

API® Lesson 9 | Siphoning a Fish Aquarium

This lesson plan provides a basic understanding how water flows naturally and whether it is even possible for water to flow uphill. The importance of understanding how to siphon water is essential for keeping an aquarium clean. At the end of the lesson any student/family member should be able to start and control a siphon to remove water and/or dirt & debris from the aquarium.

For Instructor/Teacher/Parent

Make sure to read through the entire lesson plan before beginning this with students/family members as materials will need to be purchased and information prep will need to be done.

Learning Objectives

After completing the activities outlined in this lesson plan, students/family members should be able to:

- Provide an explanation of how water flows
- Clearly explain how to start a siphon to clean aquarium gravel

Length

This activity takes place in a one-hour timeframe.

Materials to complete activity

- Two large clear glass jars or beakers
- Length of plastic tubing (approx. 1/4" (0.6 cm) inside diameter and about three foot (90 cm) in length)
- Tap Water
- Clamp to pinch off the tubing
- A timer (watch/clock with second hand or stopwatch) to measure 30 seconds and 5-minute intervals
- Tape to hold the hose in place in the beakers

Key Terms

Review key terms (printable sheet included at the end of the lesson) with students/family members.

- 1) Uphill
- 2) Downhill
- 3) Level
- 4) Siphon
- 5) Suction
- 6) Gravity

Warm Up

Ask a couple of questions to warm up for the lesson:

- 1) In what direction have you seen water flowing: down, sideways, up?
- 2) Can water flow up a hill?
- 3) If I have a container filled with water sitting on the desk and I have another container with a very small amount of water sitting on the desk, how can I get water from the full container to the empty container without touching either container?

Before You Start

Instructions for Learning Activity

1. Fill one beaker or clear jar $\frac{3}{4}$ full of tap water and set it on the table.
2. Fill a second beaker or clear jar $\frac{1}{4}$ full of tap water and set it on the table close to the first jar.
3. Fill the plastic tubing with water. Make sure you do not have any air bubbles in the tube.
 - a. Cover each end of the tubing with your thumbs.
 - b. Insert one end of the tube in one beaker/jar and without letting any air into the tube release one thumb.
 - i. Keeping your thumb on the other end, raise the tube in the air. Does any water flow in the tube?
4. Fold the tube to make a kink in the tube. Place a clamp in the middle of the tube.
5. Now place the other end of the tube in the other beaker/jar and release your thumb. Do not let any air enter into the tube.
 - a. Place a small piece of tape to hold the tube in position in each jar/beaker.
6. Remove the clamp and record how long it takes for the water to move from one jar to the other.
 - a. Which way did the water flow?
 - b. When did it stop?
 - c. How much water is in each beaker/jar? The same amount? More in one than the other?
7. Raise one jar slightly just an inch or two (5 cm). Always keep the jars in a position so no air enters the tubing.
8. Alternate the position of the jars, raising the lower jar to a higher position.
 - a. Which way did the water flow?
 - b. When did it stop?
 - c. How much water is in each beaker/jar? The same amount? More in one than the other?
9. Now put the clamp back on the tubing. Alternate the position of the jars again.
10. Partially release the clamp so some of the tubing is still pinched.
 - a. What happened to the water flow?
 - b. When did it stop?
 - c. How much water is in each beaker/jar? The same amount? More in one than the other?
 - d. Did the water move slower or faster?
 - e. Did any of the water flow uphill?

Understanding the water flow

When the water from the raised jar/beaker flowed through the tube to the lower beaker, it did flow uphill. The water in the tube flowed up the tube to the highest point of the tubing and then down to the lower jar/beaker. When you raise or lower the jar/beaker, the flow of water reversed.

Water will normally flow down in the direction of gravity unless air pressure forces it up against gravity. This experiment showed how using air pressure from one container can push water uphill in the tube to the other container. So yes, water can flow uphill.

When you filled the tube with water and placed each end in the two jars/beakers you created a siphon!

How can we use a siphon to move dirt/debris from the gravel?

In an aquarium water flows through the gravel substrate. Solid wastes, bits of uneaten food, dead organisms and other small particles become trapped and builds-up overtime. Much of the trapped materials are not biodegradable and create conditions that are not healthy for aquarium inhabitants. Excessive amounts of the debris can lead to clogging of the gravel, restriction of flow through the gravel, and a breeding ground for pathogenic organisms. For the reasons mentioned, regular maintenance of the gravel bed is advised. Gravel substrates should routinely be stirred, and unwanted materials removed. This routine maintenance should be performed once every two weeks.

Siphoning water out of the aquarium is a great way to perform a partial water change and to remove debris from the bottom of the aquarium. The disturbance of stirring the gravel substrate liberates some of the debris. You now know how to siphon water out of the aquarium. As performed in the experiment above, you will need a siphon hose and a bucket. Depending on the size of the aquarium your siphon hose and bucket will be bigger than what you used earlier.

Place the hose in the aquarium and completely fill it with water assuring there are no air bubbles. Place your thumbs on each end of the hose. Keeping one end in the aquarium under water, lower the other end into the bucket. Remove your thumbs from the ends of the hose and you have started a siphon. The flow of water can be stopped by placing your thumb on one end of the hose or by removing the hose from the aquarium.

Always remember when replacing water in the aquarium from siphoning or simply for evaporation loss to add API STRESST COAT™ water conditioner to make the tap water safe for fish, plants and invertebrates. Tap water contains disinfectants such as chlorine and chloramines that make the tap water safe for us to drink but are harmful to fish. Tap water can also contain higher amounts of heavy metals that are harmful as well. STRESS COAT treats chlorine, chloramines and heavy metals found in tap water to protect our fish. Partial water changes (i.e. removing a portion of the aquarium water and replacing it with newly treated tap water) is essential for maintaining good water quality. A partial water change especially when siphoning the gravel provides many benefits removes unwanted particles and debris from your gravel, removes accumulated organics in the aquarium water, and helps to maintain better water quality in the aquarium.

Questions

- Pass out the Questions worksheet (printable sheet included at the end of the lesson) to each student/family member.
- Review the answers to the questions during the discussion section of the lesson.

Discussion

- After finishing the items above including the questions and key terms, engage students/family members in a brief discussion about the lesson:
 - Can water flow uphill?
 - Name two materials that can accumulate in the aquarium gravel that affect water quality?
 - Name two materials commonly found in tap water that will stress or hurt our fish?

Quiz

- Once you've finished the discussion, pass out the Quiz worksheet (printable sheet included at the end of the lesson) to each student/family member.

- Have them complete the quiz and then review the answers/have an open discussion about the answers with them. Answers are below.
1. Can water flow uphill?
 - a. Yes, as the water flows uphill in the tube between the beakers during the learning activity just conducted.
 2. How do you start a siphon?
 - a. Fill the tube with water without air bubbles, hold your thumbs over each end and lower one end into the water/aquarium at higher level than the receptacle that will receive the water. Put the other end in the receptacle/bucket to catch the water. Release your thumbs and the siphon will start the water flow.
 3. Name two materials that accumulate in the aquarium gravel.
 - a. Solid waste, uneaten fish food, dead organisms, dead plant/algae
 4. Name two materials found in tap water that can harm our fish.
 - a. Chlorine & chloramines
 5. Name three things that are removed from an aquarium when we perform a partial water change and siphon clean our gravel.
 - a. Accumulated organics, unwanted particles, uneaten fish food, dead or decaying plant materials or algae

APPENDIX

See items below to be passed out to the family members or students for the lesson.

LEARNING ACTIVITY VISUALS



KEY TERMS

UPHILL

moving in a direction that goes higher/upward

DOWNHILL

moving in a direction that goes lower/downward

LEVEL

staying on the same plane or horizontal line

SIPHON

a tube used to move water from a higher location to a lower location

SUCTION

the production of a partial pressure by removing the air from hose to force a fluid liquid (water) into an area of lower pressure.

QUIZ

1. Can water flow uphill?
2. How do you start a siphon?
3. Name two materials that accumulate in the aquarium gravel.
4. Name two materials found in tap water that can harm our fish.
5. Name three things that are removed from an aquarium when we perform a partial water change and siphon clean our gravel.

CONTACT US & ADDITIONAL RESOURCES

For more information regarding this lesson plan, API® brand, or any general fishkeeping questions and/or comments, feel free to contact us below.

- Website: www.apifishcare.com
- Telephone Number: 1-800-847-0659