Louisiana Universities Marine Consortium

Parameter Information and Procedures for pH & Water Clarity

Prepared for Coastal Roots Teachers

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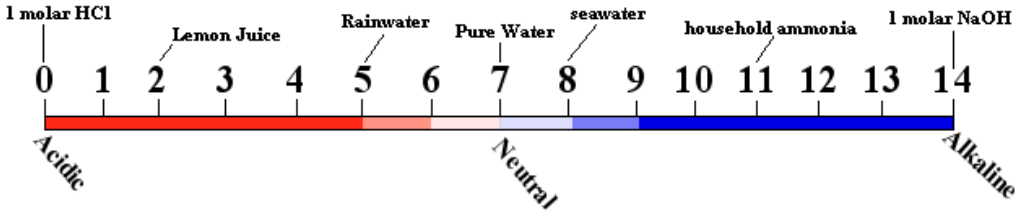
pH

pH is a measure of the concentration of hydrogen ions in a solution. Measured on a scale from 0 to 14, pH varies due to variables including temperature, dissolved gases, and pollution. Marine scientists use pH as an indicator of water quality. The marine biologist is interested in pH and its changes, since they may reflect biological activity and changes in natural chemistry of waters, as well as pollution. Most marine organisms can tolerate only a narrow range of pH and depend on the natural buffering system of saltwater to maintain pH readings between 7.5 and 8.4. As a pH reading gets closer to 0, the hydrogen ion concentration [H^+] gets higher, the hydroxide ion [OH^-] concentration goes down and the solution becomes more **acidic**. As a pH reading gets closer to 14, the hydrogen ion concentration [H^+] goes down while the hydroxide ion [OH^-] concentration goes up and causes the solution to become more **basic (alkaline)**. A pH reading of 7 means the [H^+] concentration and the [OH^-] concentration are equal and the solution is considered to be neutral, being neither acidic nor basic.



Most living organisms can tolerate only slight pH fluctuations near the neutral region of the pH scale. Under open ocean conditions an effective pH buffering system limits seawater pH values to a narrow range between 7.5 and 8.4. However, dissolved gases such as CO_2, H_2S, and NH_3 can also have a significant effect.

When recording data it is important to also record the units the parameter was measured in so there is no doubt about the measurement. pH has no units so no units are recorded.

Note: Handheld portable probes makes measuring pH in the field easy and accurate. pH probes should be calibrated regularly. Read all of the manufacturer's instructions about how often and instructions to calibrate your pH probe. After the probe is calibrated it is ready to take pH measurements.

Procedure for Measuring pH

- Simply turn the probe on by pressing the 'On/Off' button once and wait for 'PH' to clear from the display.
- Take the protective cap off of the electrode end of the probe and place into the sample and stir **gently** for a few seconds.
- Give the probe time to settle on one reading; this may take a few minutes, but usually occurs quickly. Probes that take longer may need to be recalibrated. Read the pH measurement while the probe is still in the water, do not take it out of the water to read it.
- Record the pH measurement on the data sheet
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When the sampling procedure is over, rinse the electrode area of the probe with clean water and replace the cap. Make sure to turn off the probe before packing it away to preserve battery life.

Water Clarity

Water clarity measures the clearness or the transparency of water. The transparency of water will indicate how far light is able to travel through the water column. Transparency can be used as an indicator the turbidity of a body of water since transparency can be affected by the color and the amount of suspended materials in the water. Turbidity (an optical property) is the cloudy appearance of water caused by suspended particles in the water. Suspended particles include things like sediment, minerals, microorganisms, and chemicals. Keep in mind that transparency and turbidity are very different water quality parameters and should not be used as interchangeable terms.

Measuring the transparency of a body of water will indicate the depth of the **photic zone**; the zone of water that is exposed to enough sunlight to support photosynthesis, on a given day. The depth of the photic zone varies with the turbidity of the water. In highly turbid lakes the photic zone can be as little as 1-2 centimeters, while in the open ocean it can extend to 200 meters.

Scientists are concerned with water clarity because high turbidity can cause problems. The suspended solids in a water body can absorb heat and cause dissolved oxygen levels to drop. It also lowers dissolved oxygen levels by decreasing the amount of photosynthesis by aquatic plants and algae by limiting the sunlight available. Lower levels of photosynthesis will lower the amount of dissolved oxygen required by cellar respiration. High levels of suspended solids can also have devastating affects on other aquatic life. Large amounts of suspended material can settle out of the water column destroying habitat for macroinvertebates, fish eggs, and fish fry. High turbidity can cause problems by choking filter feeders, clogging the gills of aquatic animals, and reducing their ability to feed and fight infections. Humans are also susceptible to hazards presented by high turbidity. Suspended material can make it easier for viruses, bacteria, and protozoa to survive chemical disinfection of water treatment.

Measure water clarity by using a transparency tube. A transparency tube is a clear tube with a Secchi disk pattern located on the bottom and a centimeter scale on the side. The tube should also have a drainage hose and a clamp on the bottom. Make sure that the clamp is functioning properly and that the tube does not leak before going to the field.

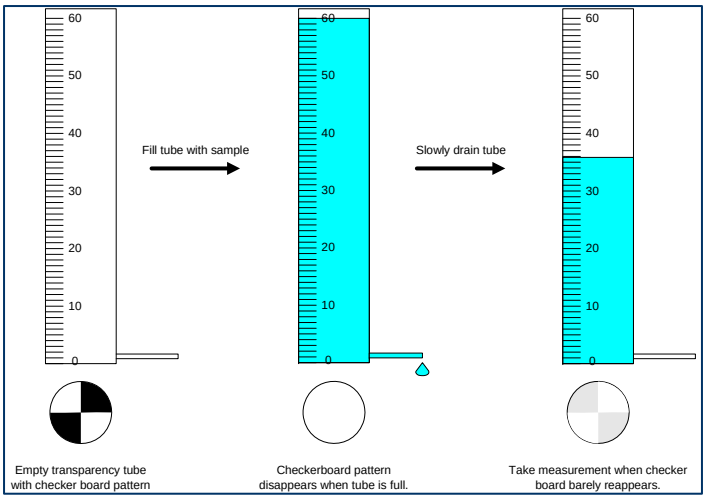
Procedure for Measuring Water Clarity:

- With a bucket tied to a rope or student sampler collect a water sample. It is important to use a **new** sample of water for measuring water clarity since solids will fall out of suspension rather quickly.

- Rinse your bucket three times with water from the site. Be careful not to stir up sediments from the bottom of the water body, this will add error to the measurement. To avoid this, collect your rinse water away and downstream of where you intend to collect your sample. Always pour the rinse water out of the bucket away from the edge of the water body.

- Collect the water sample.

- Making sure that the hose is clamped shut; pour ~10 cm of water in the tube. With one hand over the opening and the other on the bottom, rock the tube back and forth to rinse the tube. Do this at least 3 times.



- Make sure the clamp is still pinched tight. With the rest of the collected sample, fill the tube completely to the top.

- Turn your body away from the sun so that the only thing that is shading the tube is your body.

- Take of sunglasses if you are wearing them.

- Look down the center of the tube.

- If the black and white pattern of the Secchi disk is visible, the clarity measurement is +60 cm.

- If you can not see the Secchi disk, start to slowly drain water from the tube through the hose. You can use the clamp to slow the rate at which water is drained. Drain the water out of the tube until the difference between the black triangles and the while triangles of the Secchi disk is just barely visible.

- Stop draining the water by closing the clamp.

- Using the centimeter scale on the side of the tube measure how much water is left in the tube.

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