Activity 3

Filtration of Groundwater

Part 2

OBJECTIVES:

1. Be introduced to the concept of natural filtration and demonstrate how natural filtration can occur.
2. Use a total hardness strip to demonstrate how components may be dissolved and carried in water.

MATERIALS:

Total Hardness Strips
Aquarium Gravel
1 or 2 Turkey Basters
Cotton Balls
Paper Cup
Epsom salt
Holder or Clamp
Distilled Water
Sand

USING THE STRIPS:

Dip one Total Hardness strip into the sample for 3 seconds, remove, and match to the closest color on the color chart within one minute.

PROCEDURE:

1. Rinse the aquarium gravel. Place at least 2 cotton balls in the end of a turkey baster. Fill the baster with alternating layers of sand and gravel to simulate the layers of the earth (figure 3)..
2. Add some soil to the water and stir to make “dirty water”.
3. Use a holder or clamp to support the baster above the
4. Add the dirty water to the baster. The water will filter through the layers and collect in the paper cup. (This may take several minutes.) Use a hardness strip to test the water.
5. Place at least 2 cotton balls in the end of a second turkey baster.
6. Add one teaspoon of Epsom salts on top. Use a holder or clamp to support the baster above the paper cup.
7. Use a test strip to measure the hardness of a new water sample. Add 1 to 1 ½ ounces of the new water to the baster. Allow the water to filter and collect in the cup.

ANALYSIS AND APPLICATION

1. Describe how the water looks before and after it has passed through the layers of sand and gravel.
2. How does the hardness level in the cup compare to that of the water before it passed through the Epsom salts?
3. What happens if this water is passed through the baster with the layers of sand and gravel?

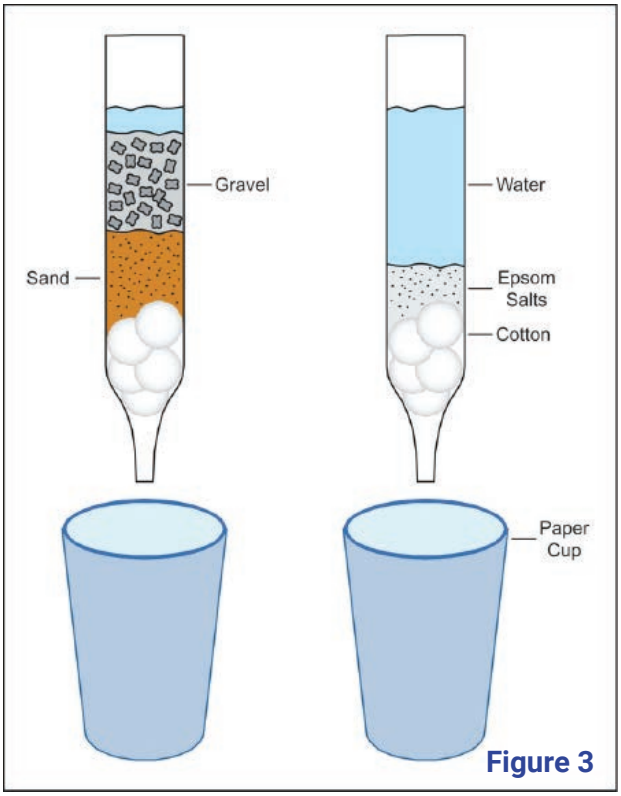


Figure 3

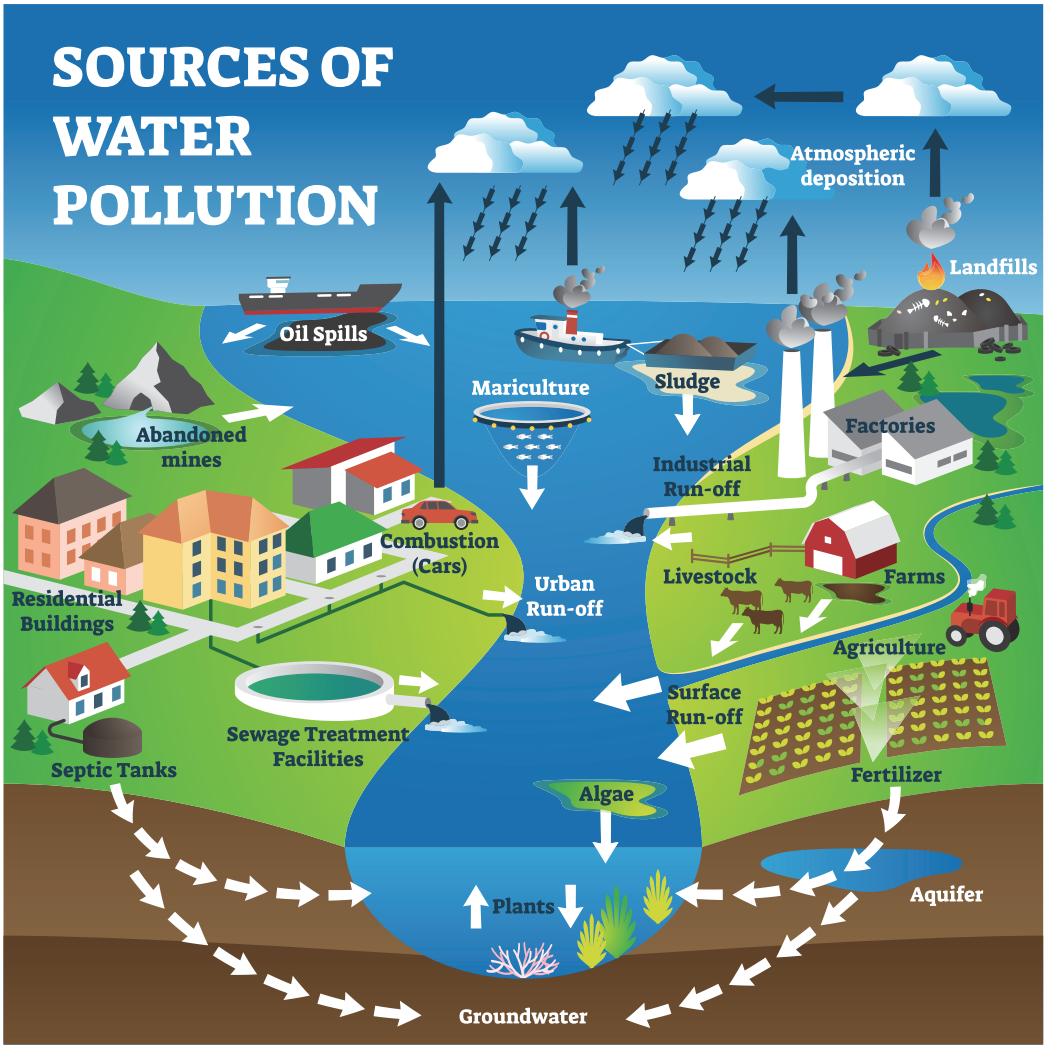
Activity 4

Contaminants in Water

Part 1

Contamination can come from two sources – point and non-point. Point-sources are
specific sites where contamination occurs. An oil spill is one example of a point source.
Non-point sources are more widespread. Farmland runoff from a wide area that is contaminated with fertilizers and seeps into groundwater is a non-point contamination.

Water treatment facilities monitor for over 83 organic and inorganic chemicals or substances, and are able to remove many contaminants. The United States Environmental Protection Agency (USEPA) sets water quality guidelines. The USEPA regulates what, and how much, of each substance is allowed in drinking water. Chemical concentrations are frequently measured in units called milligrams per liter (mg/L) or parts per million (ppm). Mathematically, mg/L and ppm are the same.



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Activity 4

Contaminants in Water

Part 2

OBJECTIVES:

1. Observe the effects of chlorination on living organisms in water and discuss the benefits of chlorination.
2. Using test strips, determine the levels of free chlorine and total chlorine in water samples from different sources.

MATERIALS:

Red or blue food coloring
5 clear 8oz cups or beakers (100ml is OK)
Pipette
Tap Water

PROCEDURE:

1. Prepare a stock using red or blue food coloring in approximately 8 ounces of water. Be sure the stock has a deep, vivid color (typically 10 drops of food coloring per cup).
2. Label three cups as 1:10, 1:100, and 1:1000. These cups represent the dilution levels. Label a fourth cup of tap water as "make-up" water.
3. Using a clean plastic dropper add one dropper full of the stock solution to the cup labeled 1:10 (figure 4).
4. To this add nine droppers full of make-up water. Mix and note the color.
5. Using a clean dropper, remove one dropper full of liquid from the 1:10 container and add it to the container marked 1:100.
6. To this add nine droppers full of make-up water. Mix and note the color difference between the 1:10 cup and the 1:100 cup.
7. Using a clean dropper, remove one dropper full of liquid from the 1:100 container and add it to the container marked 1:1000.
8. To this add nine droppers full of make-up water. Mix and note the color difference between the 1:10 cup and the 1:1000 cup.

ANALYSIS AND APPLICATION

1. How do the colors differ as the dilution increases from one part in ten (1:10) to one part in 1000 (1:1000)?
2. The USEPA regulates many chemicals in amounts of parts per million (or ppm), which is equivalent to performing the dilution three more times. Try it. What do you see?

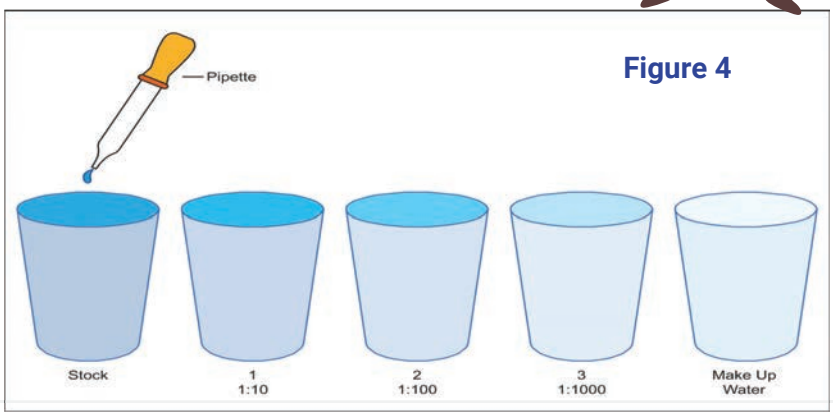

Figure 4