1.2) INSTRUCTOR'S GUIDE TO PHYSICAL CONDITIONS AND DISSOLVED OXYGEN

Overview: The dissolved oxygen content of aerated tap water at room temperature is between 7 and 8 ppm. About 1-20 seconds of vigorous shaking is usually enough to reach atmospheric saturation. To maximize the difference between the graduate cylinder and shallow container, it is best to measure oxygen after only one hour of cooling. If you wait overnight, the difference will be much less significant because dissolved oxygen levels in both containers will be much closer to equilibrium.

Sample Results for Part A

Agitation time	0 sec.	Poured	5 sec.	10 sec.	15 sec.	20 sec.	25 sec.
Oxygen (ppm)	2.0	2.4	6.8	7.8	8.2	8.2	8.2

Sample Results for Part B

Temperature (°C)	26	23	17	13	7
Oxygen (ppm)	7.4	7.8	9.0	10.4	12.2

Answers to Questions: 1) 15 seconds according to the table. 2) A flowing river may be less likely to suffer from oxygen depletion due to aeration 3) Typically, about 3 ppm in the graduate cylinder and 7 ppm in the shallow container will be detected after one hour of cooling. The shallow container will gain oxygen the fastest due to large surface area exposed to air. 4) High temperature decreases the water's capacity to hold oxygen. This is partly why oxygen depletion usually occurs during the summer months. 5) High air pressure increases the water's capacity to hold all gases from the air, including oxygen. Bodies of water at high altitudes will have lower levels of dissolved oxygen due to the lower air pressure.

Logistics: This lab can be completed during a 40-minute period. You will need one oxygen meter for each group of 2-3 students. If you have only one oxygen meter for the whole class, you can do this as a demonstration. Alternatively, you might have students take turns at taking the 10-12 oxygen readings that are needed for a complete data set while others carry out other parts of the procedure (such adding ice cubes or measuring temperature) under your supervision. Do not prepare the de-aerated water more than 24 hours before the lab, otherwise air will diffuse into the water from around the edges of the stopper and your initial oxygen readings will be too high.

Degree of Difficulty: 1—This lab requires very little time to set up. No rehearsal is needed.

Product Guidelines: Your biggest potential set-back may be the quality of the oxygen meter. Some probes need more time to adjust to different temperatures in order for them to give you accurate readings, and some are so poorly designed that they always end up taking readings that are *lower* (instead of higher) in colder water. Be sure to rehearse the temperature experiment before you try it on your students to make sure you do not encounter this problem in class.

Materials: A dissolved oxygen meter; a hotplate; about 10 ice cubes; three 250-mL Erlenmeyer flasks; a rubber stopper; and a 60-mL syringe with screw-on cap.