

Experiment GB-3: Water Quality

Exercise 1: Dissolved Oxygen Concentration of a Water Sample

Aim: To measure the dissolved oxygen concentration of a water sample.

Warning: Use gloves, goggles, and lab coats when handling water samples.

Procedure

1. Place a magnetic stirrer on or next to the base of a ringstand. Open the first water sample bottle and place a stir bar in the bottle. Place the cap on the bottle and turn it until it is tight. Turn on the stirrer and position the stir bar in the center of the bottom of the bottle. Turn off the stirrer before Step 2.
2. Remove the dissolved oxygen electrode from the beaker of deionized water. Blot the drops of deionized water from the electrode. Mount the electrode on the ringstand using a clamp.
3. Remove the cap from water sample bottle, loosen the clamp holding the dissolved oxygen electrode, and place the tip of the electrode in the water sample as close to the center of the bottle as it will go. Quickly seal the opening of the bottle around the electrode with parafilm or plastic wrap to prevent the exchange of gases between the water sample and the environment.
4. Turn on the stirrer so that the stir bar rotates slowly and evenly. Wait two minutes before recording the dissolved oxygen concentration of the water sample.
5. Click Record on the LabScribe Main window to begin recording. When the recording reaches a stable level on the O₂ Concentration channel, type DO₂ and the name of the location where the sample was taken in the Mark box to the right of the Mark button. Press the Enter key on the keyboard to mark the recording.
6. Click Stop to halt the recording.
7. Select Save in the File menu. Complete Step 8 and then proceed directly to Exercise 2.
8. Remove the dissolved oxygen electrode from the water sample. Hold the electrode over the beaker used for collecting waste liquid, and rinse it with deionized water from a wash bottle. Blot any drops of water from the electrode and place it in a beaker of deionized water.

Exercise 2: pH of a Water Sample

Aim: To measure the pH of a water sample which indicates the acidity of the water.

Procedure

1. As soon as the dissolved oxygen concentration of the first water sample is recorded, record the pH of the same water sample.
2. Remove the pH electrode from the beaker of deionized water. Blot the drops of deionized water from the electrode. Mount the electrode on the ringstand using a clamp.

3. Loosen the clamp holding the pH electrode, and place the tip of the electrode in the water sample as close to the center of the bottle as it will go.
4. Turn on the stirrer so that the stir bar rotates slowly and evenly. Wait thirty seconds before recording the pH of the water sample.
5. Click Record on the LabScribe Main window to begin recording. When the recording reaches a stable level on the pH channel, type pH and the name of the location where the sample was taken in the Mark box to the right of the Mark button. Press the Enter key on the keyboard to mark the recording.
6. Click Stop to halt the recording.
7. Select Save in the File menu. Complete Step 8 and then proceed directly to Exercise 3.
8. Remove the pH electrode from the water sample. Hold the electrode over the beaker used for collecting waste liquid, and rinse it with deionized water from a wash bottle. Blot any drops of water from the electrode and place it in a beaker of deionized water.

Exercise 3: Specific Gravity of a Water Sample

Aim: To measure the specific gravity of a water sample which indicates the concentration of dissolved solutes, like sodium and potassium and chloride, in the sample.

Procedure

1. Transfer enough of the first water sample to the hydrometer cylinder to fill about 80% of the cylinder.
2. Place the hydrometer in the cylinder and gently spin the device so that it rotates freely for at least two turns.
3. Read the specific gravity of the water sample by matching the meniscus of the sample with the scale on the stem of the hydrometer. The scale ranges from 1.000 at the top to 1.060 at the bottom.
 - If the specific gravity of a water sample is too high (>1.060), measure a given volume of sample and dilute that volume by adding one or two times more deionized water.
 - Account for the dilution when the specific gravity of the sample is recorded. For example, if one volume of deionized water was added to one volume of sample and the hydrometer read 1.02, specific gravity would be calculated by:
 - a) Subtracting 1.000 (specific gravity of water) from 1.020 = 0.02;
 - b) Multiplying the difference (0.02) x 2 (for 2 volumes) = 0.04; and
 - c) Adding 0.04 to 1.000 = 1.04, the specific gravity of sample.
4. Record the specific gravity of the first water sample on [Table GB-3-L1](#) and in the Journal.

Other Water Samples

Repeat Exercises 1, 2, and 3 for the other water samples that were collected.

Data Analysis

1. Scroll to the section of data recorded during Exercise 1.
2. Click on the 1 cursor icon on the LabScribe toolbar. Place the cursor in the middle of the stable oxygen saturation level recorded on the O₂ Concentration channel for the first water sample.
3. Read the dissolved oxygen concentration next to the term Value =, in the upper right margin of the O₂ Concentration channel.
4. Record the oxygen saturation level of the first water sample in [Table GB-3-L1](#) and in the Journal.
5. Scroll to the section of data recorded during Exercise 2. Place the single cursor in the middle of the stable pH level recorded on the pH channel for the first water sample.
6. Read the dissolved oxygen concentration next to the term Value =, in the upper right margin of the pH channel.
7. Record the pH level of the first water sample in the data table and in the Journal.
8. Record the temperature of the first water sample taken at the collection site to the data table and the Journal.
9. Repeat Steps 1 through 8 for each of the other water samples.

Questions

1. Which sample had the highest dissolved oxygen concentration? What could be the causes for that sample to have that level of oxygen saturation?
2. Which sample had the lowest dissolved oxygen concentration? What could be the causes for that sample to have that level of oxygen saturation?
3. Which sample had the highest pH level? What could be the causes for that sample to have that pH level?
4. Which sample had the lowest pH level? What could be the causes for that sample to have that pH level?
5. Which sample had the highest specific gravity? What could be the causes for that sample to have that level of specific gravity?
6. Which sample had the lowest specific gravity? What could be the causes for that sample to have that level of specific gravity?
7. Does your data indicate any correlation between pH level and oxygen saturation level, or oxygen saturation level and specific gravity, or any other combination of parameters?

Table GB-3-3: Values for Four Parameters Recorded from Water Samples

Water Sample/Location	Temperature °Celsius	Dissolved Oxygen Concentration (μ Molar O ₂)	pH	Specific Gravity
1				
2				
3				
4				
5				
6				
7				