ES 106 Laboratory # 3
INTRODUCTION TO OCEANOGRAPHY

Introduction

The global ocean covers nearly 75% of Earth's surface and plays a vital role in the physical environment of Earth. For these reasons, oceanography is an important part of the Earth sciences. Oceanographers apply the concepts from the sciences of chemistry, physics, geology, and biology to understand this critical component of Earth system.

This lab investigates some of the physical characteristics of the oceans. To establish a point of reference, the extent, depths and distribution of the world oceans are examined. The two of the most important variables of seawater, salinity and temperature, are studied to determine how they influence the density of water, and in turn deep ocean circulation.

Goals and Objectives

- Locate and name the major water bodies on Earth
- Study the distribution of land and water in each hemisphere
- Explore the influence that salinity and temperature of seawater have on the density of seawater
- Describe how the salinity and temperature of seawater vary with latitude and depth in the oceans

Useful Websites

- http://www.earthcare.ca/balloon/curriculum_facts.html
- http://www.grida.no/climate/vital/32.htm
- http://visibleearth.nasa.gov/view_set.php?categoryID=817
- http://atlas.mapquest.com/atlas/

Name_____

Lab Day/Time_____

Use your favorite internet search tool (e.g. Google, Wikipedia), answer the following:

Pre-lab Questions – Complete these questions before coming to lab.

1. Define the following terms:
   A. Salinity

   B. Thermohaline circulation

   C. Latitude

   D. Longitude

2. In what units is ocean water salinity expressed? How is salinity calculated?


3. Suppose that you take a sample of 500 g of ocean water and let the water evaporate. The mass of the remaining salts is 17 g. What was the salinity of the ocean water?

(Note: refer to following page for explanation of salinity with examples)
Hint: calculate as a percentage = mass salt / total mass x 100%

4. If the salinity of ocean water is 37 parts per thousand, what is the mass of salts dissolved in 2 kg of ocean water?

Hint: 1 kg water = 1 liter; see explantion of ppt on next page

NaCl + H_2O --------- Na^+ + Cl^- + H_2O

| $\ominus$ Oxygen -2 |
| $\oplus$ Hydrogen +1 |
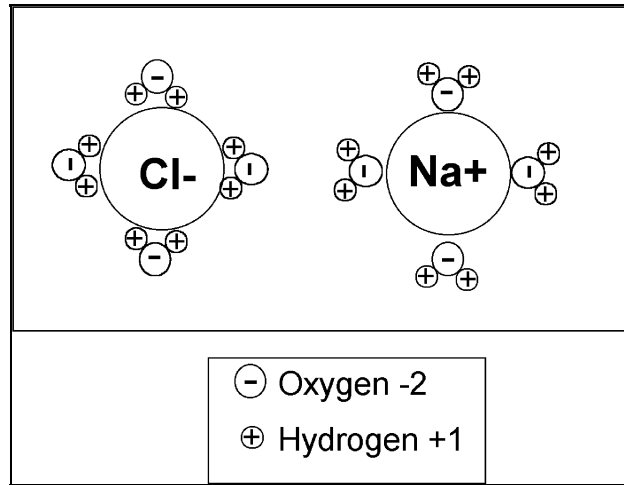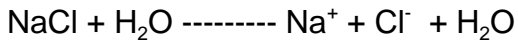
D.   Measuring concentrations of solutes in aqueous solutions
    1.   concentration - measurement of the quantity of solute in a given quantity of solvent (or solution)
        a.   Mass Percent = (mass solute / total mass solution) * 100%

E.g. if 5 g of NaCl is dissolved in 95 g of water, what is the mass percent of sodium chloride in the solution?   Total Mass of solution = 5 g + 95 g = 100 g)

Answer = (5 g / 100 g) x 100% = 5% salinity

conversion factors for mass: 1 gram = 1000 mg, 1 kg = 1000 g, 1 gram = 1,000,000 micrograms

        (1)   percent = "parts per hundred" (%)

        b.   Parts per Thousand (o/oo)   = grams of solute / liter of water

Determine the concentration in ppt for a solution of 200 gram dissolved in 2 liters of water?
        Answer = 200 g salt / 2 liter water = 100 ppt = 100 o/oo

Determine the concentration in ppt for a solution of 2000 mg dissolved in 1 liter of water?   convert 2000 mg salt to grams ----- (2000 mg) x (1 g / 1000 mg) = 2 g

 Answer = 2 g salt / 1 l water = 2 ppt = 2 o/oo

        c.   Parts per Million   = milligrams of solute / liter of water

Determine the concentration in ppm for a solution 20 mg of salt per liter of water?

 Answer = 20 mg salt / 1 l water = 20 ppm salinity

What about 20 kg of salt per liter of water?   convert to mg : 2 kg(1000 g /kg)(1000 mg/g)= 2,000,000 mg

Salinity answer = 2,000,000 mg / 1 l water = 2,000,000 ppm