

WATER FIT TO DRINK

TOPIC:

Cleaning Dirty Water

INTRODUCTION:

In many areas drinking water is obtained from local rivers and lakes. In other places, it may be transported over long distances from reservoirs. In either case, the water must be treated to remove solids and bacteria to make it fit for human consumption. In this experiment you will investigate the effects of aluminum sulfate (alum) and a sand/gravel filter bed on dirty water. Alum treatment and the filter bed are part of most large-scale water purification plants. Alum coagulates mud, bacteria, and other impurities into large clumps which sink; the filter bed subsequently removes any further solids and more harmful bacteria. Final removal of harmful bacteria requires treatment with chlorine.

TIME NEEDED:

15 minutes for Test 1

45 minutes for Test 2

15 minutes for inspection after leaving overnight

MATERIALS:

For both tests:

dirty water (add a handful of soil and 3 drops of detergent to 250 ml of water and stir well)
rubber gloves

For test 1—Alum treatment:

2 250-ml beakers
250-ml measuring cylinder or measuring cup
self-adhesive labels
felt-tip marker
teaspoon
100g aluminum sulfate
clock

For test 2—Filter bed:

plastic tube approximately 2.5 cm in diameter and 35 cm long
stopper to fit tube, with hole in center
plastic tube (approximately 2.5 cm long) to fit hole in stopper
ring stand with clamp
ruler
spatula
funnel
2 250-ml beakers
sand and gravel—about 1/2 lb. of each (obtainable from an aquarium supply store)

Safety Precautions

Adult supervision required when putting tube through hole in stopper. Please read and copy the safety precautions at the beginning of this book.

PROCEDURE:

Test 1—Alum treatment

1. Label the two beakers "A" and "B".
2. Using the measuring cylinder, measure out 100 ml of dirty water and add it to beaker A. Repeat this with beaker B.
3. Add 3 level teaspoons of aluminum sulfate to beaker A and stir. (See figure 1.)
4. Leave the two beakers overnight.
5. The next day, compare the appearance of the two beakers. Record their appearance in the Data Table.

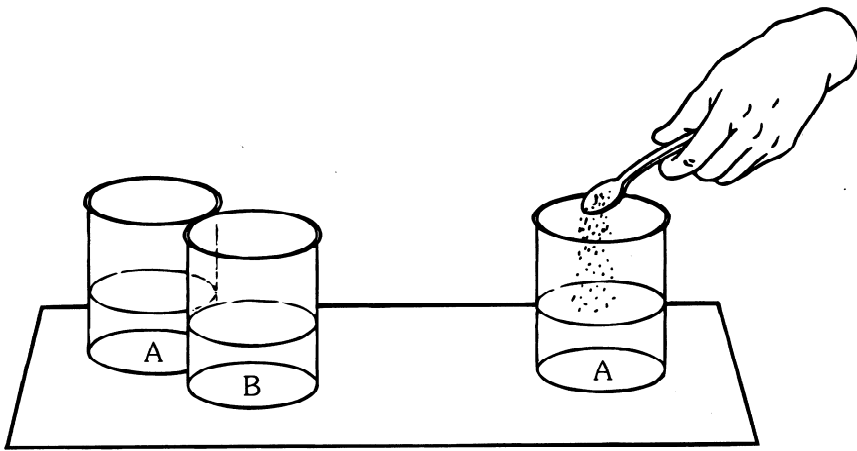


figure 1

Test 2—Filter bed

Constructing a filter bed

1. Gently push the smaller plastic tube into the hole in the stopper.
2. Put the stopper in the larger plastic tube. Clamp the tube in a horizontal position.
3. With the spatula and funnel, add 3 in. of gravel to the tube (check this with the ruler). Tap the tube gently so that the gravel settles.
4. Now add 5 in. of sand to the tube, also using the spatula and funnel. (See figure 2.)

Using the filter bed

5. Using the measuring cylinder, measure out 100 ml of dirty water and add it to the beaker labeled B.
6. Put the funnel into the top of the tube. Put a clean beaker, labeled A, under the tube.
7. Slowly pour the dirty water from the beaker through the funnel into the tube. (See figure 3.) Leave the filter bed overnight.
8. The next day, add 100 ml of dirty water to the beaker labeled B.
9. Put beakers A and B next to each other to compare water that has passed through the filter bed with unfiltered water. Record any differences between the contents of the two beakers in the Data Table.

figure 2

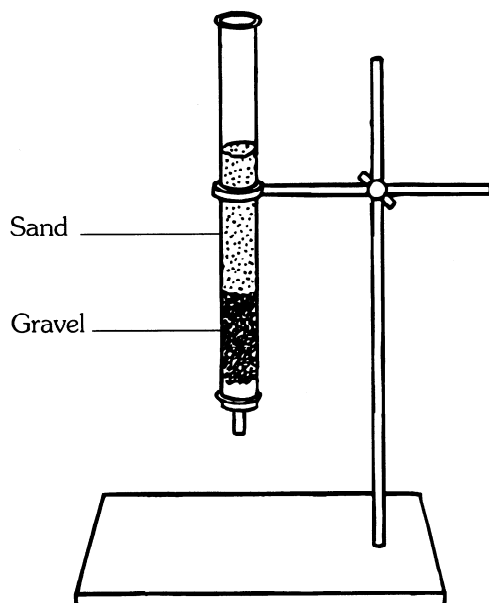
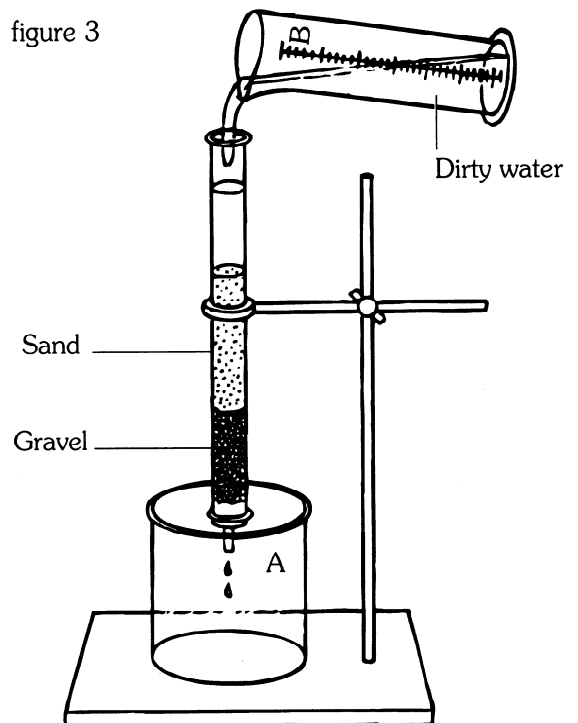


figure 3



DATA TABLE

Test	Beaker A	Beaker B
Test 1—Alum treatment Appearance of water inside beaker		
Test 2—Filter bed Appearance of water inside beaker		

ANALYSIS:

Test 1

1. What effect did aluminum sulfate have on the water in beaker A?
2. What happened to the water in beaker B over the same time period?
3. Why was beaker B included?
4. Do some research. What are the risks to human health if too much aluminum sulfate is used?

Test 2

1. What differences did you observe between beakers A and B?
2. What happened to the dirty water as it passed through the filter bed?
3. Why is gravel added first, then sand?
4. Would dirty water be fit to drink after the alum and filter bed treatments? If not, why not?
5. What further treatments could be used to make the water fit to drink?
6. Why would neither of the treatments be suitable for making seawater drinkable?

OUR FINDINGS:

See Section X.