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# DISSOLVED OXYGEN

## DISSOLVED OXYGEN TEST KITS

Dissolved oxygen test kits are routinely available from two companies: LaMotte Chemical Co. and Hach. The Hach kit contains dry powders. The LaMotte kit contains chemicals in solution plus one powder. Both work well. The LaMotte kit is the most frequently used by teachers. It is widely available through biological and scientific supply firms. Materials may also be purchased directly from LaMotte (P.O. Box 329, Chestertown, MD 21620). Each piece of the kit is independently available so that replacing the chemicals or kit parts is easy. A teacher may extend the usefulness of the kit by combining a single kit with three extra sample bottles, vials and syringes to provide enough materials for 4 groups to work at the same time at a one time cost of about \$60. Check with other schools to see if anyone has an old kit. Get the catalog from LaMotte and order the new parts. New chemicals should be purchased each year. The parts number is written on each piece. The sample bottle is 0688DO, the syringe is 0377, and the vial is 0299. Ask for both the reagents and the parts (kit) catalogues.

Detailed instructions are included with the LaMotte dissolved oxygen test kits. The instructions are too complicated for children and get ruined in use. The newer kits have addressed this problem. Read the original instructions and file them for your own use. Copy the instructions in this curriculum and laminate or cover them with plastic for your students' use. To make the kit match these instructions, label the sample bottles and solutions with tape and a permanent marker as shown below without covering up the original labels with their cautions and safety precautions. Explain to your students that this is an accurate test for dissolved oxygen and that when they have chemistry, they will understand it. For now, they can take it on faith. It works and is the same test scientists have used for many years. Label the back of each bottle in the test kit as follows:

- Empty sample bottle with screw cap - A
- Empty sample bottle with snap cap with hole in it - B
- Manganous sulfate solution - 1
- Alkaline potassium iodide azide - 2 (this is the most toxic chemical)
- Sulfamic acid powder - 3
- Sodium thiosulfate solution - 4
- Starch solution - 5

*DEMONSTRATE THE USE OF THE TEST KIT, USING STUDENTS AS HELPERS, FOR THE WHOLE CLASS BEFORE ANY STUDENTS TRY IT WITHOUT YOUR SUPERVISION. ALWAYS HAVE ONE STUDENT READ THE INSTRUCTIONS WHILE ANOTHER DOES THE TEST. MAKE SURE YOUR STUDENTS ARE AWARE OF THE FACT THAT THEY SHOULD REGARD ALL CHEMICALS AS DANGEROUS AND HANDLE THEM WITH CARE AND RESPECT. AVOID ALL CONTACT WITH SKIN OR EYES. NEVER TASTE ANY CHEMICAL. WEAR EYE PROTECTION WHENEVER USING CHEMICALS.*

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## FIELD TESTS FOR DISSOLVED OXYGEN

For use in the field with elementary children, have the students take the water samples. A teacher then adds chemicals 1-3 (steps 1-5 ) to each sample bottle promptly. At this point the samples will hold without change and may be taken back to school. This precludes children handling chemicals under somewhat uncontrolled field conditions. The final steps are then done by the children on a subsequent day at school where they may work carefully at desks. This requires enough sample bottles for all the sampling done on a field trip. You cannot store water samples untreated for any length of time and be sure of your results since bacteria and phytoplankton in the water may use oxygen before measurements are taken. Fixing the samples in the field solves this problem.

### TAKING A WATER SAMPLE FOR A DISSOLVED OXYGEN TEST:

Rinse the bottle with sample water first if possible.

**From a container:** While you can carefully pour the sample down the side of the screw-capped sample bottle (A), you may also use a kitchen baster or syringe to remove water or siphon water out with aquarium tubing. Siphoning should be done by the teacher. It is a good way to collect bubble-free samples. Hold over a bucket or sink and let the sample bottle overflow for a while if possible for a good sample.

**From shallow water:** Put the sample bottle (A) at the depth you want to sample. Hold it sideways. Remove the cap and fill completely, tipping up at the end. Cap tightly.

**From a water sampling device:** Pour gently down the side of the bottle. Do not splash or make bubbles.

**From the LaMotte Water Sampling Device:** LaMotte now makes a water sampler for field use that holds the DO sample bottle (A). Just pull it out and fix the sample.

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## LAMOTTE DISSOLVED OXYGEN TEST KIT INSTRUCTION

*DANGER: POISONOUS CHEMICALS  
DO NOT TASTE OR GET ON SKIN OR IN EYES  
USE EYE PROTECTION WHEN WORKING WITH CHEMICALS*

This kit should contain: 2 empty bottles marked "A" and "B," 5 chemical bottles marked "1, 2, 3, 4, and 5", an eye dropper (which may be in the cap of chemical 5), a scoop and a syringe. Check the contents first and identify these things. **ALWAYS PUT THE CAP BACK ON THE CHEMICALS IMMEDIATELY AFTER USE! USE EYE PROTECTION. PUT NEWSPAPERS ON YOUR DESK TO CATCH SPILLS.** In addition, you may want to work on a pie plate.

1. Fill Bottle A full to overflowing with the water you are testing without splashing it or making bubbles in the sample.
2. Add 8 drops of chemical 1 to the water sample. The drops will sink.
3. Add 8 drops of chemical 2 to the water sample. Catch spills with newspaper or paper towels.
4. The sample will change color. Screw the cap on tightly and shake gently several times to mix. Then, let the sample sit for 1 minute.
5. Fill the white scoop with chemical 3. The top should be level, but do not use your fingers. Use inside of chemical vial to make level. Remove the cap from the sample Bottle A and add the scoop of chemical 3. Do not get the scoop wet. Tap it on the handle, not the scoop, with your finger if the powder sticks.
6. Replace the sample cap and shake until the brown flakes go away. This may take a while. **IF YOU WANT, YOU CAN STOP AT THIS POINT AND THE SAMPLE WILL NOT CHANGE AS LONG AS THE LID IS ON TIGHT. FIX SAMPLES TAKEN IN THE FIELD TO THIS POINT AND RETURN TO CLASSROOM FOR FINAL TESTING.**
7. Pour the colored sample from Bottle A into Bottle B up to the white line.



8. Push the plunger on the syringe all the way in. Put the syringe into the hole in the top of chemical 4. Turn the bottle upside down and **SLOWLY** pull the plunger down until the bottom

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of the plunger is at 0. Do not pull it all the way out! **DO THIS SLOWLY**. You may set the syringe on the desk without having it spill.

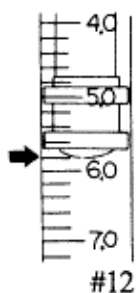
9. Use the eye dropper to add 8 drops of chemical 5 to the sample in B. It will turn blue. Cap Bottle B and swirl. **DO NOT PUT YOUR FINGER OVER THE HOLE AND SHAKE**. Hold the top in one hand and make the bottom of the bottle go in a circle, causing the solution to circle around in the bottle.



10. Put the syringe into the hole in the top of Bottle B and add chemical 4 to the sample **ONE** drop at a time. Mix by swirling after **EACH DROP**. Do **NOT** push the syringe hard. Do **NOT** hold it like a shot. Swirl the sample each time to mix.

11. When the blue appears to lighten before mixing, **SLOW DOWN** even more. Continue to add **ONE** drop at a time and swirl until the blue just barely goes away. **STOP IMMEDIATELY WHEN THE SAMPLE TURNS CLEAR**. If the sample stays blue and the syringe is empty, refill it and continue. Add the results.

12. When the blue disappears, look at the end of the plunger on the syringe. Read the number where the bottom stopped. Write down the number and write ppm behind it. This stands for parts per million.



13. Dispose of the remaining sample as instructed by your teacher and rinse the two sample bottles with water.

14. **WASH YOUR HANDS WITH SOAP.**