

General Oceanography

Name \_\_\_\_\_

Geology 105

Expedition 11 - The Briny Deep

See Due Date in Greensheet or in Module Area of Canvas

**Expedition Objective:**

- To Learn about the Chemical and Physical Properties of the Ocean and their Role in Governing Oceanic Processes
- **Homework** - post in your expedition learning group according to the instructions in the Module Area of Canvas for this expedition

**1. Chemical Properties of Water**

View Chemistry Now: Chemistry of Water at:

[http://www.nsf.gov/news/special\\_reports/chemistrynow/chem\\_water.jsp](http://www.nsf.gov/news/special_reports/chemistrynow/chem_water.jsp)

What is the chemical formula of water?

What are three properties of water (fun facts)?

Why is water considered a polar molecule and how is this related to the arrangement of the hydrogen and oxygen atoms that form the water molecule?

Why is water a universal solvent? (a substance that dissolves a solute, which is a chemically different liquid, solid or gas, resulting in a solution.)

How does water dissolve NaCl (sodium chloride) or common table salt and what does this say about ocean water?

### 1. Expedition 11 - The Briny Deep

View at:

<http://youtu.be/hW-xAjXw9TY>

2. What are three of the fundamental properties of seawater (listed as parts I, II and III of this online lecture)?

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

### 3. Source of Water?

What is the current thinking, based on scientific research, about the source of the Earth's water?

### 4. Water - A Complicated History

How much of the earth's water is contained in the ocean? \_\_\_\_\_

### 5. Hydrologic Cycle

What is meant by hydrologic cycle?

### 6. Sea Level Change - Changing Volume of Water in Ocean

Has sea level changed over time?

### 7. Salt in Seawater

What is meant by ions of salt dissolved in seawater?

**8. How Much Salt in Seawater?**

**9. What are the Sources of Dissolved Salt in Seawater? (list them below)**

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

**10. Sea Salts in Seawater**

In order of decreasing abundance, list the 6 most abundant constituents of the dissolved salt in seawater?

Ion Name	% of Ion in Total Dissolved Salt
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____

**11. Sea Salt in Seawater**

What is salinity?

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

## 12. Sea Salt in Seawater

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

## 13. Balance of Evaporation and Precipitation

Which two processes influence the salinity of the surface waters of the oceans?

1. \_\_\_\_\_

2. \_\_\_\_\_

How do these two processes influence the salinity of the surface waters of the oceans?

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

## 14. Measuring Salinity Using a CTD

What does a CTD measure and how?

How does the CTD make these measurements from the sea surface to the seafloor?

How do the water bottles attached to the CTD collect water samples at different water depths?

View Part II of lecture at: <http://youtu.be/17I6UiDTe50>

### 15. Calculating Salinity from the Constancy of Seawater Composition?

Why can salinity be determined from measuring only the concentration of the chloride ion in seawater? (hint: think about mixing of ocean waters and the age of the oceans)

How is salinity calculated from chlorinity (write down equation)?

If the concentration of the chloride ( $\text{Cl}^-$ ) ion is 19.2632 in a sample of seawater, what is the salinity?

### 16. Global Map of Sea Surface Salinity

What is the basic pattern of salinity in the surface waters of the global ocean?

How is this related to slide #13 showing the variation in the balance between evaporation and precipitation by latitude?

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

### 17. What is Aquarius?

### **18. Sea Surface 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.

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

### **19. Annual Mean Solar Radiation**

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

### **20. Intensity of Solar Radiation per Surface Area**

From this diagram, why is solar radiation per kilometer<sup>2</sup> and the amount of heat highest at the equator and least in the polar regions? (Hint: it is not related to distance from Sun)

### **21. Sea Surface Temperature**

Summarize your observations of the distribution of sea surface temperature in the global ocean

## **22. 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)

## **23. 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?

## **24. Euphotic Zone**

What is the euphotic zone (or photic zone) and how is it defined?

## 25. Heat Capacity & 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?

## 26. Using CTD - Plotting Variation in Water Temperature vs. Water Depth

What is the range of water depth where the temperature decreases sharply?

## 27. Water Temperature vs. Water Depth

What is the thermocline?

## 28. Thermocline and Halocline

How does the variation in salinity with water depth compare to the change in water temperature with water depth? (feel free to discuss this with your learning group discussion online)

## 29. Halocline

What is the halocline?

This is good place to stop and we will discuss the effect of temperature and salinity on water density, which produces a layering in the ocean.

- **Homework** - post in your expedition learning group according to the instructions in the Module Area of Canvas for this expedition

Remember to answer the questions posted by one other student and give feedback on the clarity and quality of their questions.