

# Vertical Water Movement

## Objective

To determine if a water mass is mixed or stratified by acquiring and analyzing a vertical set of temperature, salinity, and oxygen measurements.

## Correlations

National Science Education Standards

Grades 5-8: A, B, D, E

Grades 9-12: A, B, D, E

California State Science Education Standards

Grade 6: 3a, c, 7a-e

Grade 7: 6f, 7a, c-e

Grade 8: 8c-d (*if discussion includes how salt and temperature affect density of a water mass*), 9e

Grades 9-12: Biology/Life Sciences: 6a, Earth Sciences: 5d, Investigation and Experimentation: 1a, b, c, d

Ocean Literacy Principles and Fundamental Concepts

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## Background

Lakes, estuaries, and oceans all contain examples of how water masses of different densities stay separate and form layers (stratification). Scientists can determine whether or not there is a lot of mixing going on in the water column by measuring salinity, temperature, oxygen, and other parameters in a vertical transect of the water column. When scientists conduct these vertical profiles and find that the parameters they are measuring are consistent throughout the entire depth of the water column, then the water is said to be well mixed. However, if there are differences in the parameters (e.g. temperature, salinity, density) at different depths, then the water column is said to be “stratified”, or not well mixed. Whether or not the water column is mixed has strong implications for the organisms living in this environment. For example, the main source of oxygen to bottom water is from mixing with surface water, which is oxygenated by direct contact with the air. If there is no mixing, oxygen is depleted from the bottom water and organisms will either move away or die.

In a companion web-based activity, we will compare field data with those data from ocean observing systems and assess the advantages and disadvantages of the two methods of data collection.

## Materials

- Boat
- YSI instrument
- Datasheet

**Procedure**

1. Select a station in a body of water with a depth of at least 10 meters.
2. Record latitude and longitude. Observe weather conditions and record on worksheet.
2. Using an instrument that measures conductivity (salinity), temperature, and oxygen, lower the probe through the water column taking measurements at 1 meter intervals.
3. Record salinity (conductivity), temperature, and oxygen in the worksheet provided.

**Questions**

1. Was the water column mixed or stratified? Explain your answer.



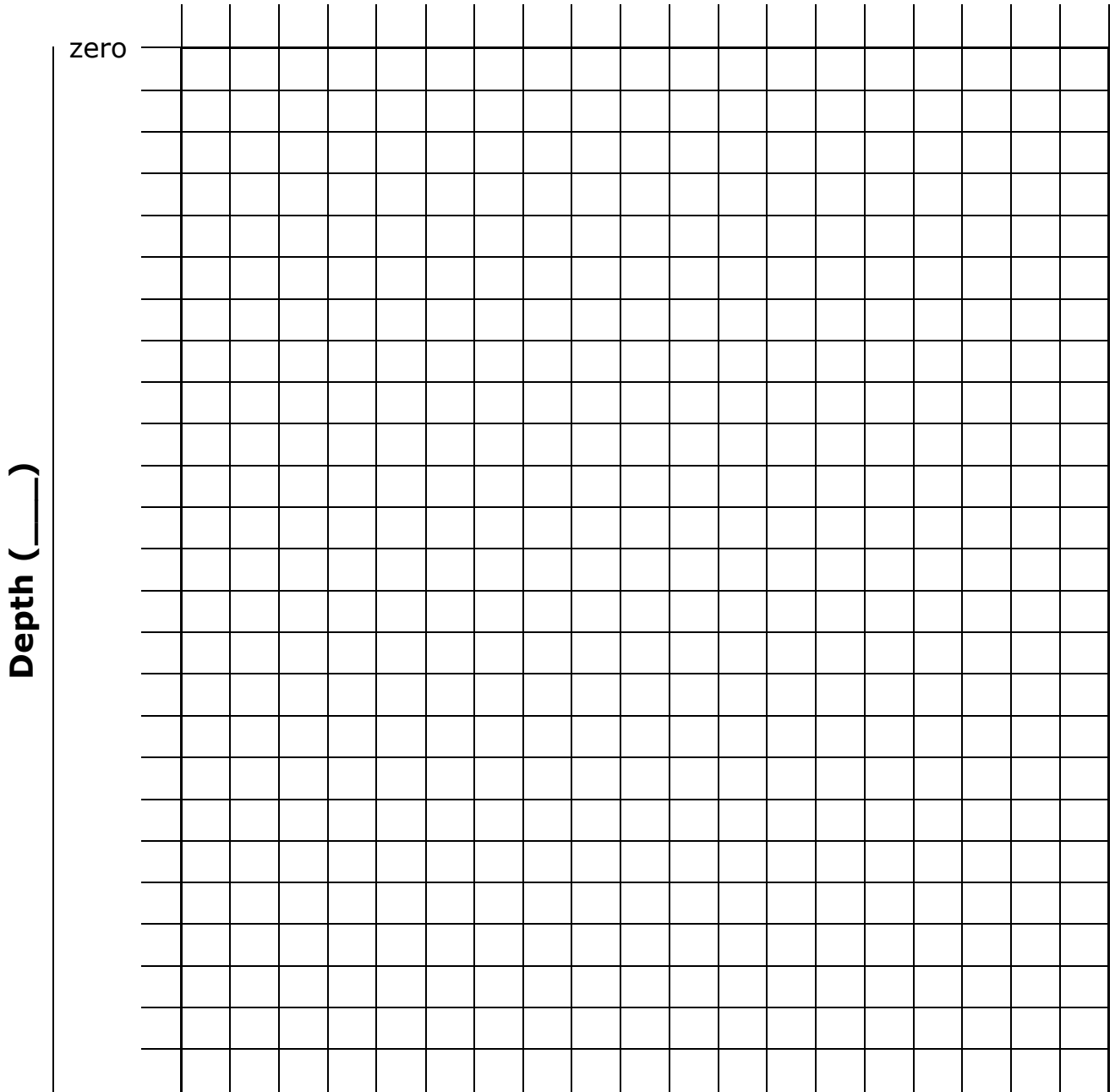
**Parameters measured:**

	Temperature (°C)
	Oxygen (mg/L)
	Salinity (PSU)

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Describe your graphs above and explain what they tell you about the water column.