

## LESSON 5 - TAKING CARE OF WATER



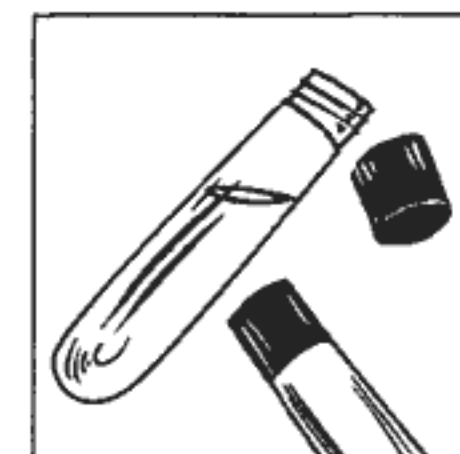
## **LESSON 5 - TAKING CARE OF WATER**

We look at two aspects of caring for drinking water: a) testing and treating water between its source and the consumer, which is the responsibility of the water supplier; and b) conserving water, which is the responsibility of the consumer.

Drinking water safety is a large topic, but one of its basic principles is elimination of microorganisms (germs) from water. With the first two activities, students gain some practical experience in testing and treating water. In Water Testing, students perform a basic bacteria test with two samples, a (presumable clean) tap water sample, and a second sample in which they have rinsed their hands. They observe the tests for two days, to see if a color change indicates the presence of bacteria in either tube. In Water Treatment, they use the same test procedure after disinfecting their "contaminated" sample water with a bit of chlorine bleach. Both the test and the treatment are quite true, on a smaller and simpler scale, to the methods water suppliers use every day.

Conserving water means accomplishing the same purpose with fewer drops, cups or gallons. How Much Water Does It Take to... picks up on activities in Lessons 1 and 2, helping students quantify water use through math activities.

## Lesson 5 Taking Care of Drinking Water



### ACTIVITY 5-1 WATER TESTING

**SUMMARY** Students will create a water sample with bacteria and then test water for bacteria. This activity tends to work best in warm weather when students have been outside playing.

**CONTENT AREAS** science

**GOAL** to understand that bacteria can contaminate water and that drinking water is tested for these germs

**TIME** one session and two short sessions

**MATERIALS** (for each group of students)

- two test tubes with broth (supplied with kit or order through biological supply company)
- large bucket
- pitcher of water
- test tube rack (kit)
- masking tape
- marker

#### ADVANCE PREPARATION

- Prepare water samples.
- Create student working groups.
- Arrange area in room for test tubes for 4 days.
- Copy student pages.

#### BACKGROUND

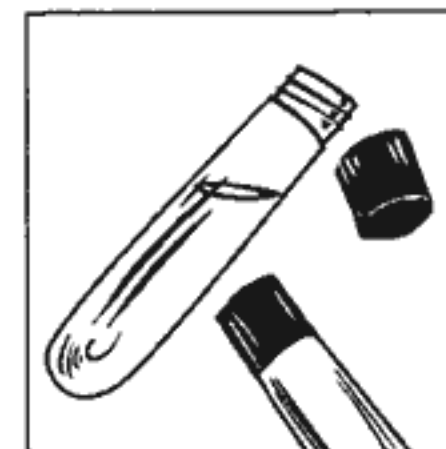
This activity helps students understand how water is tested for bacteria. There are many different types of microorganisms everywhere, including in water. Pathogens are the ones that cause diseases. Germ, in common usage, has also come to mean disease-causing microorganism. Most students will use the term in this way. Students will probably understand that bacteria (or germs) can make people sick. What they may not know is that there are federal and state regulations that require water suppliers to test for bacteria and other pathogens. There are strict rules that water suppliers must follow.

In this experiment test tubes with nutrient broth will be used to grow bacteria. The broth is the ideal environment for bacteria to grow; it is not necessary to incubate them. If there are bacteria in the water that is added to the test tubes then the broth will change to yellow after about 48 hours. If bacteria are not present, then the broth will stay purple. (A change to yellow does not necessarily mean that pathogenic bacteria are present, but that some type is in the sample.) In this activity students will compare tap water to water that they have rinsed their hands in and presumably contaminated with bacteria. There should be plenty of bacteria on the students' hands to cause a color change for the contaminated sample. It is very important to add a small amount of bleach to any sample that changes to yellow before you dispose of it down the drain.

Water suppliers are required to test their water for a variety of pathogens. They must test the water in the reservoir as well as the water at several different tap locations in the service area.

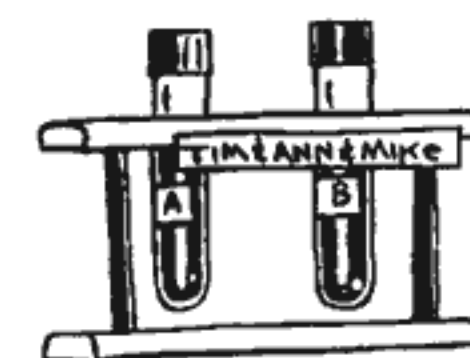
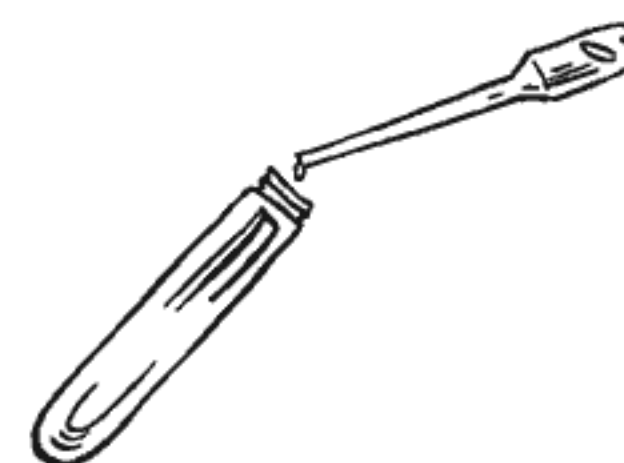
## Lesson 5 Taking Care of Drinking Water

### ACTIVITY 5-1 WATER TESTING



#### TEACHER PROCEDURE

1. Prior to class get a sample of tap water in a clean container. To clean the container wash it well with soap and water, rinse to remove soap and rinse again with boiling water. Or you can buy a bottle of water to use for the test. You must test your water sample prior to doing this activity with the students. If your tap water or bottled water turns to yellow you have probably contaminated it with bacteria from your hands or from the faucet. To solve this problem wash your hands well and clean the faucet before collecting your sample.
2. Each group should get a test tube rack and two test tubes with broth.
3. They should label the test tubes "A" and "B". Each test tube rack should be labeled with the names of the students in the group.
4. Water sample A will be tap water or bottled water. Use a clean dropper to fill each group's test tube close to the top.
5. Students should seal test tube A with masking tape and put it in the test tube rack.
6. Water sample B will be the contaminated sample. Create sample B by pouring water over each student's hands into the bucket.
7. Using a dropper, students should fill test tube B close to the top with water sample B. If you are going to do Activity 5-2 (Water Treatment) soon, you should save the remains of water sample B.
8. Students should seal their test tubes and return them to the test tube racks. They should record their observations for Day 1.
9. Students should check their test tubes for the next two days and record their observations.
10. Discuss with students the results of the activity. Explain that this test is similar to the ones that water suppliers use.
11. Students should complete the conclusion section.
12. Collect test tubes from the students.
13. Add a small amount of bleach to any sample that has turned to yellow.
14. Rinse all samples down the drain.



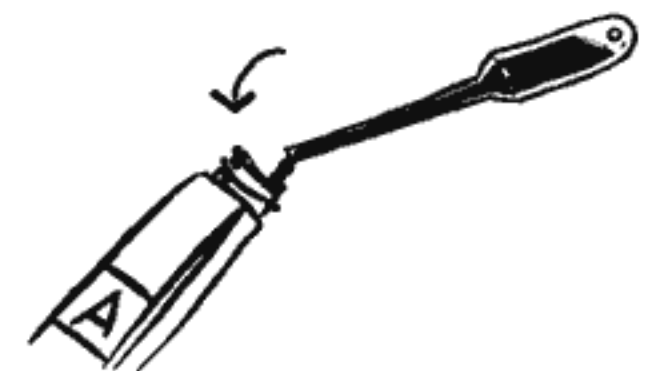
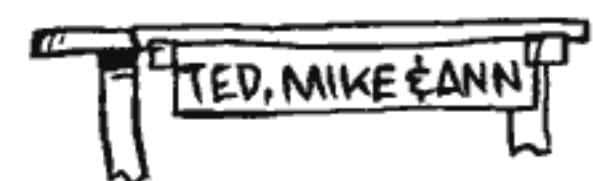
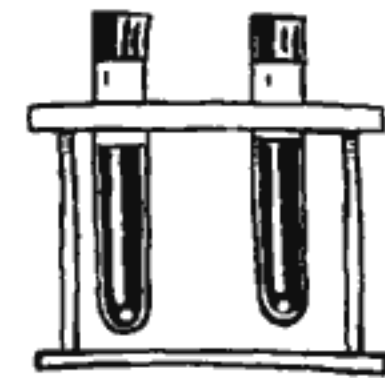
# Water Testing

**Introduction** Are there germs on your hands? Can germs live in water? During this activity you will investigate both of these questions. You will test two different water samples for germs. You will use tubes with purple broth. If the water that you add to the broth has germs in it, then the liquid will turn to yellow. If there are not germs in it, the liquid will stay purple.

- Materials**
- two test tubes with broth
  - large bucket
  - pitcher of water
  - test tube rack
  - masking tape
  - marker

## Procedure

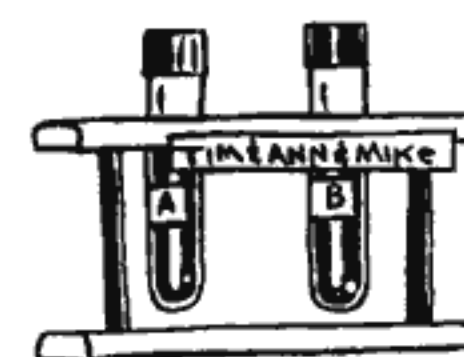
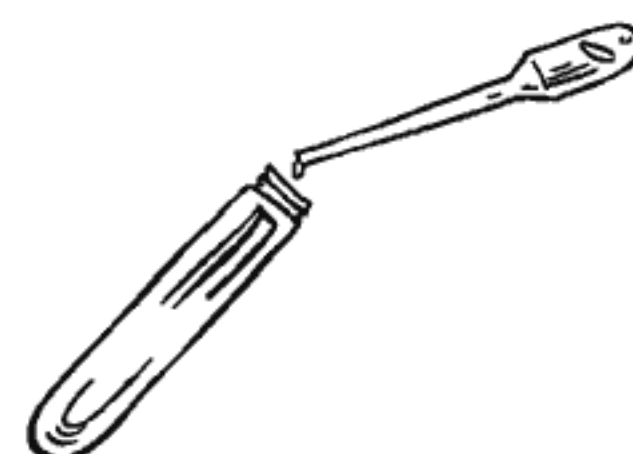
1. Get a test tube rack and two test tubes. Each test tube will be half filled with a purple liquid. You will be adding water to this test tube. The liquid will change to yellow if there are bacteria in the water.
2. Label the test tubes "A" and "B".
3. Label your test tube rack with the names of the students in your group.
4. Water sample A will be water from the tap or bottled water. Go to your teacher who will put water from sample A into your test tube A.





# Water Testing

5. Seal test tube A with masking tape and return it to the test tube rack.
6. Go to your teacher who will pour water over your hands into a bucket. This will be water sample B.
7. Use a dropper to fill test tube B close to the top with water sample B.
8. Seal test tube B and put it in the test tube rack.
9. Draw and describe how your test tubes look in the observation section of the student page.
10. Check your test tubes for the next two days and record your observations.
11. Complete the conclusion section.
12. Give the test tubes to your teacher for disposal. Do not open them.
13. Remove your names from the test tube racks. Return them to your teacher.









Name \_\_\_\_\_ Date \_\_\_\_\_

# Observations

Test Tube A

Test Tube B

DAY 1	 _____ _____	 _____ _____
DAY 2	 _____ _____	 _____ _____
DAY 3	 _____ _____	 _____ _____

# Water Testing Conclusion



1. Describe what happened in your experiment and why you think it happened.

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2. Why do you think there are rules about testing drinking water?

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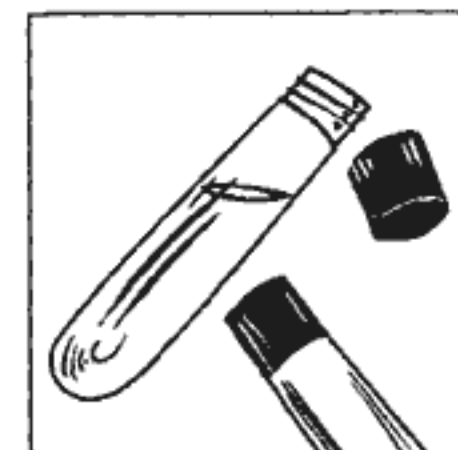
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## Lesson 5 Taking Care of Drinking Water



### ACTIVITY 5-2 WATER TREATMENT

**SUMMARY** Students will use the water from sample B in Activity 5-1 to see how water treatment works. Water sample B will be treated with chlorine and then tested for bacteria using the test tubes with nutrient broth.

**CONTENT AREAS** science

**GOAL** to understand that drinking water is treated for bacteria

**TIME** one session and two short sessions

**MATERIALS**

- water sample B from Activity 5 - 1
- two test tubes with nutrient broth (kit)
- masking tape
- pen
- test tube racks or cups
- diluted bleach to create water sample C - 1 table-  
spoon of bleach + half a cup of water

#### ADVANCE PREPARATION

- Prepare water samples.
- Copy student pages.
- Arrange space in room for test tubes for three days.
- Create student working groups.

#### BACKGROUND

In this activity you will use two water samples. Water sample B can be saved from activity 5-1 or you can create a new water sample B by rinsing students' hands in water again. Water sample C will be created by adding bleach to Water sample B. This step, which you will do in front of students, will demonstrate water treatment. Water suppliers add chemicals (often a mixture of chlorine and ammonia) to the water to kill any pathogenic germs that might be present.

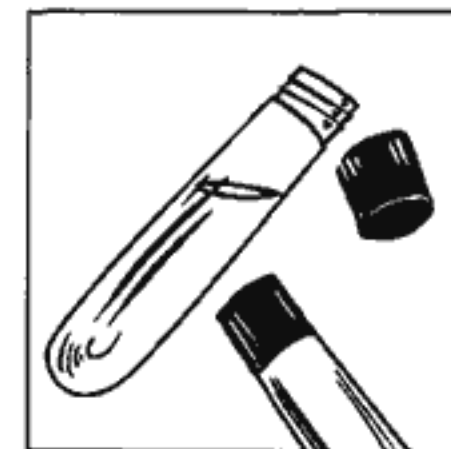


#### TEACHER PROCEDURE

1. Explain activity to students.
2. Give each student group a test tube rack and two test tubes.
3. Students should label their test tubes B and C.
4. In test tube B they should add water sample B. Remind students that water sample B is the sample they rinsed their hands in.
5. Test tube B should be sealed and put in the test tube rack.
6. With all of the students watching add the diluted bleach to water sample B. This will now be water sample C. Explain to the students this chemical is similar to the one used to treat drinking water.
7. Students should come to you to fill test tube C with water sample C.
8. Test tube C should be sealed and put in the test tube rack.

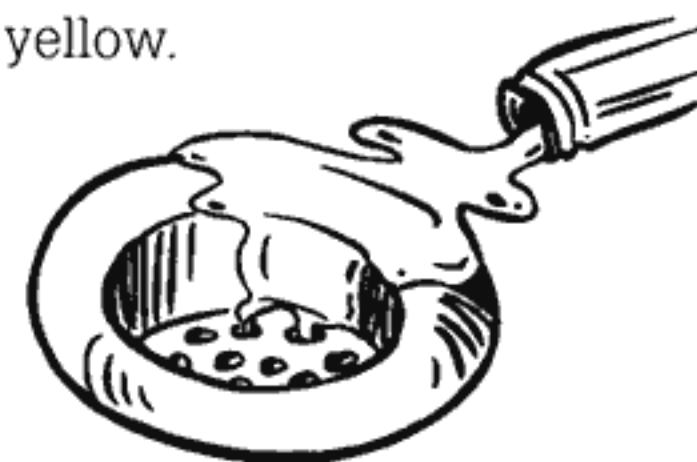
## Lesson 5 Taking Care of Drinking Water

### ACTIVITY 5-2 WATER TREATMENT



#### TEACHER PROCEDURE

10. Students should check their test tubes after 24 and 48 hours and record their observations.
11. Discuss with students that drinking water is treated with chemicals such as chlorine which kills any bacteria that might make them sick.
12. Students complete the conclusion.
13. Collect the test tubes from the students.
14. Add a small amount of bleach to any sample that has turned yellow.
15. Rinse all samples down the drain.



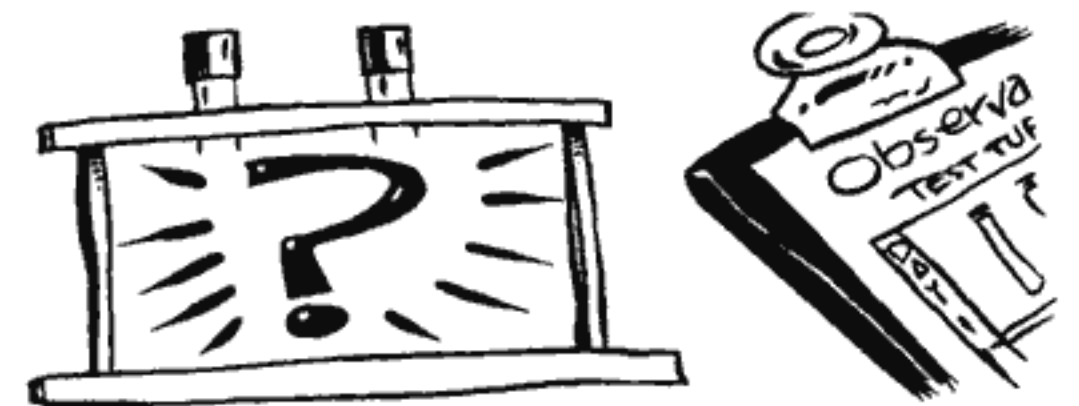
# Water Treatment

**Introduction** It is important that there are not any germs in your drinking water. During this activity you will see how water is treated to kill germs.

- Materials**
- water sample B
  - water sample C
  - masking tape
  - pen
  - two test tubes with broth
  - test tube rack

## Procedure

1. Get your materials
2. Label your test tubes B and C.
3. Label your test tube rack with the names of the students in your group.
4. Add water sample B to test tube B. Remember, water sample B is the water you rinsed your hands in.
5. Seal test tube B and put it in the test tube rack.
6. Fill test tube C with water sample C.
7. Seal test tube C and put in the test tube rack.
8. Record your observations in the "Day 1" space.
9. Check your test tubes on the second day and record your observations in the "Day 2" space.



# Water Treatment







10. Check your test tubes on the third day and record your observation in the "Day 3" space.
11. Complete the conclusion.
12. Give your test tubes to your teacher to be disposed of properly.
13. Remove your names from the test tube rack. Return it to your teacher.

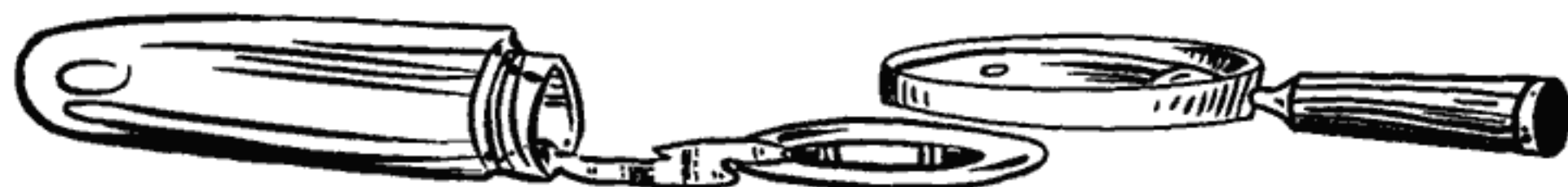


# Observations

Test Tube B

Test Tube C

DAY 1	 _____ _____	 _____ _____
DAY 2	 _____ _____	 _____ _____
DAY 3	 _____ _____	 _____ _____



# Water Treatment Conclusion



1. Describe what happened in your experiment and why you think it happened.

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2. Why do water suppliers add chemicals such as chlorine to drinking water?

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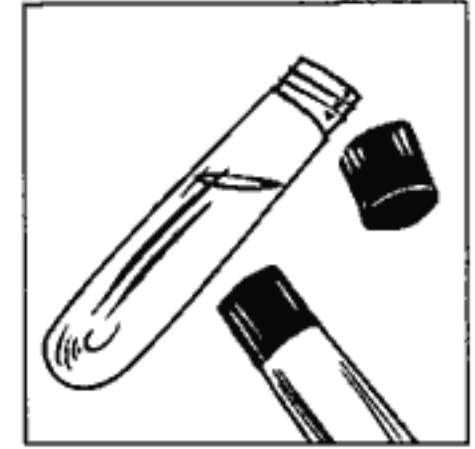
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## Lesson 5 Taking Care of Drinking Water



### ACTIVITY 5-3 HOW MUCH WATER DOES IT TAKE. . .

**SUMMARY** Students will calculate and compare how much water it takes to do various activities.

**CONTENT AREAS** math, problem solving

**GOAL** to encourage students to think about water conservation in their daily lives

**TIME** one session

**MATERIALS** - paper  
- pencil

#### ADVANCE PREPARATION

- Copy student pages, including pictures of 1/2 gallons and gallons, if necessary.

#### TEACHER PROCEDURE

1. Distribute the student pages.
2. Have students read the introduction.
3. You may need to explain the first example.
4. Some students may need the pictures of 1/2 gallons and gallons to solve the problem.



# How Much Water Does it Take...

**Introduction** Here is a tricky question. Does it take more water to take a bath or a shower? The answer may surprise you. It depends on how long you stay in the shower and how full you fill a bath. You are going to figure out some water conservation problems by using information about showers, baths, toilets and faucets.

Water Use	Amount
toilet	2 gallons per flush
shower	3 gallons per minute
full bathtub	30 gallons
bathroom faucet	2 gallons per minute
kitchen faucet	4 gallons per minute

1. If Angie takes a fifteen minute shower, how much water does she use?

$$15 \text{ minutes} \times 3 \text{ gallons/minute} = 45 \text{ gallons}$$



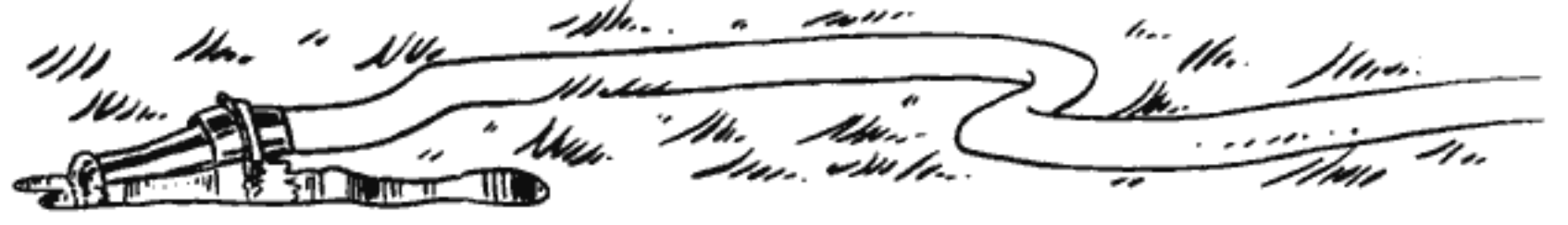
# How Much Water Does it Take...



2. How much water will she use if she takes an 8 minute shower?
  
  
  
  
  
  
  
  
  
  
3. How much water does Angie save by taking an 8 minute shower instead of a 15 minute shower?
  
  
  
  
  
  
  
  
  
  
4. If she wanted to conserve water, should Angie take a 15 minute shower or a bath? Explain your answer.
  
  
  
  
  
  
  
  
  
  
5. Luis washes the dishes every night. One night it took him 20 minutes to wash the dishes and he left the water running the entire time. How much water did he use?

# How Much Water Does it Take...

6. The next night Luis's father told him to run the water only when he was rinsing the dishes. Luis did this and the water was running for only 7 minutes. How much water did he use?



7. How much water did Luis conserve by running the water only when rinsing the dishes?
8. Anita and her mom are trying to conserve water. Their toilet uses 4 gallons every time it is flushed. They installed a new toilet that only uses 2 gallons of water per flush. How much water will they save in one day if their family flushes the toilet 10 times each day?
9. How much water will Anita's family save in one week with their new toilet?



