Name_____

Lab Report Template

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Project 4.2.3 – Buffering Soils

Problem

This experiment will determine which soil texture will have the highest buffering capacity.

Hypothesis

Clay will have the highest buffering capacity compared to Sand and Loam.

Materials

- Vernier pH sensor
- 100 ml buffer solution
- 2 250 ml beakers
- Permanent Marker
- Laboratory Tape
- 3 spoons
- Rinse bottle
- HCl Dropper
- NaOH Dropper
- Stir Rod
- 3 soil samples
- 4 9 oz cups

Procedures

1. Obtain a 250ml beaker with 100ml of buffer solution.
2. Using tape and a permanent marker label the 250ml beaker *buffer solution*.
3. Label the second 250ml beaker *rinse beaker*.
4. Label the cups Loam, Clay, and Sand
5. Set up the LabQuest2 for data collection.
    - Attach the pH sensor to Channel 1.
    - On the *Meter* screen, tap **Mode**. Change the data-collection mode to **Events with Entry**.
6. Enter the *Entry Label* as **drops** and leave the Units field blank.
7. Put three spoonfuls of soil from bucket 1 into the cup labeled loam
8. Put three spoonfuls of soil from bucket 3 into the cup labeled clay
9. Put three spoonfuls of soil from bucket 5 into the cup labeled sand
1. Place 100ml of distilled water in each cup of soil.

2. Stir the soil thoroughly.
3. Let sit for 2-5 minutes.
4. Rinse the pH sensor thoroughly with distilled water over the rinse beaker.
5. Place the sensor into the loam cup.
6. Start data collection. Monitor the pH readings displayed to the right of the graph. When the readings are stable, tap **Keep.**
7. Using the numerical keyboard displayed on the screen, Enter **0** as the number of drops you have added. Select **OK** to store the first data set for this experiment.
8. Rinse the pH sensor thoroughly with distilled water and place the sensor into the beaker of buffer solution.
9. Add 5 drops of HCl (acid) to the cup. Stir the solution thoroughly with a stirring rod after adding the acid.
10. Place the pH sensor in the solution.
11. When the LabQuest2 readings are stable, tap **Keep**. Enter the total number of drops of HCl added to the water in the beaker and select “OK”.
12. Rinse the pH sensor thoroughly with distilled water and place the sensor into the beaker of buffer solution.
13. Repeat Steps 1-12 adding 5 drops of HCl each time until you have added a total of 30 drops.
14. Stop data collection by tapping on the red square on the screen
15. Repeat Steps 1-14 for the cup of clay and the cup of sand.

Table 4 - Data Collection

Acid	0 drops	5 drops	10 drops	15 drops	20 drops	25 drops	30 drops	^pH
1 Loam	6.71	6.51	6.67	6.40	6.44	6.35	6.16	-0.55
3 Clay	6.83	6.78	6.63	6.64	6.43	6.59	6.63	-0.20
5 Sand	7.58	7.19	6.67	6.57	6.52	7.09	6.97	-0.61

Analysis of Results

The results show the buffering capacity of the different soils. They show that clay has the highest buffering capacity and sand has the lowest. The clay has the highest buffering capacity because the small pores hold hydrogen ions that cling to the acids and bases balancing them. The sand, because of the large pores, does not have much hydrogen ions because they drain away.

Conclusions

Some inferences that can be made are that all clay will have a higher buffering capacity than sand. Another inference is that most soil that has a high buffering capacity will be clay. The hypothesis was proven because clay was predicted to have the highest buffering capacity. The sensor could have been accidently put in the soil and read different pH. What would the buffering capacity of gravel be? Would non soil substances affect the buffering capacity?