MASTER 2.1

WATER AND SOIL PROPERTIES

NAME

DATE

SETTING UP THE EXPERIMENT

1. Using the marking pen, draw a line on each straw 2 cm from the bottom. Draw a second line 7 cm above the first line.

2. Cover one end of each straw with a piece of coffee filter and tape the coffee filter to the straws. Do not cover the bottom of the straws with tape.

3. Using the plastic spoon and the funnel, add sand to each straw up to the level of the lower line. The level of sand should be the same in each of your team's straws.

4. Add baby powder to one straw until it reaches the upper line mark you drew on the straw. Be careful not to disturb the bottom layer of sand. To the other straw, add additional sand until it reaches the mark.

5. Insert the straws through the plastic lids. (Insert the top end so you will not tear the coffee filter.) Rest the lids on top of the cups making sure the straws do not touch the bottom of the cup.

MATERIALS FOR THE TEAM

2 plastic spoons
2 straws
2 pieces of coffee filter (3.5 cm^2)
Transparent tape
Permanent marking pen
Sand
Baby powder
2 cups
2 plastic drink cup lids
10 mL graduated cylinder
Disposable pipet
Stopwatch or timer
Ruler
Funnels made by rolling up paper

EXPERIMENTAL PROCEDURE

1. Decide what role each team member will play during the experiment. One student should be in charge of measuring and adding water. Another student will be responsible for timing the experiment and the third student will record data.

2. Measure 10 ml of water in the graduated cylinder. Use the pipet to add the water to the top of the sand in the straw. (Using the pipet will cause the least disturbance to the sand.) Begin timing.

3. Record the time when the first drop of water falls into the cup. Continue timing.

4. Stop the timer when the last drop of water falls into the cup. Measure the water in the cup.

5. Record your team's data in the chart below. Calculate the amount of water retained in the straw at the end of the experiment (10 mL – amount entered in column 5). Also, measure the decrease in height of the substance at the end of the experiment.

SUBSTANCE	TIME FOR FIRST DROP TO FALL	TIME FOR ALL WATER TO PASS THROUGH STRAW	TOTAL AMOUNT OF WATER THROUGH STRAW (mL)	AMOUNT OF WATER RETAINED IN STRAW (mL)	DECREASE IN HEIGHT OF SUBSTANCE AT END OF EXPERIMENT (CM)
SAND					
BABY POWDER					

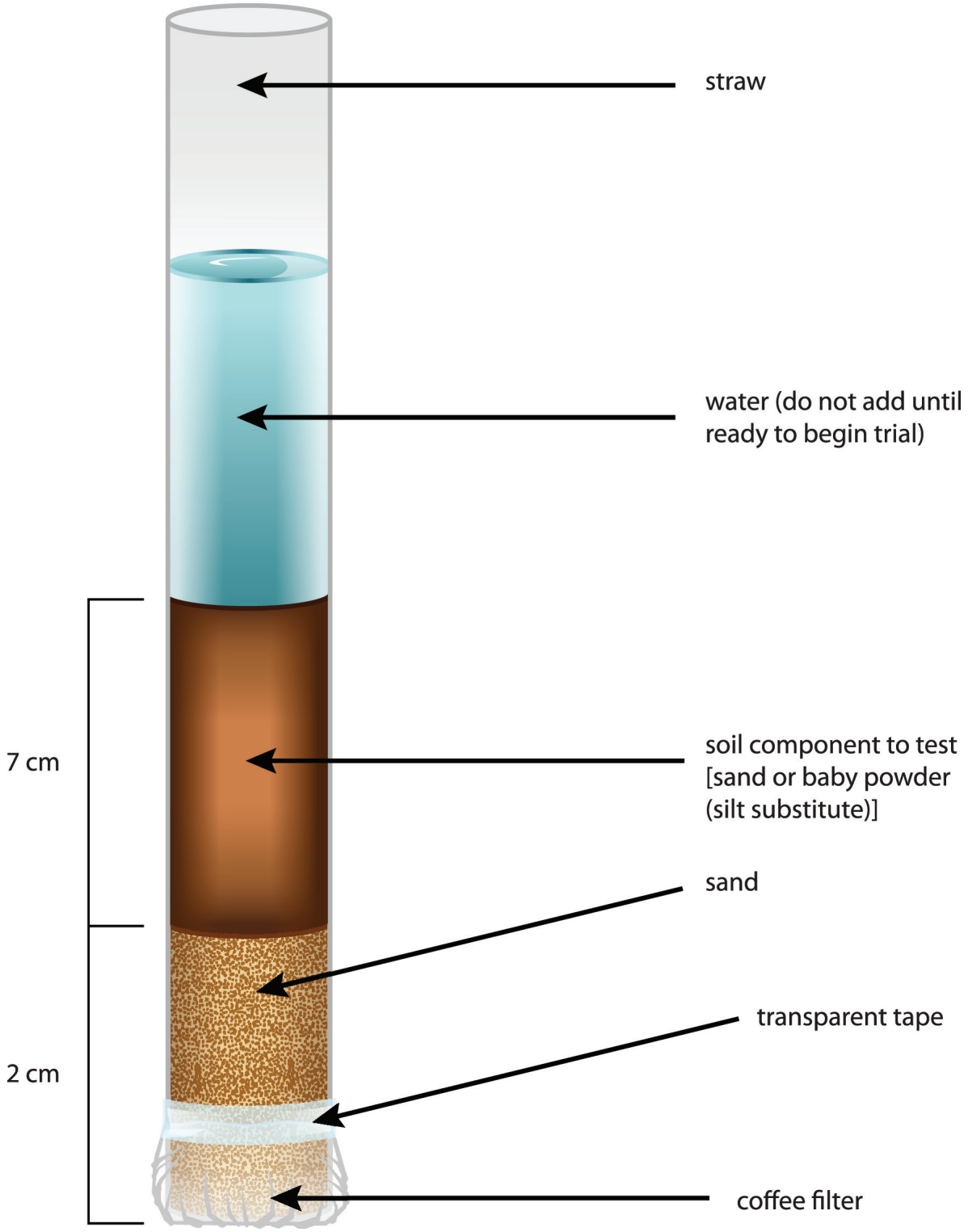
6. Repeat Steps 2–5 using the straw containing baby powder.

7. Add your measurements to the class data chart.

MASTER 2.2
COLUMN SETUP

NAME

DATE



MASTER 2.3
MAKING SENSE OF THE DATA

NAME

DATE

WORK WITH YOUR TEAMMATES TO ANSWER THE FOLLOWING QUESTIONS.

1. How does the size of sand grains compare with the size of baby powder particles? What is your evidence?

2. Which substance allowed water to move through more quickly?

3. Based on your data from your experiment using sand and baby powder, write 1–2 sentences about particle size and the movement of water through the column.

4. The data from the column containing clay show that it took longer for the water to move through the column. If the statement you wrote for question 3 is correct, how does the size of a particle of clay compare with a particle of sand or baby powder?

5. Which substance retained the most water in the straw? Which substance retained the least?

6. Write a sentence that summarizes the relationship between water retention and particle size.

7. At the beginning of the experiment, your column of sand, baby powder, or clay (in the demonstration) was 7 cm in height. What differences did you see in the height at the end of the experiment?

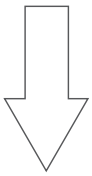
8. What accounts for the differences in height at the end of the experiment?

MASTER 2.4

PARTICLE SIZE, SURFACE AREA,
AND WATER MOVEMENT

NAME

DATE

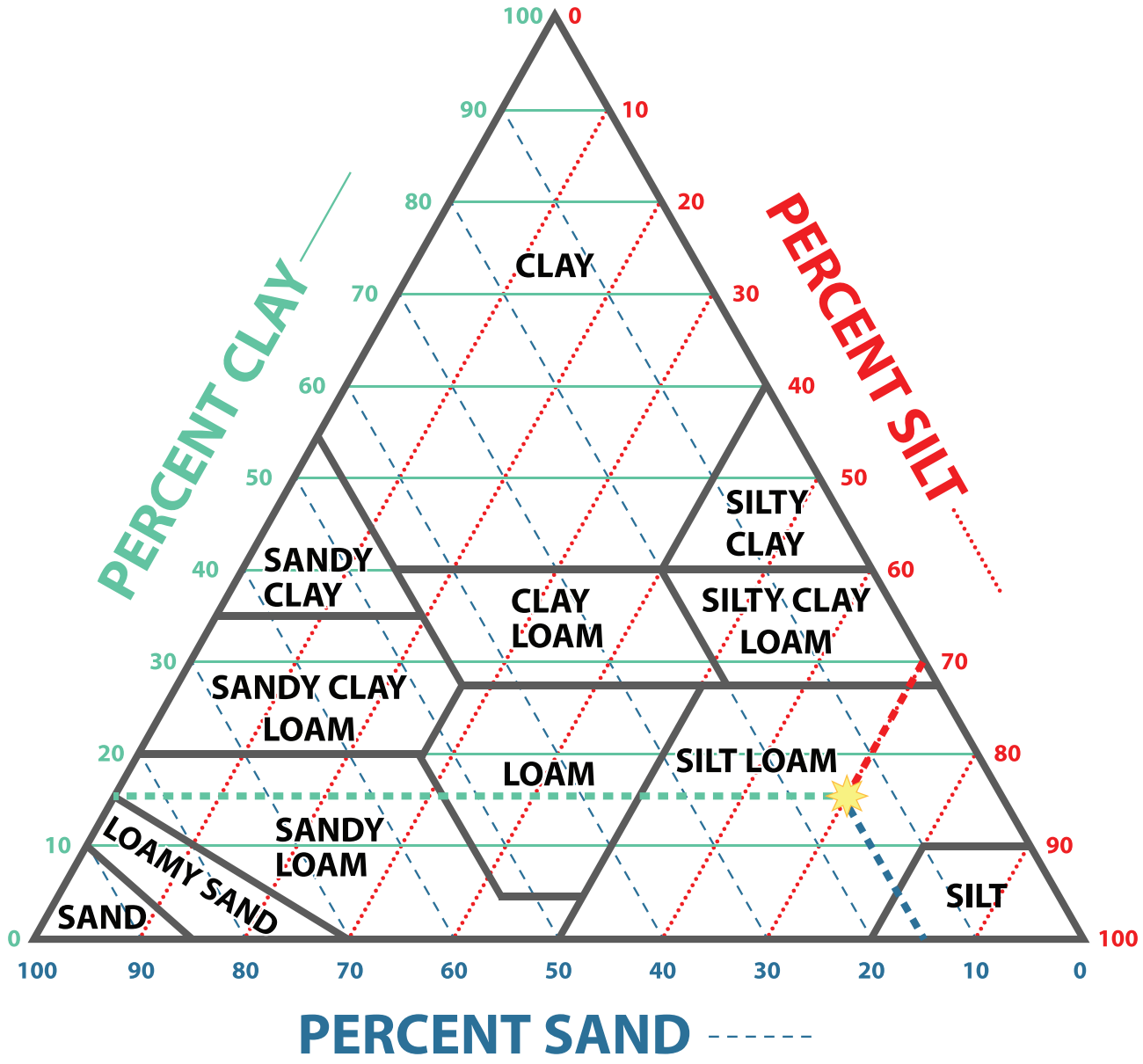
PARTICLE SIZE	SURFACE AREA (same total volume)	WATER MOVEMENT SPEED	WATER RENTENTION
			
			

MASTER 2.5

THE SOIL TRIANGLE

NAME

DATE



MASTER 2.6
SOIL PARTICLE SIZE

NAME

DATE

SOIL COMPONENT	PARTICLE DIAMETER
Rock	Greater than 75.0 mm
Gravel	2.0 to 75.0 mm
Sand	0.05 mm to 2.0 mm
Silt	0.002 to 0.05 mm
Clay	Less than 0.002 mm