MONITORING KIT INSTRUCTIONS

English

❝ All living things - plants, animals, and human beings - require clean water. As users of water and citizens of planet Earth, we must take responsibility for our impact on water quality. Recognizing that education and awareness are important first steps toward action, we challenge you to test the quality of your waterways, share your findings, and protect our most precious resource. ❞

–Philippe Cousteau, Jr.

FOUNDER, EARTHECHO INTERNATIONAL

CONTENTS

WARNING! *This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.*

CONTENIDO

¡CUIDADO! *Esta colección contiene químicos que pueden ser dañinos si no se utilizan corectamente. Lea cuidadosamente las precauciones de cada recipiente. No debe ser utilizado por los niños sin la supervisión de un adulto.*

HOW TO PARTICIPATE

The EarthEcho Water Challenge (formerly World Water Monitoring Challenge) is a program of EarthEcho International that runs annually from March 22nd (United Nations World Water Day) through December 31st.

The EarthEcho Water Challenge builds public awareness and involvement in protecting water resources around the world by engaging citizens to conduct basic monitoring of their local waterbodies:

STEP 1: Test

Check the quality of surface waters in your community.

STEP 2: Share

Enter your data in the international database at www.monitorwater.org. You can also share your monitoring stories and photos through the website or on social media @MonitorWater.

STEP 3: Protect

Armed with your monitoring results, you can use the information and resources available in the "Tools" section of www.monitorwater.org to take action and protect the vital water resources in your community.

FOR YOUR SAFETY

Before you take to the water, read these safety instructions!

- Always monitor with one or more partners. Let someone else know where you are, when you intend to return, and what to do if you don't come back at the appointed time.
- If possible, have a cell phone and a first aid kit handy. Know any important medical conditions of team members (e.g., heart conditions, diabetes, allergies) and bring any needed medications.
- Check the weather conditions. Do not go sampling in heavy rain or if a storm is predicted.
- Keep your pets at home. Dogs can damage stream banks and hurt or destroy aquatic life and wildlife.
- Follow all posted notices and placards regarding water hazards and never trespass on private property.
- Watch for dogs, farm animals, snakes, and insects such as ticks and bees. If possible, wear boots, a hat, light colored long pants and long-sleeved shirts.
- Know how to identify poisonous or other problem plants or vegetation to ensure the safety of those monitoring.
- Never drink the water you are monitoring. Assume it is unsafe and bring your own drinking water.
- Do not walk on unstable banks that might be in danger of eroding or collapse.
- Stay out of the waterbody you are monitoring as much as possible. Never wade in swift or high water.
- If you take a boat out, follow safe boating practices. Wear a life jacket at all times!
- If at any time you feel uncomfortable about conditions at the site, stop monitoring and leave at once.

Your safety is more important than the data!

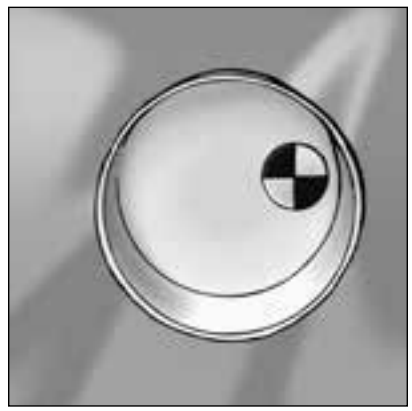
NOTE: *Store TesTabs in a cool, dry place and only open the foil when ready to use the tablet. To view or print a Safety Data Sheet (SDS) for the tablets go to www.lamotte.com. Search the five character Part Code number listed in the test procedure. Emergency information for all LaMotte reagents is available from Chem-Tel (US, 1-800-255-3924) (International, call collect, 1-813-248-0585).*

BEFORE MONITORING

Before monitoring day:

- **Assemble monitoring equipment.**
  - Unpack your kit and inventory the contents.
  - Adhere two thermometer strips on the outside bottom half of the white sample jar.
  - Adhere Secchi disk sticker.

1. Remove the backing from the Secchi disk sticker.

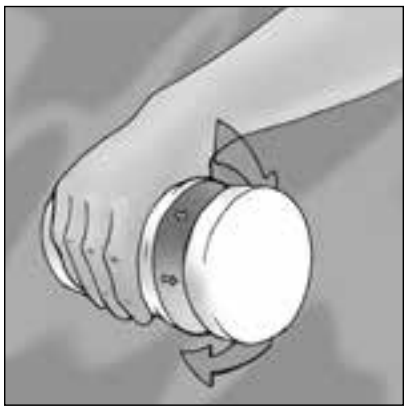


2. Adhere sticker on the inside bottom of the white jar. Position the sticker slightly off center.

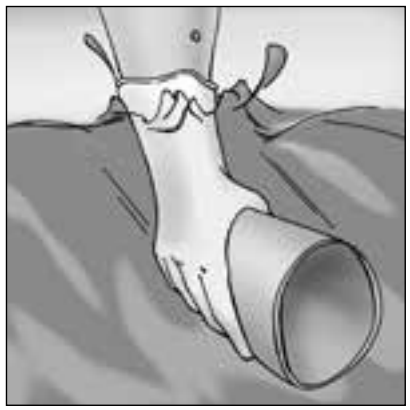
  - Print kit instructions and datasheets if needed. Printable versions available for download from www.monitorwater.org/tools.

- **Create a user account.** Visit the international database at www.monitorwater.org, click "Add Results" and enter your name, username, email address, and password.
- **Adding a monitoring site.** If you are monitoring at a new location you will need to add your site to the database in order to add your monitoring data. Log into the international database and use the geolocation feature on your device or the search box to find your location. Then click "Add Site."

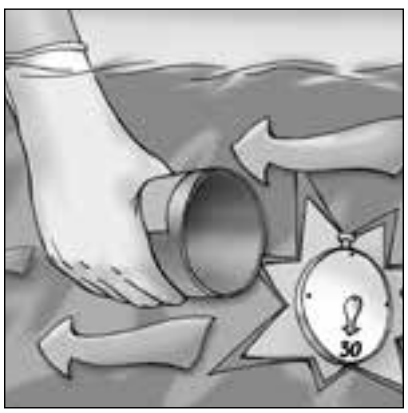
COLLECTION PROCEDURE



1. Remove the cap and rinse the white sample jar 2-3 times with sample water.



2. Hold the jar near the bottom and plunge it (opening downward) below the water surface.



3. Allow the water to flow into the jar for 30 seconds.

4. Cap the full jar while it is still submerged. Then proceed to the temperature procedure.

STEP 1: TEMPERATURE

Why is temperature important?

Aquatic organisms (e.g. insects, fish, and snails) are sensitive to changes in water temperature and require a certain temperature range to survive and thrive. If the temperature of a waterbody is outside that range for a long period of time, organisms can become stressed and die.

°C
(Celsius)

Unit of measure for temperature used by most countries in the world.

Temperature also affects the amount of oxygen water can hold (cold water holds more oxygen than warm water), the rate of photosynthesis by aquatic plants, and the sensitivity of organisms to toxic wastes, parasites, and disease.

What can affect temperature?

Temperature changes that threaten the balance of an aquatic ecosystem can be caused by warm water discharged from industrial operations, the removal of trees and vegetation that shade streams, and runoff from city streets.

TEMPERATURE PROCEDURE

1. Place the thermometer ten centimeters below the water surface for one minute.

2. Remove the thermometer from the water and read the temperature (the number with the green background on the high-range thermometer). Record the number in degrees Celsius.

Equipment Needed:

- 2 adhesive thermometer strips (Part Code: 31821 and 31822)
- white sample jar
- timer or watch

STEP 2: TURBIDITY

Why is turbidity important?

Turbidity is the measure of the relative clarity of water. It should not be confused with color, since darkly colored water can still be clear and not turbid.

High turbidity indicates that there are solid particles such as clay, slit, organic and inorganic matter, and microscopic organisms suspended in the water that make it hazy. These particles can be bad for water quality because they can clog fish gills, block light from aquatic plants, and absorb heat.

What can affect turbidity?

Turbid water may be the result of soil erosion, urban runoff, algal blooms, and bottom sediment disturbances, which can be caused by boat traffic and abundant bottom-feeding fish.

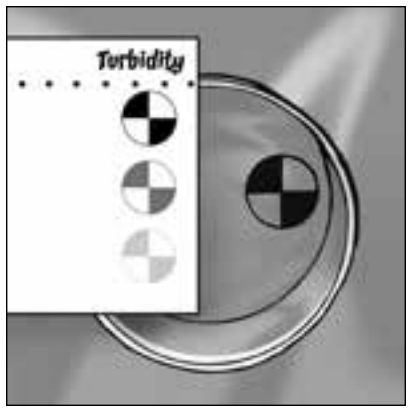
JTU
(Jackson Turbidity Units)

Unit of measure for the turbidity of water. It measures the attenuation, or reduction in strength, of light as it passes through a water sample.

NOTE: *The use of the Secchi disk sticker has limited utility in pristine, clear waters. For more precision in measuring turbidity in standing waters such as lakes, reservoirs, and estuaries, you could obtain and use a Secchi disk. For vendors see 'Advanced Kits' section at www.monitorwater.org.*

TURBIDITY PROCEDURE

1. Pour out water sample until the white sample jar is filled to the fill line located on the label.



2. Hold the color comparison chart on the top edge of the sample jar. Looking down into the jar, compare the appearance of the Secchi disk sticker in the sample jar to the chart. Record the result as turbidity in JTU.

Equipment Needed:

- Secchi disk sticker (Part Code: 5886-STICKER)
- white sample jar
- color comparison chart (Part Code: 8132-CC)

STEP 3: DISSOLVED OXYGEN

Why is dissolved oxygen important?

Dissolved oxygen (DO) is important to the health of aquatic ecosystems. Most aquatic organisms need oxygen to survive. Natural waters with consistently high dissolved oxygen levels are most likely healthy and stable environments capable of supporting a diversity of aquatic organisms.

DO levels can fluctuate seasonally and over a 24-hour period. Levels tend to be lower in the early morning because aquatic plants have been "resting" all night without sunlight for photosynthesis (and oxygen generation).

The key to fully understanding your DO data is to determine the % saturation for the waterbody. In the next step you will use the water temperature and DO level to determine the % saturation of your water sample.

PPM
(parts per million)

PPT
(parts per thousand)

Units of measure for very dilute solutions. These units are very similar to percent. 1% is one part per hundred. 1 ppt is one part per thousand. 1 ppm is one part per million. In water testing, ppm is also called milligrams per liter (mg/L).

What can affect dissolved oxygen?

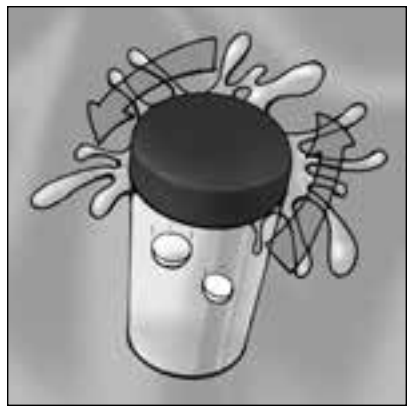
Natural and human-induced changes to the aquatic environment can affect the availability of dissolved oxygen. High levels of bacteria or large amounts of rotting plants can cause DO to decrease. Water temperature can also affect oxygen levels, as cold water can hold more dissolved oxygen than warm water.

NOTE: *This test is a screening test and will only give ballpark indications of poor, fair, and good water quality. If you want more accurate measurements or need a higher range, you could use a Winkler or DO meter titration kit. For vendors see 'Advanced Kits' section at www.monitorwater.org.*

DISSOLVED OXYGEN PROCEDURE

1. Submerge the small glass vial into the water sample. Carefully remove the vial from the water sample, keeping the vial full to the top.

2. Drop two Dissolved Oxygen TesTabs® into the vial. Water will overflow when the tablets are added.



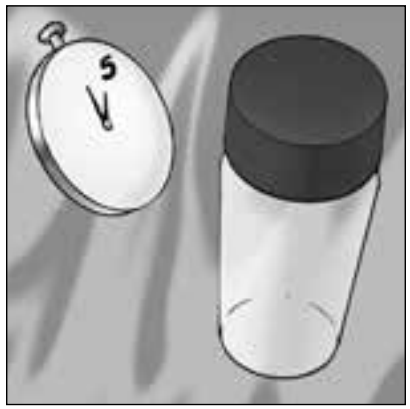
3. Screw the cap on the vial. More water will overflow as the cap is tightened. Make sure no bubbles are present in the sample.

Equipment needed:

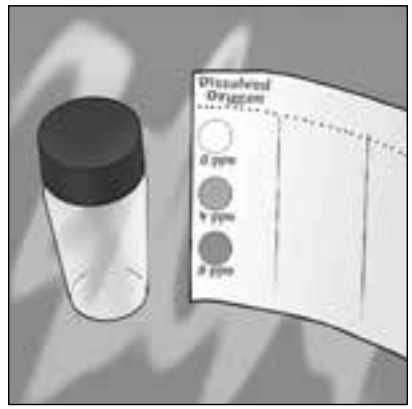
- small glass vial (Part Code: 0125)
- white sample jar
- 2 dissolved oxygen TesTabs® (Part Code: 3976A)
- color comparison chart (Part Code: 8132-CC)
- timer or watch

DISSOLVED OXYGEN PROCEDURE (CONT.)

4. Mix by inverting the vial over and over until the tablets have dissolved. This will take about four minutes.



5. Wait five more minutes for the color to develop.



6. Compare the color of the sample to the color comparison chart. Record the result as ppm dissolved oxygen.

STEP 4: CALCULATION OF SATURATION % OF DISSOLVED OXYGEN

The saturation percentage of dissolved oxygen (% saturation) is an important measurement of water quality. Cold water can hold more dissolved oxygen than warm water. For example, water at 28° C will be 100% saturated with 8 ppm dissolved oxygen. However, water at 8° C can hold up to 12 ppm of oxygen before it is 100% saturated.

To calculate the % saturation locate the temperature of the water sample on the % saturation chart.

Locate the dissolved oxygen result of the water sample at the top of the chart. The % saturation of the water sample is where the temperature row and the dissolved oxygen column intersect.

For Example: If the water sample temperature is 16° C and the dissolved oxygen result is 4 ppm, then the % saturation is 41.

*Calculations based on solubility of oxygen in water at sea level, from *Standard Methods for the Examination of Water & Wastewater, 18th edition*.

DISSOLVED OXYGEN, PPM

TEMPERATURE, °C	0 ppm	4 ppm	8 ppm
2	0	29	58
4	0	31	61
6	0	32	64
8	0	34	68
10	0	35	71
12	0	37	74
14	0	39	78
16	0	41	81
18	0	42	84
20	0	44	88
22	0	46	92
24	0	48	95
26	0	49	99
28	0	51	102
30	0	53	106

STEP 5: pH

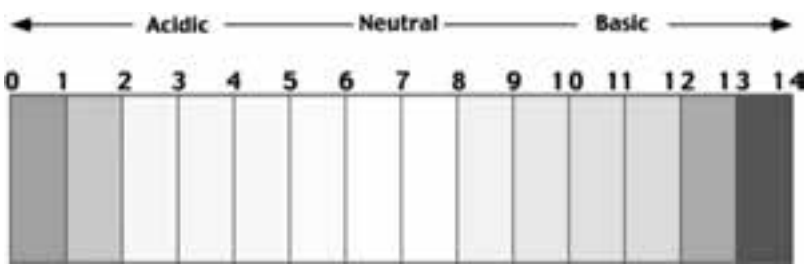
Why is pH important?

Aquatic organisms have adapted to a specific pH level and may die, stop reproducing, or move away if the pH of the water is too high or too low. Most organisms prefer a pH range of 6.5 to 8.0, but to truly determine whether a reading is acceptable, research the needs of the species native to your region.

What can affect pH?

pH can be affected by atmospheric deposition (or acid rain), wastewater discharges, drainage from mines, and leaching from naturally occurring sediment found in the area.

pH Scale

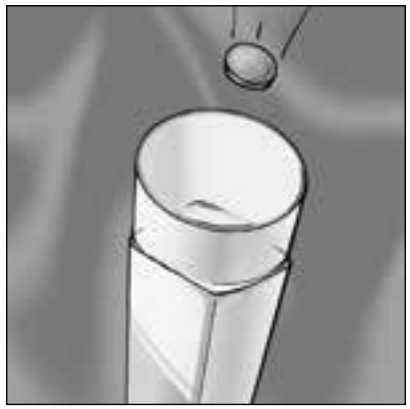


pH

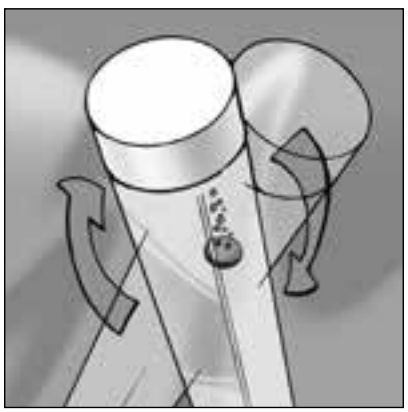
pH is a measurement of the acidic or basic quality of water. The pH scale ranges from a value of 0 (very acidic) to 14 (very basic), with 7 being neutral.

pH PROCEDURE

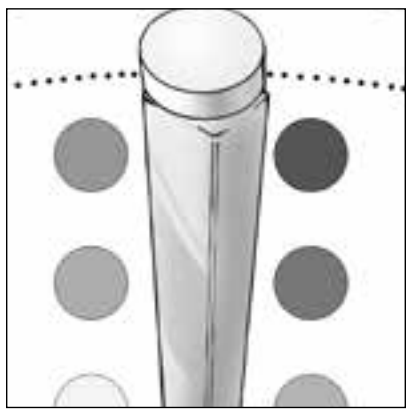
1. Fill the plastic test tube to the 10 mL line with the water sample.



2. Add one pH Wide Range TesTab®



3. Cap and mix by inverting until the tablet has completely dissolved. Bits of material may remain in the sample.



4. Compare the color of the sample to the color comparison chart. Record the result as pH.

Equipment needed:

- plastic test tube (Part Code: 0106)
- white sample jar
- 1 pH TesTab® (Part Code: 6459A)
- color comparison chart (Part Code: 8132-CC)

DATA SHEET

Data can either be recorded in the data sheet below or entered in real time through the international database at www.monitorwater.org.

PARAMETER	EXAMPLE	SITE 1	SITE 2	SITE 3
Date & Time	September 18 1:00 PM			
Location	Potomac Park			
Air Temperature	21° C			
Water Temperature	23° C			
Turbidity	40 JTU			
Dissolved Oxygen	4 ppm			
% Saturation	47%			
pH	7			

If you recorded your findings on a data sheet, you're not finished yet!
Make sure to enter your data through the international database (www.monitorwater.org). Your data proves you monitored, gives a snapshot of your local water quality, and provides the foundation for you to take action to protect or restore your local waters!

DATA SHEET

PARAMETER	SITE 4	SITE 5	SITE 6	SITE 7
Date & Time				
Location				
Air Temperature				
Water Temperature				
Turbidity				
Dissolved Oxygen				
% Saturation				
pH				

Submit your data: www.monitorwater.org

AFTER MONITORING

- **Clean-up.** All reacted samples can be disposed of by flushing down the drain with excess water. While in the field, reacted samples can be poured together into a waste container for later disposal. After monitoring be sure to wash your hands with soap. Also be sure to leave your site in the same - or better - condition than you found it.

- **Submit your data.** If you didn't enter your data while in the field, go to www.monitorwater.org and select "Add Results." Then log into your EarthEcho Water Challenge account.

- **Share your story.** Submit your monitoring story and photos with us at www.monitorwater.org or on social media using @MonitorWater. By doing so, you join a network of citizen scientists from more than 120 countries, and become part of the solution for clean water and healthy waterways worldwide.

- **Determine next steps.** Armed with your test results, use the following information and resources available in the "Tools" section of www.monitorwater.org to take action and protect the vital water resources in your community!

TAKE ACTION

You have run the tests, now it's time to interpret your results and develop a plan for action. Turbidity, pH, temperature, and dissolved oxygen are all indicators that help us understand what's happening in our waterways. But that's just the first step. Once you understand the health of your waterway then you can make decisions about how to protect and restore it. Environmental action ranges from simple projects—conducting surveys or posting signs—to complex and collaborative events—daylighting an enclosed stream or crafting legislation about nonpoint source pollution.

Did you find high temperatures?

Possible cause – thermal pollution from streambank collapse
Possible action – daylight the waterbody through restoration

Did you find high turbidity levels?

Possible cause – too much runoff is entering the waterbody
Possible action – develop a riparian buffer

Did you find low dissolved oxygen?

Possible cause – eutrophication from increased nutrients entering the waterbody
Possible action – install a log deflector to aid in creating turbulence

Did you find a non-neutral (~7) pH?

Possible cause – nonpoint source pollution contaminating the waterway
Possible action – restore wetland surrounding the waterbody

You can find more information and resources on how best to implement these actions at www.monitorwater.org/tools.

Sponsored by/Patrocinado por:

xylem
watermark®
Because Every Drop Counts

Manufactured by/Fabricado por:

LaMotte

PO BOX 329 • CHESTERTOWN, MD 21620
800-344-3100 • f: 410-778-6394 • WWW.LAMOTTE.COM