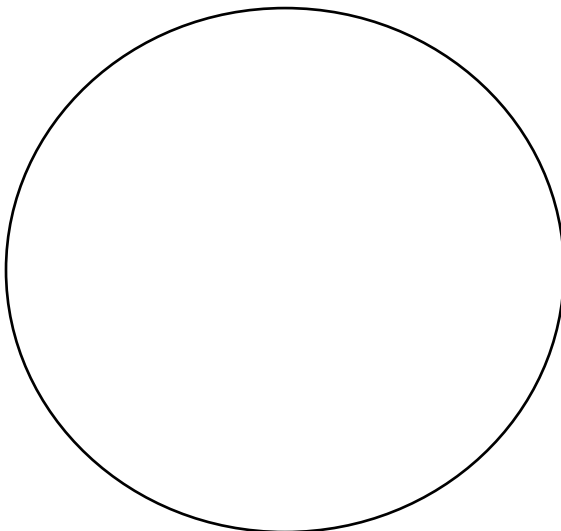
Answer:

1. Consider the prediction you made at the beginning of this demo, were you surprised to see how much of the earth crust was topsoil? Why or why not.
2. Why is it important to make sure we protect the topsoil?
3. What will happen if we don't maintain the health of our topsoil?



### Part 2: So what is topsoil made of?

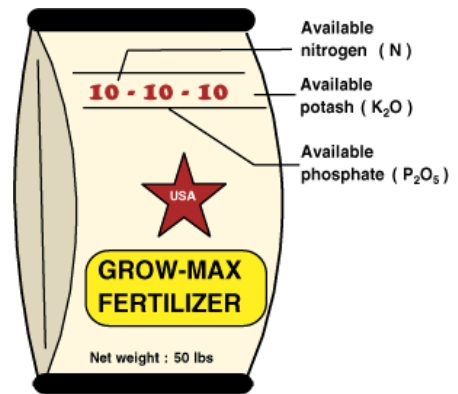
Create a pie chart to show the percentage of each component in healthy soil. Use the boxes to the right to create a legend.



<input type="checkbox"/>	_____
<input type="checkbox"/>	_____
<input type="checkbox"/>	_____
<input type="checkbox"/>	_____

### Part 3: What are the main *elements* in the topsoil that are responsible for plant growth?

When you are looking at a bag of fertilizer it lists the amount of Nitrogen, Phosphate and Potassium in that order. A bag of 10-10-10 fertilizer contains 10 percent Nitrogen, 10 percent Phosphate (phosphorus) and 10 percent Potash (potassium)



Because these are the three primary nutrients in soil, when you're buying potting soil you should also see them written on the bag. What percentage of each nutrient is found in this bag of potting mix?

\_\_\_\_\_ N      \_\_\_\_\_ P      \_\_\_\_\_ K

### Part 4: Testing for N, P, K and pH

#### Materials

- pH Testing tube (green cap)
- N Testing tube (purple cap)
- P Testing tube (blue cap)
- K Testing tube (orange cap)
- 3 green capsules
- 3 purple capsules
- 3 blue capsules
- 3 orange capsules
- 4 plastic droppers
- Distilled water
- Soil 1
- Soil 2
- Soil 3
- Soil solution 1
- Soil solution 2
- Soil solution 3
- Stopwatch or some other time keeping device

**Procedure:**

1. Clear your table of everything except for this activity booklet and a pen or pencil.
2. Collect the testing tubes, the capsules and the droppers and bring them to your desk.
3. Label the droppers with H<sub>2</sub>O, soil 1, soil 2 and soil 3. Be sure not to interchange them.

**pH**

4. Remove the cap of the green capped tube and fill with soil sample 1 to the first line.
5. Carefully empty the contents of one green capsule into the test chamber.
6. Using a dropper, add distilled water to the fourth line.
7. Secure the lid tightly and then shake for 15 seconds.
8. Allow the soil to settle and the color to develop for 1 minute.
9. Compare the color of the solution against the pH chart and record your results in the observation table.

**N, P, and K Test**

10. Remove the cap of the purple testing tube and using the dropper labelled soil 1, fill the tube with Soil Mixture 1 to the 4<sup>th</sup> line.
11. For the Nitrogen test, carefully pour the contents of one purple capsule into the test chamber.
12. Secure the lid tightly and then shake them sample thoroughly.
13. Allow the color to develop for 10 minutes and then record your results in the observation table.
14. While you wait for the color to develop, use the same procedure for the P Test (blue tube and blue capsule) and the K Test (orange tube and orange capsule).
15. Repeat all 4 tests for soil samples 2 and 3. Record all of your results in the observation table.

**\*\*\*while you wait for the color to develop, you can read the Natural Resources Fact Sheets for Nitrogen, Phosphorus and Potassium and fill in the table in Part 5.**

Observations:

Sample	Location	Soil Description	pH	Nitrogen	Phosphorus	Potassium
1						
2						
3						
bonus						

Describe the conditions (pH, N, P and K) for each of the soils that you tested:

Soil 1: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Soil 2: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Soil 3: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Bonus soil: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Part 5: Nutrient Facts

Read the Natural Resources Fact Sheets for Nitrogen, Phosphorus and Potassium and fill in the table below:

Nutrient	How is it used by the plant?	Where does it come from?	What forms can it be found in?	What are the main countries producing it?
Nitrogen				
Phosphorus				
Potassium				

## Part 6: What happens to plants if the soil conditions aren't right?

As you saw in Part 4, sometimes there's not enough of a particular nutrient in the soil. This means that the plants become deficient and can't grow properly. The following table shows some of the symptoms you might notice. Use it to answer the questions below:

Nutrient	Deficiency	What to look for in a fertilizer?
Nitrogen	General yellowing of leaves, stunted growth, often the older (bottom of the plant) leaves are affected first. The rest of the plant is often light green.	Anything with the words "ammonium", "nitrate", "urea" or "manures".
Phosphorus	Difficult to visualize until severe. Dwarfed or stunted plants. Leaf tips look burnt, and older leaves turn dark green or reddish purple	Anything with the words "phosphate" or "bone".
Potassium	Older leaves may wilt or looked scorched. Yellowing between veins begins at the base of the leaf and goes inward from the leaf edges.	Anything with the words "potassium" or "potash".

\*\*\* Note: in this activity we are only looking at 3 of the nutrients that affect plant growth, there are many more macro and micronutrients that can cause deficiencies that may look similar!

- Plants need the correct pH because it controls how well the plants use the nutrients in the soil. All plants have a pH preference, here are some examples:

Tomato: 5.5 - 7.5    Lettuce: 6.0 - 7.0    Onion: 6.0 - 7.0    Mint: 7.0 - 8.0

Which of the above plants would do well in:

Soil 1: \_\_\_\_\_

Soil 2: \_\_\_\_\_

Soil 3: \_\_\_\_\_

Soil pH and Interpretation

5.0	5.5	6.0	6.5	7.0	7.5	8.0
Strongly Acid	Medium Acid	Slightly Acid	Neutral	Neutral	Mildly Alkaline	Moderately Alkaline

Best Range for Most Crops

2. For each of the pictures below, identify the nutrient deficiency and make a recommendation of how to fix it:

Nutrient Deficiency 1: \_\_\_\_\_

Recommendations: \_\_\_\_\_

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Nutrient Deficiency 2: \_\_\_\_\_

Recommendations: \_\_\_\_\_

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Nutrient Deficiency 3: \_\_\_\_\_

Recommendations: \_\_\_\_\_

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## Conclusion

Using all the information that you've learned in this activity, what recommendations would you make for the soils that were tested in Part 4 of this activity in order to avoid having these problems with plant growth?

Soil 1: \_\_\_\_\_

\_\_\_\_\_

Soil 2: \_\_\_\_\_

\_\_\_\_\_

Soil 3: \_\_\_\_\_

\_\_\_\_\_

Bonus soil: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_