

**Lesson Topic:** Human Health and the Hydrosphere

**Objective:**

Students will be able to:

1. Identify the pH levels of different types of water.
2. Determine the importance of drinking clean water.
3. Convey the importance of maintaining clean water.
4. Provide ways to become water stewards.

**Time Required:** 80 minutes

**Materials Needed:**

- 6 glasses of water (6 glasses per group)
  - Tap water
  - Filtered water
  - Salt water (add salt to water)
  - Pond water (if not available, use distilled water)
  - Vinegar
  - Baking Soda water
- Teacher computer with internet access
- Projector/Smartboard
- 1 computer/laptop/iPad per student with internet access
- Human Health and the Hydrosphere handout (attached)
- Helpful Websites:
  - <https://a4ws.org/about/>
  - <https://www.epa.gov/standards-water-body-health/what-are-water-quality-standards>
  - [https://www.cdc.gov/healthywater/drinking/public/water\\_treatment.html](https://www.cdc.gov/healthywater/drinking/public/water_treatment.html)

**Teacher Preparation:**

- Assign a Legends of Learning Content Review [Quick Play](#) playlist for the day(s) you will be teaching the lesson.
  - Content Review - Middle School - Human Health and the Hydrosphere
- Make copies of Human Health and the Hydrosphere Worksheet (1 per student)

**Engage (10 minutes):**

1. Tell students to get out their notebook.
2. Hold up a glass of water.
3. Ask students “This is a glass of water. In your notebooks, I want you to take a moment and answer the following questions (write them on the board):
  - a. Would you drink this glass of water? Why or Why not?
  - b. What do you know about the water in this glass?
  - c. What is the risk?
4. Give students time to write.
5. Then, have a class discussion.
  - a. Possible answers: Yes, because it looks clear, I’m thirsty; No, I don’t know

- where it's been, I'm not thirsty;
- b. The water looks clear, but is it safe to drink? No one saw where I got this water from.
  - c. The water could be contaminated and have toxic elements that are living organisms that we can't see inside it.
6. Tell students "Believe it or not, this glass of water is part of our hydrosphere on Earth. Today we are going to talk about our health and the health of our water."

**Explore (15 minutes):**

1. Put students into small groups.
2. Pass out the Human Health and Hydrosphere handout.
3. Tell students "In your groups, you will be getting 6 glasses (jars) of different kinds of water (tap water, filtered water, saltwater, pond water (if possible otherwise distilled could be an option), vinegar, and baking soda water)."
4. Hold up a piece of litmus paper and the color coded key for students to reference.
5. Tell students "Now, there are lots of different things that can be present in our water, but we are going to explore how acidic or basic these different types of water are using the Litmus Test."
  - a. When the liquid you are testing is acidic (has a pH level of less than 6) the paper will turn pink or red.
  - b. When the liquid you are testing is a base (has a pH level greater than 8) the paper will turn a light blue or blue.
  - c. Use the guide on the handout to help you.
6. Pass out all materials to students: glasses of liquids and litmus paper.
7. Tell students "As you test each type of water, write in your results in the chart in your handout."
8. Give students time to work.
9. Discuss what they found during the experiment.

**Explain (25 minutes):**

1. Tell students "As we go through the information, be sure to fill it in your handout under each heading."
2. Write the following heading on the board: Monitoring the Hydrosphere.
3. Ask "What is the hydrosphere?" (It is all the water on, above, and under the Earth's surface).
4. Tell students "The hydrosphere makes up all the water on Earth. Because living things need water to survive, the hydrosphere is pretty important. This is one of the reasons we need to monitor the hydrosphere."
  - a. Ask "How do we monitor the hydrosphere?"
    - i. Allow students to guess.
  - b. Tell students "Scientists monitor the hydrosphere by checking the temperature, pH levels, dissolved oxygen content, and turbidity. Let's write down some vocabulary to make sure we understand all of these words (write the words on the board):"
    - i. pH levels - how acidic or basic the water is. This can be tested using litmus paper.
    - ii. Turbidity - cloudiness or haziness of a liquid. Clean water would have

- very low turbidity.
- iii. Bio-indicator - living organism that sheds light on the health of the water and aquatic life.
5. Tell students “Look at your handout and find the Water Standard Chart for drinking water.”
    - a. As you can see, there are a lot of things in your water that are fine to drink as long as they are within the acceptable levels.
    - b. Which liquids that you tested during your litmus tests had acceptable pH levels? (All but the vinegar is probably within the recommended range, but the baking soda and pond results may vary).
  6. Show students the image of the water treatment process.
  7. Ask “Why does our water need to be treated? (to protect us from drinking contaminants like germs, harmful microorganisms, and other unsafe substances)
  8. Tell students “This image outlines how most communities are treating the water we drink. This is a generalization, because not all communities do this, but most complete these four steps: (write the steps on the board, but verbally say the information).
    - a. Coagulation - chemicals with a positive charge help to neutralize the negative charge that is attached to dirt and other stuff found in the water. All of the yucky stuff in the water bonds to the chemicals forming large particles called floc.
    - b. Sedimentation - floc settles to the bottom.
    - c. Filtration - with the floc out of the way, the clear water at the top will go through lots of filters to remove even dissolved particles like chemicals, bacteria, parasites, dust etc.
    - d. Disinfection - a disinfectant (chlorine or chloramine) gets added to the water to kill any remaining parasites or any other microorganisms before piping it to homes for drinking.

**Elaborate (30 minutes):**

1. Tell students “We just went through a lot of information about drinking water and the quality of drinking water. Now, it is your turn to put that information to good use.”
2. Have students get into small groups.
3. Tell students “ Preserving our drinking water and making sure that we have water on our planet is important for everyone to acknowledge. All humans need clean water to drink, so it is up to us to take care of it and manage it.”
4. Tell students “With your groups, you will need to assign jobs and research the information on your handout. You will create an action plan that you will present to the class.
  - a. They can create their presentation on paper or on an online format (teacher discretion).
5. Give students time to work. Walk around and monitor.
6. Allow each group to present.

**Evaluate (Estimated Time):**

1. Have your students [sign in to Legends of Learning](#). Instruct students to complete the Content Review playlist.



2. [Analyze student results](#) to determine what concepts need to be a focus for reteaching.

**Additional Lesson Strategies:**

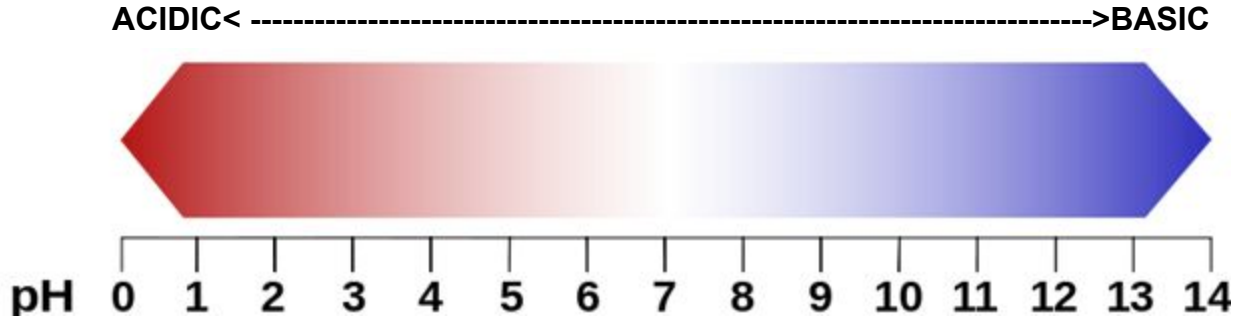
- To use Legends for additional instruction, create a [custom playlist](#) with an [instructional game](#) and pre and post [assessment](#).
- To use Legends for a quick formative assessment, create a 5-question [assessment](#) in a [playlist](#).
- To use Legends for a student-directed experience, create a [targeted freeplay](#) playlist.
- Encourage students to play on their own at home in [Legends of Learning: Awakening](#) for a student-driven experience including avatars, battling, and quests all centered around topics they are covering in class.

Name: \_\_\_\_\_

# Human Health and Hydrosphere

## Litmus Test

Use the litmus paper to test each glass of water. Using the color key provided below, decide what the pH level is for each glass.



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<b>Jar</b>	Tap water	Filtered water	Saltwater	Pond water	Vinegar	Baking soda water
<b>pH</b>						

## Vocabulary

Hydrosphere -

pH levels -

Turbidity -

Bio-indicator -

## Drinking Water Standards

<b>Drinking Water Tests</b>	<b>Standards (mg/L except for pH)</b>
pH	6.5-8.5

Total Alkalinity	120
Total Hardness	300
Total Dissolved Solids	500
Calcium	75
Magnesium	30
Chloride	250
Nitrate	45
Sulphate	150
Dissolved Oxygen	5.0
B.O.D (Biochemical oxygen demand)	50

#### Steps for Treating Drinking Water

- 1.
- 2.
- 3.
- 4.

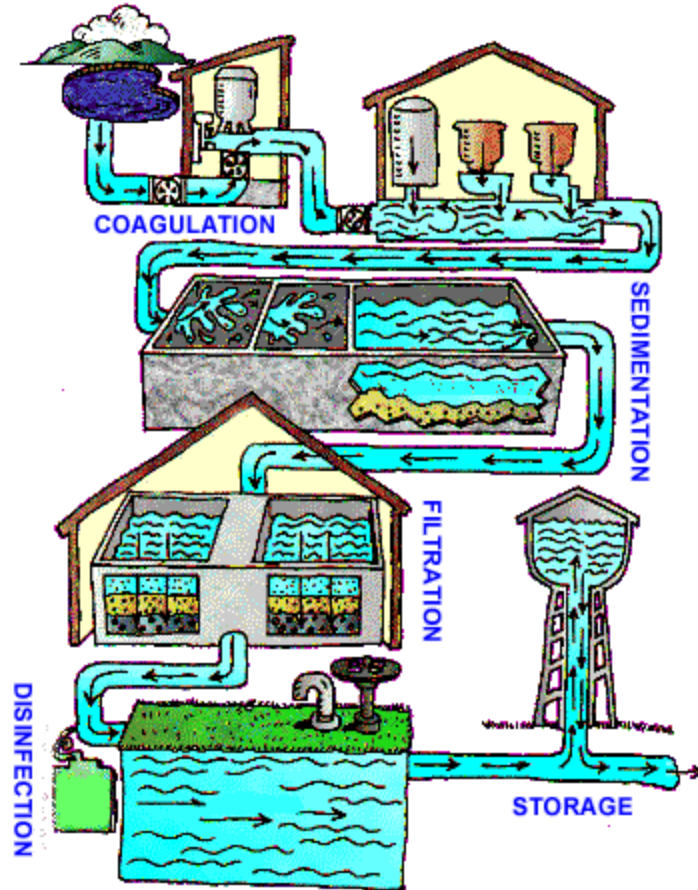


Image from EPA (Environmental Protection Agency)



### Research Project

With your group, answer the following questions using real data and evidence. Take notes in the space below.

Some reliable websites have been provided. You can use other sources, but you must document them below.

- <https://a4ws.org/about/>
  - <https://www.epa.gov/standards-water-body-health/what-are-water-quality-standards>
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- 
- Why is maintaining water quality important?
  - What is a water steward and why do we need to become one?
  - What is your call to action? What are three things people can do in their own communities to preserve water?

Space for Research Notes

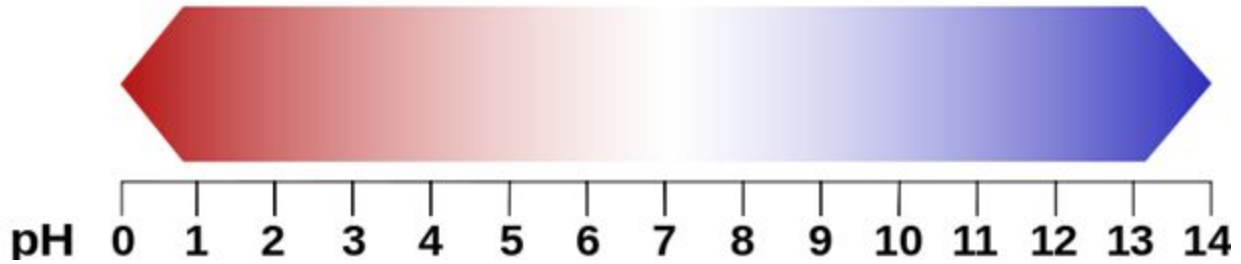


Name: **KEY**

## Human Healthy and Hydrosphere

### Litmus Test

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### Answers will vary slightly

Jar	Tap water	Filtered water	Saltwater	Pond water	Vinegar	Baking soda water
pH	6-7	6-7	7-8	8	3-4	8

### Vocabulary

Hydrosphere - **all water on Earth such as bodies of water, ground water, and water in the atmosphere.**

pH levels - **how much acid or alkaline are in the water. This can be tested using litmus paper.**

Turbidity - **cloudiness or haziness of a liquid. Clean water would have very low turbidity.**

Bio-indicator - **living organism that sheds light on the health of the water and aquatic life.**

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- 1. Coagulation**
- 2. Sedimentation**
- 3. Filtration**
- 4. Disinfection**

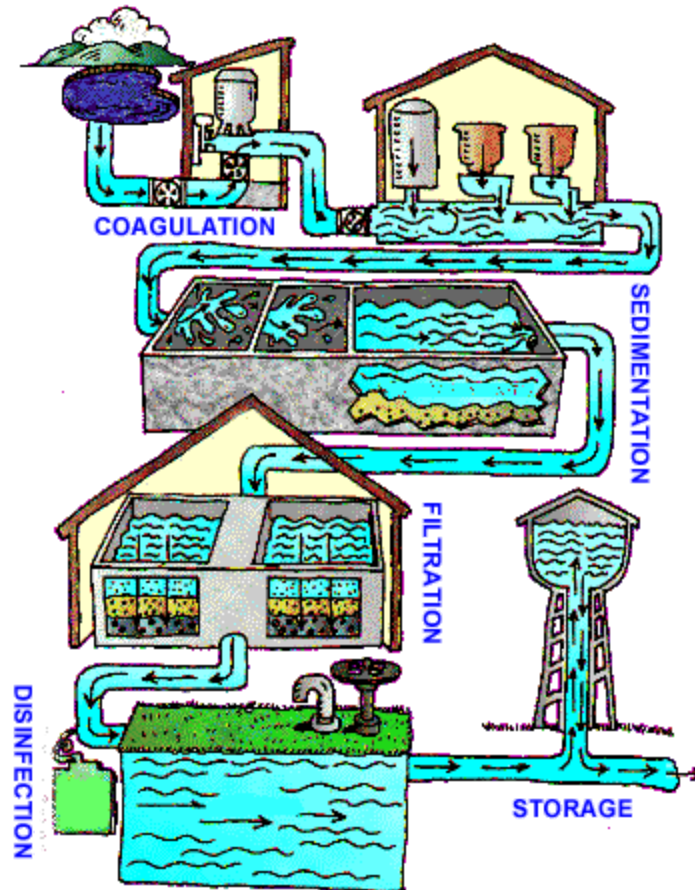


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- Why is maintaining water quality important?

**Answers will vary.**

- What is a water steward and why do we need to become one?

**Water steward is someone that takes on the task of preserving water and taking care of the water resources we rely on. Water is a necessity for all living things so we are all in this together.**

What is your call to action? What are three things people can do in their own communities to preserve water?

**Answers will vary**