**Dissolved Oxygen and Temperature Testing Protocol**

**Overview:**

Dissolved oxygen (DO) is an indicator of lake health and affects the viability of fish. Fish must have a certain percentage of dissolved oxygen to live. DO is also an indicator of the amount of decomposition occurring on the bottom of the lake, as decomposing materials consume large amounts of oxygen. More oxygen can be dissolved in water at colder temperatures. Oxygen in the atmosphere dissolves in lake water by diffusion across the air/water interface: as air hits the water, oxygen atoms transfer from the gaseous state to a dissolved solute in a liquid.

A YSI Environmental 550A Dissolved Oxygen Meter is used for this test. This meter was borrowed from the Indiana Clean Lakes Program, which is a sector of the Indiana Department of Environmental Management Office of Water Management. This group works with citizens in establishing monitoring systems on lakes in Indiana. They loan out meter systems so that local residents can take measurements. I advise reading the manual before taking measurements with the meter.

**Materials Needed:**

* Notebook with waterproof paper (Spiral bound, Rite in Rain, Journal or Field type, purchased from Amazon)
* Waterproof Pen (Rite in Rain All-Weather #37 Black Ink Fine Point)
* Paddle boat
* GPS device (Lowrance HDS5 GPS Unit)
* Bottle of distilled water (Aquafina)
* DO/temp meter (YSI Environmental 550A Dissolved Oxygen Meter with 50 ft probe)
* Sponge
* Rubber band
* String
* Weight (metal weight, available in PPA building)
* Nylon zip tie

**Preparation:**

 The DO meter is equipped with a lightweight probe that measures both dissolved oxygen (in ppm or % saturation) and temperature (in Celsius). Because of its light weight, the probe can drag in the water when lowered, thus skewing the results, so an X-gram weight is attached. This silver weight, attached to a rope in the PPA building laboratory, was attached via the rope loop to the ribbing on the cord right above the probe using a zip tie. A kitchen sponge was then wrapped around the weight and secured with a rubber band. When testing, you must pick up the weight and the probe together so that the weight does not pull on the probe. Once in the water, there will be less pull, and the weight will eliminate the drag (probe will lower cleanly into the water).

**Procedure:**

1. Arrive at desired test site with the aid of the GPS device.
	1. Record date, time, test site number, GPS location, water color (WC), overall depth (displayed on the GPS unit screen), and observer (who conducted the test) in your notebook
	2. Record number of Physical Condition (PC) in your notebook using the following codes 1-5:

1 = crystal clear water

2 = not quite crystal clear – a little algae/weeds visible/present

3 = definite algae/weeds – green, brown, or yellow color present

4 = high algal/weed levels with limited clarity and/or mild odor apparent

5 = Very high algal/weed levels with one or more of the following: massive floating scum on the lake or washed up on shore; strong or foul odor; fish kill

* 1. Water color: use your best judgment on color of water, two colors can be used to describe, light and dark as descriptors (examples include: light green, dark grey, light green/grey)
1. Calibrate the unit. This needs to be done only at the beginning of the testing day, not at every test site.
	1. The probe is inserted horizontally into the side of the meter under the screen. Carefully pull it out and do not touch the gold membrane at the end of the yellow tip.
	2. Make sure the probe tip is wet/moist. If not, apply distilled water to the probe end, shake off the excess, and then return to the storage chamber.
	3. This test is recorded in % saturation, so the “calibration in %” calibration is necessary.
	4. Turn on the unit and allow the readings to stabilize.
	5. Press and release UP and DOWN arrow keys at the same time.
	6. Press mode key until % is displayed. Press ENTER.
	7. Increase or decrease value until the number is 8. (This indicates the altitude of the region, measured in hundreds of feet. We are roughly at an altitude of 800 feet above seal-level).
	8. Wait for the current DO readings on the main display to stabilize. Press ENTER.
	9. Increase or decrease salinity until it reads 0 ppm. Press ENTER.
	10. You are ready to begin testing.
2. Measurements are made every meter. Judging by the overall depth, decide how many 1-meter increments can be made. Do not allow the probe to touch the lake bottom, so only do as many increments that allow you to get close to the bottom without touching it. There are 0.3048 meters in 1 foot.
3. Take the probe out of the storage chamber and insert it into the water until it reaches the desired depth (the cord is labeled every meter).
4. Move the probe up and down roughly 1-2 inches to allow water to flow in and out of the probe head.
5. Wait until the readings stabilize and record temperature (in Celsius) and % Dissolved Oxygen for specific depth.
	1. The numbers will not completely stabilize (remain constant). You are looking for a number to repeat several times or hover around a specific value.
6. Repeat until all depth increments have been recorded. There is no need to take the probe out of the water between increments at a given test site.
7. Take the probe out of the water and rinse it with distilled water from the water bottle before returning it to the storage chamber on the meter. Don’t forget to shake off the excess water.
8. Move to the next test site and repeat. Do not turn the meter off between sites, as this will require re-calibration.
9. When completely done with your measurements, rinse off the probe with distilled water and return it to the storage chamber. Turn off the unit.

**Example of Data Table:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Date** | **Time** | **Test Performed By:** | **Test Site Number** | **Depth (m)** | **Location** | **WC** | **PC** | **Temperature (oC)** | **DO %** | **Increment Depth** |
| 7/31/13 | 10:35 |  | 5 | 7.2 | GPS coordinates | green | 3 | H | 82.7 | 1 |
| 7/31/13 | 10:35 |  | 5 | 7.2 | GPS coordinates | green | 3 | H | 65.3 | 2 |