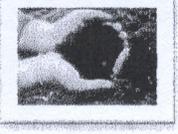


Name: Katie C

WHICH MATERIAL WILL ABSORB THE MOST WATER?

Material	Description	Picture	Comments
Loam	Composed of sand, silt, and clay; is considered ideal for gardening because it retains nutrients well and retains water while still allowing excess water to drain away		absorbed 80ml
Mulch	Material applied to the surface of soil; it conserves moisture, reduces weed growth and makes the area visually appealing		absorbed 50ml
Pea Gravel	Rock fragments that are various shades of brown; is often used for walkways and driveways		absorbed 124ml
Sand	Granular material composed of finely divided rock and mineral particles		absorbed 223ml

1. Which soil material was most successful at absorbing water? Why do you think so?

Sand, Pea Gravel

2. Do you think the material above would be successful at sustaining plant life? Why or why not?

No nutrients

3. Why might it be important for the materials in a rain garden to be able to sustain plant life?

help filter, use water

RAIN GARDEN ENGINEERING CHALLENGE

Now that you have experienced how water is absorbed by various soil-like compounds, it is your turn to design the ultimate soil filtration/absorption system in a bottle!

Your challenge: What combination of sand, loam, gravel, and mulch will absorb the most storm water runoff in a 1 minute time trial?

Design 1: Using information from the demonstration and your knowledge about the soil types, design a system that will absorb the most water. Your goal is to have the least amount of water flow through the filter.

Design 2: Engineers always go back and modify, change and improve their designs based on results from testing. For design 2, use information from your first trial (and your classmates' first trials) to try and improve the absorption of your design.

Constraints: Engineers always face constraints in the design process.

What might these constraints be?



In this trial, you may only use loam, mulch, pea gravel and sand and you only have \$100 to spend for *each* trial.

THE WINNERS OF THE CHALLENGE ARE:

- ❖ THE GROUP WHOSE 1ST DESIGN ABSORBS THE MOST WATER;
- ❖ THE GROUP WHOSE 2ND DESIGN ABSORBS THE MOST WATER; AND
- ❖ THE GROUP THAT SHOWS THE MOST IMPROVEMENT BETWEEN THEIR TWO DESIGNS!

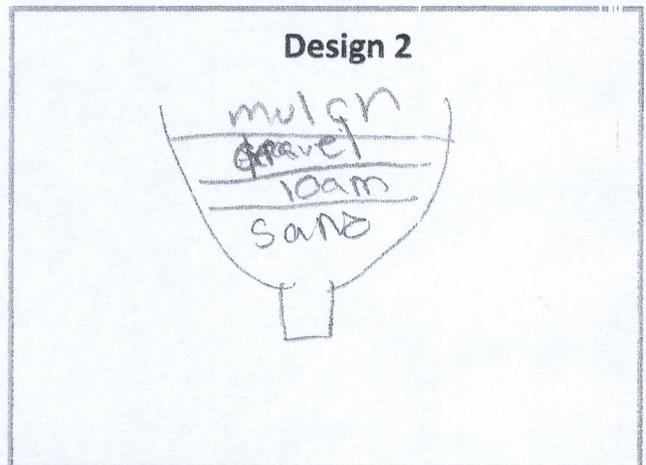
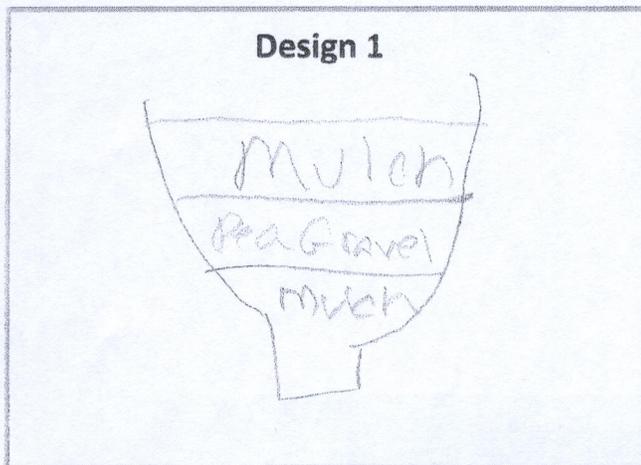


4. In the space below, create a table to help you keep track of how much of each soil type you use for each design, how much each costs, and the total cost. The cost per gram for each of the soil types are as follows:

- Loam - \$0.40/g; Mulch - \$0.30/g; Pea Gravel - \$0.60/g; Sand - \$0.80/g

	amount D1	price	amount D2	price
loam			50g	\$20
Pea Gravel	100g 91g	\$54.6	41g	\$25
Mulch	100g	\$30	1g	\$5
Sand			62.5g	\$50

5. Draw a picture of what your rain garden design will look like below. Label all materials used and include amounts. Make sure to use the table above to calculate your total cost. Remember, you cannot use more than \$100 of materials for each trial.



Design 1:
 Amount of water NOT absorbed: 122 mL
 Use math to determine the amount of water absorbed: 128 mL

Design 2:
 Amount of water NOT absorbed: 73 mL
 Use math to determine the amount of water absorbed: 11 mL

Calculate the difference between the amount absorbed between your first design and second design. Write your answer here. Don't forget your units! 49 mL

Water Absorbed:

Class Data

Draw a data table in the space below to collect the class's data on the following:

- Amount of water absorbed for design #1
- Amount of water absorbed for design #2
- Difference in the amount of water absorbed between design #1 and #2

Groups	Amount Absorbed in T1	Amount Absorbed in T2	Difference
1	200ml	200ml	0ml
2	226ml	226ml	0ml
3	194ml	217ml	23ml
4	201ml	220ml	-3ml
5	227ml	224ml	3ml
6	196ml	230ml	34ml
7	138ml	194ml	56ml
9	189ml	171ml	-18ml
10	128ml	177ml	49ml
11	199ml	174ml	-25ml
12	79ml	215ml	136ml

Lab Assessment Questions:

6. How well did your first design work? What parts made it successful or unsuccessful?

Our 1st design was not successful.
This was primarily because
we used mulch mainly in our design.

7. What changes did you make to your second design? Why?

We added more types of soil
to our design. This was to
increase absorbency.

8. What group has the best water absorption system? Provide evidence for your answer.

Group 5+6 because they absorbed
227ml and 230ml of water.

9. What do you think this tells us about the best materials for building an effective rain garden? Why? Give evidence for your claims.

10. Would your rain garden design support plant life? Why might this be important? Brainstorm with a partner and write your ideas below.

CONCLUSIONS:

13. *What is a rain garden and why are rain gardens important?*

14. *What factors must you consider when designing a rain garden?*

15. *What role do plants play in a rain garden?*

16. *How is what you did today similar to what engineers do?*
