

Name: _____ Date: _____ Class: _____

Graphing Salinity - Characteristics of Ocean Water

READING: Read the following paragraphs, then answer the following questions from the reading:

The average density of surface ocean water is 1.025 g/mL, but this varies from place to place, and with seasons. Variations in *salinity* and *temperature* are the two most important factors in creating the density differences that create deep-ocean circulation, which will be studied in greater detail below.

Salinity is the amount of dissolved material in water. It is typically expressed as parts per thousand (‰), called 'permil'. Permil means 'per 1000 parts', in contrast to 'percent', which is 'per 100 parts'. This concentration is a weight ratio: typical sea water has a salinity of about 35‰, meaning one kilogram of sea water contains about 35 grams of dissolved salts. Although there are many dissolved salts in seawater, sodium chloride (NaCl) is the most abundant.

Variations in the salinity of seawater are influenced primarily by changes in the water content of the seawater. In regions where evaporation rates are high, removing the water and leaving behind the salts increases the concentration of dissolved material in seawater. Alternatively, in areas of high precipitation and high runoff from rivers and streams, the additional water dilutes the seawater and lowers the salinity. Because the factors that influence the concentration of salts in seawater vary, the salinity of seawater also varies with latitude and depth.

Seawater *temperature* is the most extensively determined variable of the oceans because it is easily measured and has an important influence on marine life. Like salinity, ocean water temperatures vary from equator to pole and vary with depth. Temperature, like salinity, also affects the density of seawater, but density of seawater is more sensitive to temperature fluctuations than salinity. Cool surface water, which has a greater density than warm water, forms in the Polar Regions, sinks and flows towards the tropics.

Reading Questions:

1. What is the average density of surface ocean water? _____
2. What two factors can cause variation in the density of seawater?

3. What results from these density differences? _____
4. What is salinity?

5. How is salinity typically expressed? _____
6. How many grams of salt are typically found in 1 kilogram of seawater? _____
7. What is most abundant salt in seawater? _____
8. Where do we find seawater with a greater salt concentration?

9. Where do we find seawater with a lower salinity?

10. Why do we have better data for ocean temperature?

11. What two factors influence ocean temperature?

12. Which affects density of seawater more, temperature or salinity? _____
13. What happens to cooler surface water in the polar regions?

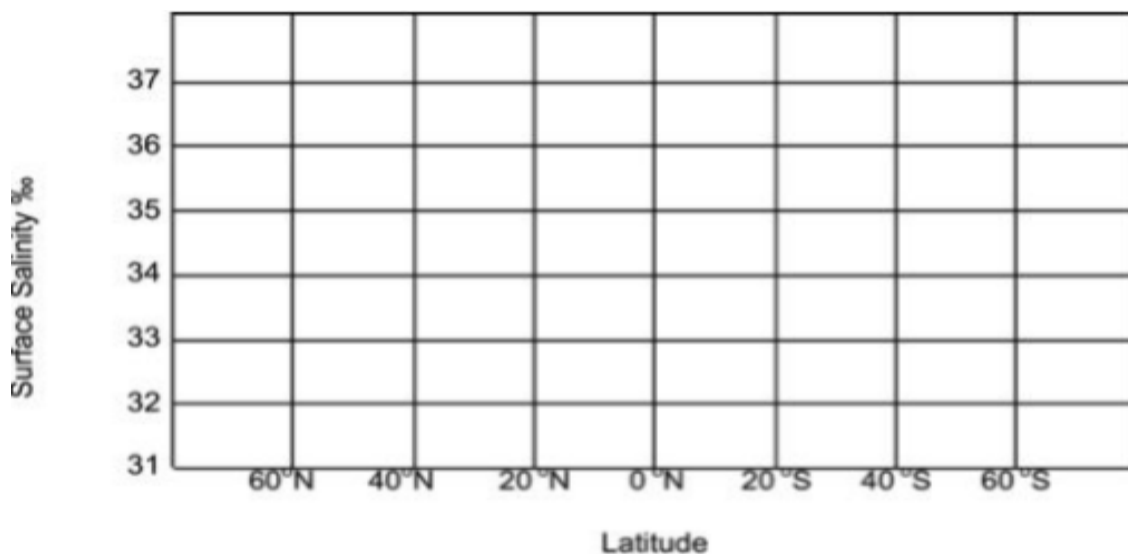
Graphing Exercise 1:

The table below lists the approximate surface water salinity values at various latitudes in the Atlantic and Pacific Oceans. Using the data, construct a salinity curve for each ocean on the graph provided below the table. Use a **different colored pencil** for each ocean. Answer the questions on the following page using the graph you create.

Surface Water Salinity in the Atlantic and Pacific Oceans:

Latitude	Atlantic Ocean	Pacific Ocean
60°N	33.0‰	31.0‰
50°N	33.7‰	32.5‰
40°N	34.8‰	33.2‰
30°N	36.7‰	34.2‰
20°N	36.8‰	34.2‰
10°N	36.0‰	34.4‰
0°N	35.0‰	34.3‰
10°S	35.9‰	35.2‰
20°S	36.7‰	35.6‰
30°S	36.2‰	35.7‰
40°S	35.3‰	35.0‰
50°S	34.3‰	34.4‰
60°S	33.9‰	34.0‰

Surface Salinities:



Questions:

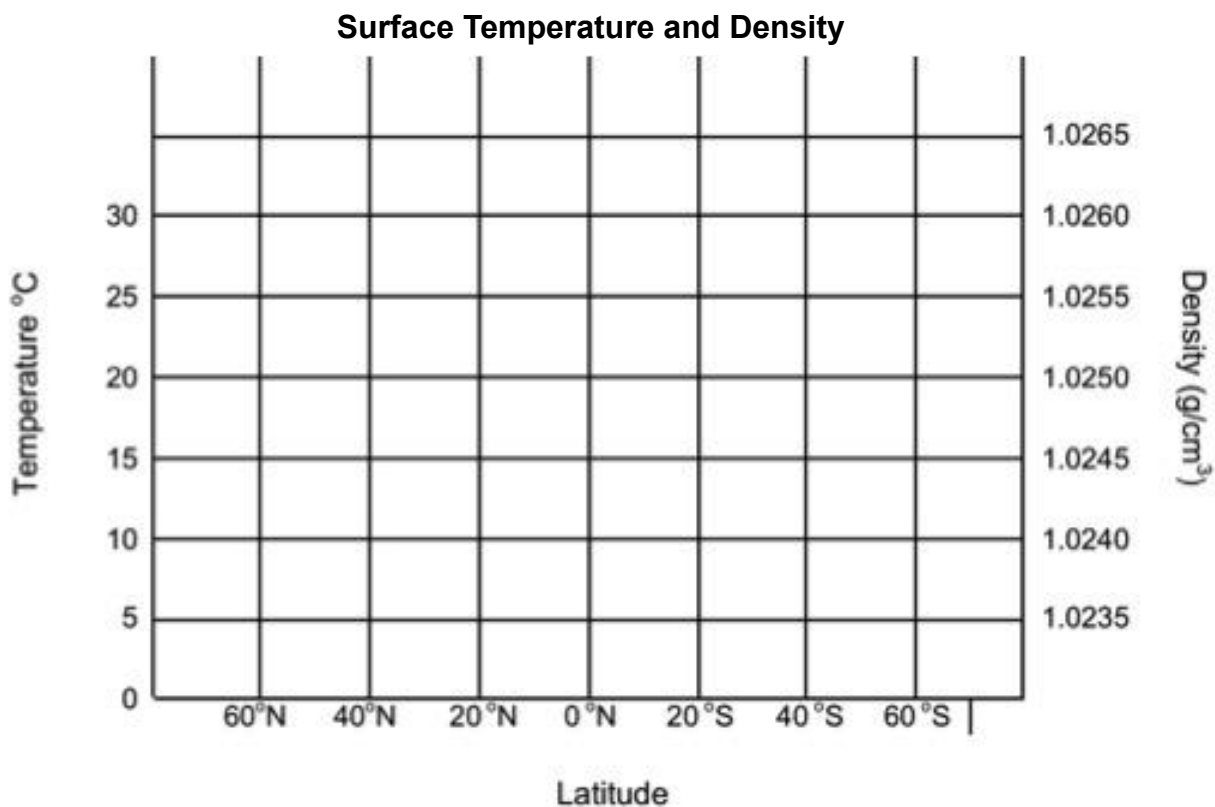
1. At which latitudes are the highest surface salinities located?
2. What are the two factors that control the concentrations of salts in seawater?
3. What is the reason for the difference in surface water salinity between equatorial (0°) and subtropical regions ($20-30^\circ$) in the Atlantic ocean?
4. Which ocean, the Atlantic or the Pacific, has higher average surface salinities?
5. Suggest a reason for the difference in average surface salinities between the oceans:

Graphing Exercise 2:

Using the data in the table, plot a **colored line for temperature** on the graph below, and a **separate differently-colored line for density** on the same graph. Answer the following questions using the graph and your text for reference.

Average surface water temperature and density of seawater at various latitudes

Latitude	Surface Temperature (°C)	Surface Density (g/cm ³)
60°N	5	1.0258
40°N	13	1.0259
20°N	24	1.0237
0°N	27	1.0238
20°S	24	1.0241
40°S	15	1.0261
60°S	2	1.0272



Questions:

1. Briefly describe the overall relationship between temperature and density:
2. Describe the surface temperature and surface density of ocean waters in equatorial regions.
3. Describe the surface temperature and surface density at high latitudes.
4. What is the reason for the fact that higher average surface densities are found in the Southern Hemisphere?