

Not attempting to answer questions on expeditions will result in point deductions on course workbook (**two or more blank answers** will result in a deduction of 2-4 points; a 5 point deduction will be assessed if **more than five answers** are left blank).

1. Introduction

Objective: To Learn about the Chemical and Physical Properties of the Ocean and their Role in Governing Oceanic Processes

2. Measuring Properties of Seawater

What are three of the fundamental properties of seawater?

1. _____
2. _____
3. _____

Describe two methods of measuring these properties (temperature, salinity and density) measured?

How much dissolved salt is contained in 1000 grams of seawater (Hint Remember seawater is 96.5% water & 3.5% dissolved salt)?

3. What Do You Mean about Ions of Salt Dissolved in Seawater?

Make a diagram of the Sodium (Na^+) and Chloride (Cl^-) ions that are dissolved in seawater

4. What is the Source of the Salt?

What are the sources of the dissolved salt in seawater?

1. _____
2. _____
3. _____

Why do dissolved salts become concentrated in the sea? _____

5. Salinity and its Variability

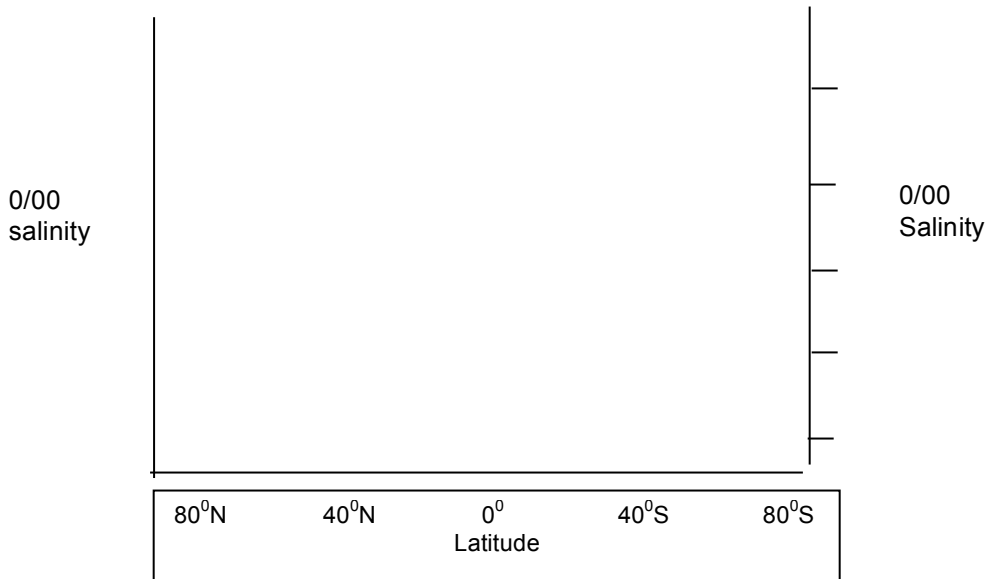
What is salinity? _____

In order of decreasing abundance, list the 7 most abundant constituents of the dissolved salt in seawater and their concentrations in parts per mil (o/oo or parts per thousand)?

	Ion Name	Chemical Symbol	Concentration in Seawater
1.			
2.			
3.			
4.			
5.			
6.			
7.			

How many grams of dissolved salt are contained in 2000 grams of seawater with a salinity of 35o/oo? _____

6. Salinity and Precipitation

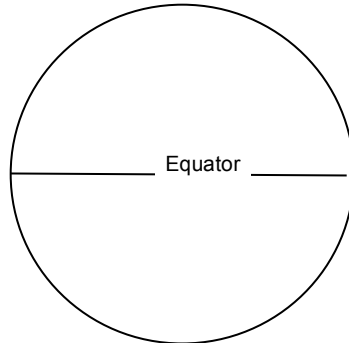


Draw the curve of the salinity of the ocean's surface water versus latitude (put in the numbers on the axes!!!!)

Based on the graph on the WWW page, where would you expect to find regions of high salinity in the ocean? _____

7. Salinity Summary

Draw a picture of the movement of air and moisture around the intertropical convergence zone



If the oceans' salinity is increased by evaporation, how would the salinity be affected by the freezing of ice from seawater, or so-called sea ice?

How would the salinity change as a result of rainfall, runoff, or the melting of ice?

8. Calculating Salinity

Why can salinity be determined from measuring only the concentration of the chloride ion in seawater? (think about a mixing ocean) _____

Write the equation for calculating salinity _____

The concentration of the Cl^- ion is 19.2632 in a sample of seawater, what is the salinity?

9. Ocean Temperature

The map shows this week's sea surface temperature around the world. A temperature scale in degrees Fahrenheit is given at the bottom of the image. Click on map only if you want to see larger image (but be patient)

Based on the distribution of the sea surface temperature, what is the source of heat in the surface of the world's oceans? _____

10. Intensity of Solar Radiation

Describe, in general terms, the distribution of heat in the ocean's surface waters?

Based on the map of solar radiation, where would you expect to find the highest temperature waters in the ocean? _____

Complete the diagram by extending the arrows, in perfectly straight lines, to the surface of the earth.



If you extend the arrows in straight lines to the right, so that each touches the surface of the Earth, you should notice that the spacing between the arrows as measured along the surface of the Earth (or solar radiation) varies as a function of latitude.

From this diagram, why is solar radiation per kilometer² highest at the equator and least in the polar regions? (Hint: it is not related to distance from Sun)

11. Variations in the Properties of Sea Water

What is the range in temperature in the world's oceans (least to most)?

What is the range in salinity in the world's oceans? _____

What is the temperature of 75% of the world's oceans? Yes, it is very COLD!

Why should most of the ocean be so cold, when much of the ocean, at least at the surface, is warm? _____

(think water depth and light penetration)

12. Light Penetration in the Ocean - How far?

How far does light penetrate into the ocean? _____

How does this observation affect the distribution of temperature in the ocean?

How does this observation affect the distribution of life in the ocean? _____

Why doesn't light penetrate far into the ocean?

13. Temperature in the Ocean

What is the temperature of the water below 1000 meters? _____

Why is the vast majority of the ocean dark and cold? _____

14. Thermocline and Halocline - Temperature and Salinity in the Ocean

What is the thermocline? _____

What is the halocline? _____

What is the pycnocline? _____

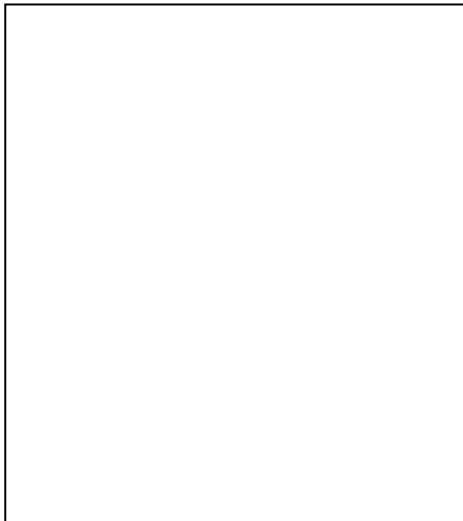
15. Density of Sea Water

Write the equation for calculating sigma-t _____

How does the density of seawater vary changing temperature? _____

How does the density of seawater vary with changing salinity? _____

16. An Ocean of Layers - Make a diagram showing the sea surface and sea floor, the location of the mixed layer, thermocline, and the deep water (include a water depth scale on the left edge of your drawing).



Where is the **mixed layer** and what are its properties?

Where is the **thermocline** and what are its properties?

Where is the **pycnocline** and what are its properties?

Where is the **Deep Water** and what are its properties?

17. Measuring Ocean Temperature Change Over Time

How is Stanley Levitus analyzing ocean temperature changes over time?
