WATER QUALITY TEST KIT

OBJECTIVE:

Collect three water samples: distilled water, tap water, and a natural water. Test the temperature, pH, and for TDS. Analyze the data to determine how "clean" the samples are.

DEVELOPED BY:

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NIEHS Environmental Health Center

NIH National Institute of Environmental Health Sciences

CEG Center for Environmental Genetics

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WATER QUALITY

Water quality is commonly defined by its physical, chemical, and aesthetic characteristics. The characteristics of water and the presence of any containments are used to indicate and measure the quality of the water.

- Physical: temperature, turbidity, dissolved solids, clarity, salinity
- Chemical: pH, organic and inorganic compounds (toxicants)
- Aesthetic: odors, taints, color, floating matter

Water quality is very important because it directly affects living things, such as humans, animals, and plants. The higher the water quality the better the water is for the environment.

pH

Potential of hydrogen (pH) measures the concentration of protons (H+) in a substance. The more protons the higher the pH (acidity) will be.

- An acid is a substance that **donates** hydrogen ions.
- A base is a substance that **accepts** hydrogen ions.

pH is a universal scale from 0-14, given to determine how acidic or basic a substance is. The lower numbers on the scale are the result of a more acidic substance and the higher numbers on the scale are the result of a more basic substance. When the substance is neutral, neither acidic nor basic, the substance receives a 7.

TOTAL DISSOLVED SOLIDS (TDS)

Total dissolved solids (TDS) is the measure of all the particles in any organic or inorganic substances within a liquid.

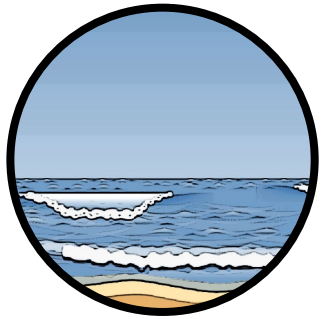
- Organic substance: A compound whose molecules contains carbon.
- Inorganic substance: A compound that does not contain carbon (Most elements).

TDS is a secondary drinking water contaminant, but is not health threatening. High levels of TDS can have aesthetic and technical effects, including cloudy water, salty taste, odor, and pipe corrosion.

TDS is typically measured in two units:

- Micrograms per liter (mg/L)
- Parts per million (PPM)
    - *1 mg/L = 1 ppm*

Fresh water has less than 1,500 mg/L of TDS.



Sea water has between 30,000 - 40,000 mg/L of TDS.

COLLECTING WATER SAMPLES

SUPPLIES NEEDED:

- ☐ Collection cups
- ☐ Data Collection Sheet
- ☐ Dry erase marker

DISTILLED WATER

1. Using a dry erase marker, label the water collection cup, "Distilled Water".
2. Fill the container approximately 2 inches full of distilled water. Put the lid on the cup.

TAP WATER

1. Using a dry erase marker, label the water collection cup, "Tap Water".
2. On your Data Collection Sheet, note the name of the collection location or address where you are collecting the sample.
3. Determine where you will be collecting the sample. Generally, bath tubs and kitchen sinks are suitable. Check the faucet to be sure it is clean.
4. Flush the faucet with cold water, letting water run undisturbed, for 2 –3 minutes before collecting sample. Once the flush is complete, adjust the water flow to a medium-pressure.
5. Fill the container approximately 2 inches full of tap water. Put the lid on the cup.
6. When you return to the classroom, determine the latitude and longitude of your sampling location. Record the coordinates on your Data Collection Sheet.

NATURAL WATER

1. Using a dry erase marker, label the water collection cup, “Natural Water”.
2. On your Data Collection Sheet, note the name of the collection location and type of natural water you are collecting.
3. Also record the time of collection and the current and past 24 hour weather conditions.
4. Determine the latitude and longitude of your sampling location. Record the coordinates on your Data Collection Sheet.
5. Fill the container approximately 2 inches full of natural water. Put the lid on the cup.

TESTING WATER SAMPLES

SUPPLIES NEEDED:

- ☐ pH meter
- ☐ TDS meter
- ☐ Thermometer
- ☐ Collected water samples
- ☐ Tissues/Tissue paper
- ☐ Distilled water in wash bottle

TDS Meter

pH Meter

Thermometer

TOTAL DISSOLVED SOLIDS (TDS)

1. Remove the protective cap from the TDS meter and ensure the tip of the probe is dry. *If it is not dry, gently shake the probe or use a tissue to dry.* ***Do not touch the metal probe.***
2. Turn the probe on by pushing the 'ON/OFF' button.
3. Set mode to TDS-ppm (0.5); press and hold the 'HOLD/MODE' button to switch between modes.
4. Place the probe in the water for testing. Swirl and lightly tap meter on the bottom to allow trapped air to be released. Wait 30 seconds for the TDS reading to stabilize in the water, then quickly press the 'HOLD/MODE' button to capture the reading, so it can be viewed out of water. The 'HOLD/MODE' button will also release it.
5. Record the value from the probe on your Data Collection Sheet, then press the 'ON/OFF' button to turn the TDS probe off.
6. Rinse off the end of the probe using distilled water in wash bottle. Gently shake or wipe dry with a tissue before replacing the cap.

pH

1. The pH meter must be cleaned before each use. To clean, remove the black cap from the pH meter. Place the electrode cap-level deep in distilled water for 5 minutes. ***Do not touch the metal probe. Do not drop meter in water or dip beyond the capped area.***
2. Remove the probe from the distilled water and dry with tissue paper.
3. Turn on the pH meter by moving the black square on the top of the meter to the left.
4. Take off the cap and place the electrode in the water sample to be tested. Hold the meter cap-level deep in the sample. Wait 10-30 seconds for the reading to stabilize.
5. While the meter is still in the water, record the value from the probe on your Data Collection Sheet.
6. Remove the meter and rinse off the end of the meter using distilled water in wash bottle. Gently shake and wipe with tissue paper until the probe dry. Once dry, place the cap on the meter.

TEMPERATURE

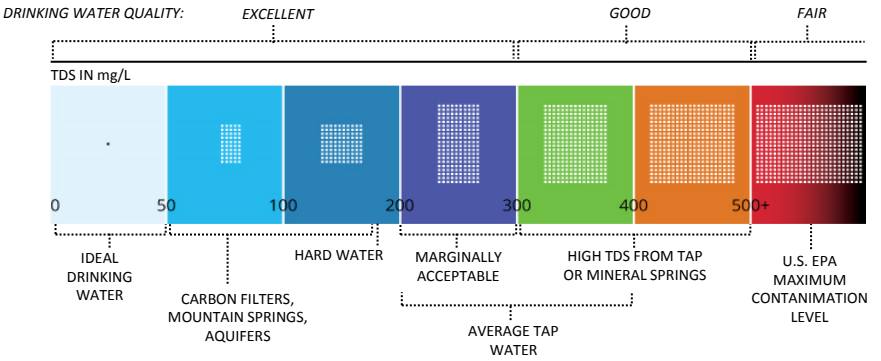
1. Take the thermometer out of its case. Ensure the tip of the thermometer is clean and dry. If it is not, use tissue paper to clean/dry it off.
2. Press the 'ON/OFF' button to turn on the thermometer. Hold the thermometer in the water and wait 30 seconds for the reading to stabilize.
3. Once stabilized, press the hold button on the thermometer. Record the value on your Data Collection Sheet. Press the 'ON/OFF' button to turn off the thermometer.
4. Rinse off the thermometer using distilled water in wash bottle. Dry it with tissue paper. Place the thermometer back in its case.

** Repeat TDS, pH, and temperature procedures for each water sample. Follow package/teacher directions if calibration of instruments is needed. If probe display is faded or will not appear, the batteries may need to be replaced.*

WHAT DOES YOUR DATA MEAN?

Using the graphs below, evaluate the quality of each water sample.

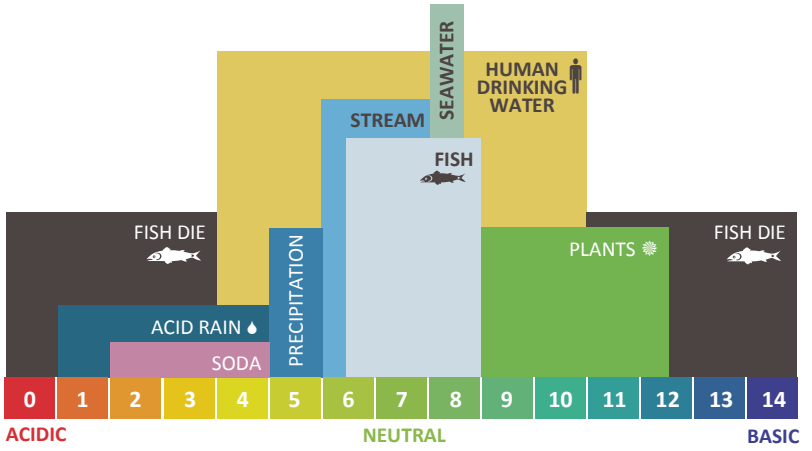
TOTAL DISSOLVED SOLIDS (TDS)



Graphs from: www.fondriest.com

pH

Humans and animals can tolerate fairly large extremes of pH. In fact, most soft drinks have a pH between 2 and 4! Untreated public water supplies typically have a pH between 4 and 9. After treatment, most public water supplies have a pH between 6.9 and 7.4. The acceptable pH range for drinking water set by the Public Health Service Act is 6.5 -8.5.



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