Name_____

CASE

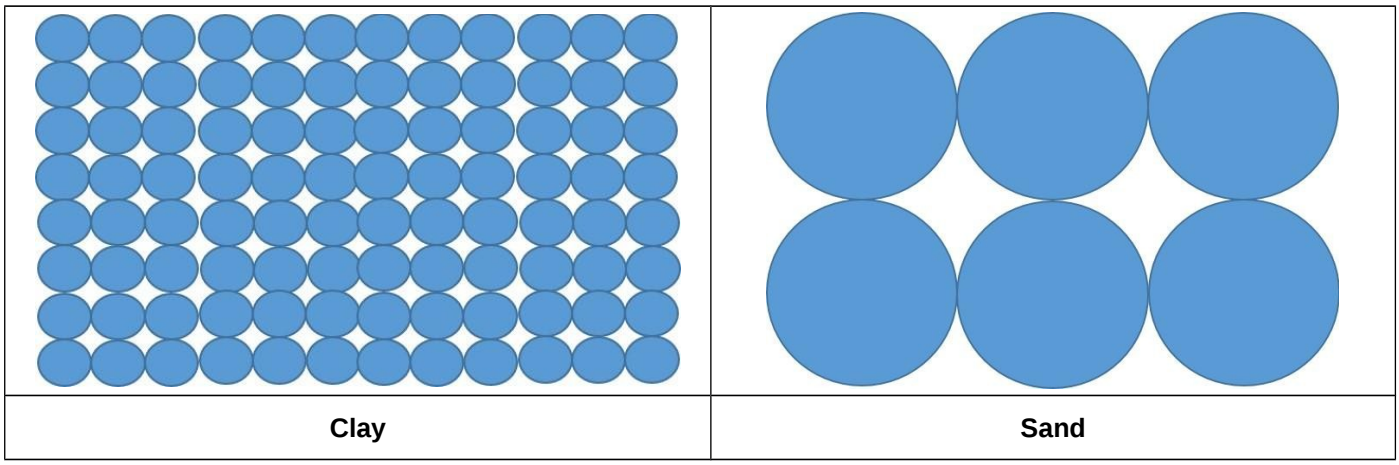
Activity 4.1.2 Extracting Air

Purpose

Just like with any living organism, plant roots need oxygen to survive. How is this possible when plant roots are grown underground? It all depends upon porosity which are pores filled with air or water in the soil structure. Air is one of the four components that make up soil.

The size and number of pores are dependent upon a number of factors including mineral size, organic matter and compaction of the soil. Smaller pores will have the capability of holding water for a longer time, while larger pores allow water to flow freely through. Soils with a larger proportion of clay, which are very small in size, will have more small pores for holding water than soils with a larger proportion of sand. See Figure 1.

Organic matter, such as roots, breaks up the soil and provides additional space for air and water. Soils with more porosity are better suited for sustaining plant life. Since soil is filled with pores ranging in all sizes, the pores are hard to see with the naked eye.



Clay	Sand

Figure 1. Mineral Pore Space

What factors affect soil porosity?

Materials

Per pair of students:

- Two clods of soil
- Polyurethane spray can
- Laboratory tape
- Permanent marker
- 2 600ml beakers
- Stopwatch
- Water
- Paper towels

Per student:

- *Agriscience Notebook*
- Pencil

Procedure

Work with a partner to compare the porosity in two different soils.

Part One – Apply Sealant

Take two clods of soil, one from sample A and one from sample B. Make sure both samples are approximately the same size. Be sure the clods fit easily in the beaker. If either one does not, carefully break a small portion away to allow it to fit in the beaker.

Coat both samples with an even coat of polyurethane and set aside to dry. Drying time will require 5 – 10 minutes. While the clods are drying, complete Part Two.

Part Two – Observations and Prediction

1. Observe the features of each clod of soil. Look for organic matter, mineral size, and evidence of compaction.
2. Record the description of each clod in Table 1 of *Activity 4.1.2 Student Worksheet*.
3. Work with your partner to agree upon a prediction for the porosity of the each sample.
4. In the box provided on the student worksheet, formulate and write down a prediction as to which soil sample will have the most pore space. Record your prediction as a complete sentence.

Part Three – Conduct the Experiment

1. Use a permanent marker and laboratory tape to label one 600ml beaker “A” and the other “B”.
2. Pour 375ml of water into each of the 600ml beakers.
3. Once the polyurethane is dry, you and your partner will gently place each clod into the corresponding beakers at the same time. NOTE: Start the stopwatch at the moment the soil is placed into water.
4. Observe the bubbles that emerge from each clod. Record your observations in Table 3 for the time intervals listed. Important observations should be made including how fast and how many bubbles each clod is producing, and when a sample stops bubbling. Each partner will need to be responsible for one of the clods. But, each partner should observe the other clod when possible.

Part Four – Analysis and Clean Up

After recording your observations, answer the analysis questions on the student worksheet. Then dispose of the water and soil, clean and return the equipment, and clean up your workstation according to your teacher’s directions.

Conclusion

1. Why do you think organic matter affects the amount of pore space in soil?

The small the matter, the tighter it is, the less amount of pore space.

2. What are some recommendations you would make for increasing porosity in soils?

I would get smaller dirt and compact it more, so there is less space.

Name_____

Activity 4.1.2 Student Worksheet

Table 1. *Cloud Observations*

Sample A	Sample B
from a field light brown	Dark brown

Table 2. *Prediction*

B will break apart faster than A

Table 3. *Data Observations*

Observations	Sample A	Sample B
:30 check	building a lot	breaking apart
1:00 check	bubbling a little	breaking apart
1:30 check	not changing	a dirt pile
2:00 check	few bubbles	bubbly
2:30 check	staying together	absorbing water
3:00 check	staying together	pieces at the top
3:30 check	staying together	not changing
4:00 check	staying together	not changing
4:30 check	staying together	not changing
5:00 check	staying together	not changing

Analysis Questions

- What do you believe the bubbles represent in the soil?

The bubbles represent the air left in the dirt

- Explain why you believe your prediction was or was not correct about pore space between the two soil samples.

My prediction was correct because the pile dirt fell apart right away and the field took longer than other.

- What do you believe caused the difference in pore space between the two samples?

How compact the dirt was, gave us the results. The tighter it is the less it falls apart.