

Experiment Instructions

Chapter 15- Mud Matters - The Science of Soils

Gather Your Materials and Mark Below

- | | |
|---|--|
| <input type="checkbox"/> Soil Test Kit | <input type="checkbox"/> pH Test Strips |
| <input type="checkbox"/> Clear Jars with Lids | <input type="checkbox"/> Measuring Cups or Beakers |
| <input type="checkbox"/> Plastic Spoons | <input type="checkbox"/> Hand Trowel |
| <input type="checkbox"/> Distilled Water | <input type="checkbox"/> Ruler |

Overview

Detailed instructions found on student lab pages

Part 1: Collect and Label

Start by gathering your materials and collecting soil samples from different places. Use a hand trowel and be sure to label each sample with the location where it was collected. Try to find samples from different environments like a garden, park, or roadside.

Part 2: Test and Observe

Run three tests on each soil sample:

1. Texture Test: Mix soil with water in a jar, shake it, and let it settle for 24 hours to see the layers of sand, silt, and clay.
2. pH Test: Use pH strips to test how acidic or basic each soil is.
3. Nutrient Test: Use a soil test kit to check for nutrients like nitrogen, phosphorus, and potassium. Record your results in a table and measure any layers you see in the jars.

Part 3: Analyze and Apply

Look for patterns in your data. Which soil had the most nutrients? Which had the highest or lowest pH? What kind of soil might be best for growing plants? Use your findings to draw conclusions and think about how this information could be useful in real-world situations like gardening or farming.

▶ **Title** _____ **Date** _____

▶ **Objective** _____

▶ **My Question** _____

▶ **Materials**

Check your materials and make sure you have everything you need

☐ Soil Test Kit

☐ Measuring Tape or Ruler

☐ Clear Jars with Lids

☐ Distilled Water

☐ Plastic Spoons

☐ pH Test Strips

☐ Measuring Cups or Beakers

☐ Hand Trowel

▶ **Experiment: Test, Tinker, Try**

▶ **Step 1 : Gather Your Materials**

- Make sure you have all the materials laid out on a clean, flat surface within easy reach. Check that everything is in good condition and ready to use.

▶ **Step 2 : Collect Soil Samples**

- Use a hand trowel to collect soil samples from different locations. Label each sample with the location it was collected from.

▶ **Step 3: Test Soil Samples**

• **Texture Test:**

- Fill a clear jar with one part soil and two parts distilled water. Shake the jar and let it sit for 24 hours.
- Observe the layers that form: sand at the bottom, silt in the middle, and clay on top. Using the ruler measure the length of each layer and record your results below.

- **pH Test:**

- Use pH test strips to determine the pH of each soil sample.
- Record your results below.

- **Nutrient Test:**

- Follow the instructions on the soil test kit to test for nitrogen, phosphorus, and potassium.
- Record your results below.

▶ Results

▶ Record your results in the table below.

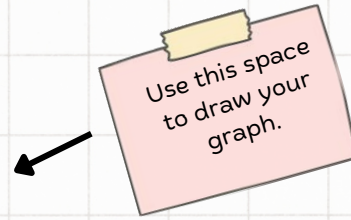
Location	Sand layer (cm)	Silt layer (cm)	Clay layer (cm)	pH	Nitrogen	Phosphorus	Potassium

▶ Analyze Your Data

- Look for patterns in your data. For example, which soil sample has the most nutrients?
- Graph Data:
 - Create a graph to show the relationship between location and pH or sand layer and nitrogen, or phosphorus and clay layer. What do you want to know? Plot the data to look for correlations.

Use the space on the next page to graph your data





► Write Your Conclusions

Summarize Findings:

- Summarize what you found out about the soil in your area.

Mud Matters - The Science of Soils

Materials List:

- Soil Test Kit
- Clear Jars with Lids
- Plastic Spoons
- Distilled Water
- pH Test Strips
- Measuring Cups or Beakers
- Hand Trowel
- Ruler

Objectives:

- Help students understand the different components of soil.
- Teach students how to conduct a soil test.
- Encourage students to ask questions, make observations, and analyze data.

Research:



- Have students review Chapter 15 and note the differences between rocks, minerals and soils. Review that soils are made up of different components, including sand, silt, clay, organic matter, and nutrients and that these components affect how well plants grow.
- Have students note the type of soil where they live and how well or difficult it is to grow plants in their area. Do they live near farmland with rich soil or in a desert with dry soil?

Asking Questions



- **Step 1: Write Down Questions**
 - Encourage students to write down questions they have about soil.
 - **Open-ended:** "How does soil composition affect plant growth?"
 - **Closed-ended:** "Does sandy soil hold more water than clay soil?"
- **Step 2: Improve the Questions**
 - Help students refine their questions. Convert open-ended questions to closed-ended questions and vice versa.
 - **Example:** "How does soil composition affect plant growth?" -> "What effect does the proportion of sand in soil have on plant growth?"
- **Step 3: Prioritize the Questions**
 - Assist students in selecting the most interesting or important questions to explore in the experiment.
- **Step 4: Record Your Question**
 - Have students write down their prioritized question in their notebooks.

Test, Tinker, Try



- **Step 1: Gather Materials**
 - Have students gather the materials they need for testing soils.
- **Step 2: Collect Soil Samples:**
 - Have students use a hand trowel to collect soil samples from different locations. This would be a great opportunity to take a hike or drive to different locations collecting samples from different areas. Ensure they label each sample with the location it was collected from.
- **Step 3: Test Soil Samples:**
 - **Texture Test:**
 - In a clear jar, mix one part soil with two parts distilled water. Shake the jar vigorously and let it sit for 24 hours.
 - Observe the layers that form: sand will settle at the bottom, followed by silt, and clay on top.
 - **pH Test:**
 - Use pH test strips to determine the pH of each soil sample.
 - **Nutrient Test:**
 - Use a soil test kit to test for nutrients such as nitrogen, phosphorus, and potassium.

Observe and Record

- Have students observe the different layers in the texture test and record their findings.
- Have student measure the length of the different layers.
- Record the pH levels and nutrient levels for each soil sample.
- Have students create a data table for their data.

Analyze



- **Analyze Data:**
 - Guide students to analyze their results. Ask them to look for patterns in the data, such as which soil sample has the most nutrients or the highest pH level.
- **Evaluate Findings:**
 - Help students draw conclusions from their data. For example, they might conclude that soil with a higher sand content drains water faster or that soil with a neutral pH is better for plant growth.
- **Discuss Implications:**
 - Discuss with students how their findings can be applied in real life, such as in gardening or farming.

Draw Conclusions

- o **Have students** revisit their initial hypothesis and discuss whether their data supports it.
- o **Guide students** to summarize their findings in a clear and concise manner. They should explain how force and distance affect the amount of work done.

Share Results

- **Presentations:**



- **Have students prepare presentations** to share their findings with the class. They can use visual aids such as charts and graphs to illustrate their data.

- **Written Reports:**

- **Encourage students** to write a detailed report summarizing their experiment, including their research, question, hypothesis, methods, observations, data analysis, and conclusions.

- **Group Discussions:**

- o **Facilitate a class discussion** where students compare their results and discuss any differences or similarities.

Notes

This image shows a blank sheet of white paper designed for writing. It features a series of evenly spaced horizontal blue lines across its width. A single vertical red line runs down the left side, creating a narrow margin. The paper is otherwise empty, with no text or markings.