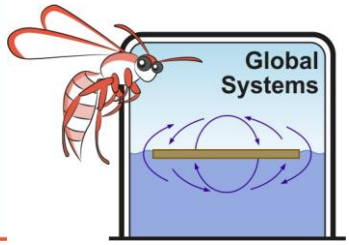


Salinity & Density - Student Activity

Factors that drive deep ocean currents - Thermohaline Circulation

The great global conveyor belt runs deep under our oceans. It is powered by density differences that result from changes in temperature and salinity. When seawater freezes at the poles freshwater ice is formed and the remaining seawater becomes denser and sinks adding to the downward pull. This current initiated at the poles moves millions of cubic metres of water moving heat around our planet. It is estimated to take hundreds to thousands of years to complete its circuit.

Aim **To demonstrate how freezing water can change its chemistry and density.**

Activity 1 - Freezing out salt

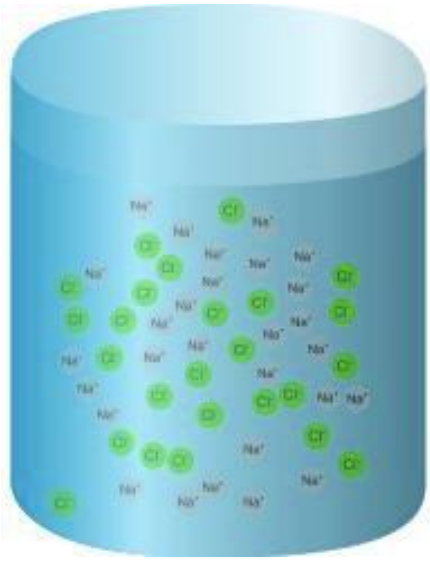
Teachers may prepare the chilled salt solution water in advance and present separated samples for students to test in the classroom.

Which is the solvent? _____

Which is the solute? _____

Write an ionic equation for the dissolution of salt in water

_____



Materials

- A large container of salty water (Super saturated sodium chloride in cold water)
- A freezer
- Two test tubes
- A dropper of silver nitrate solution

Method

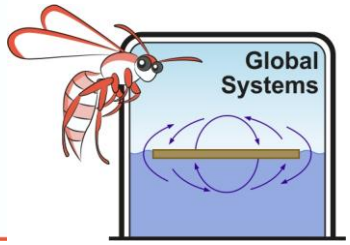
1. Leave the salt water overnight to freeze.
2. Melt a little ice from the crust into one test tube
3. Collect an equal volume of saline solution in the other test tube
4. Put three drops of silver nitrate into each test tube
5. Observe and note your observations

Observation/results

What did you observe? _____

_____

_____



Salinity & Density - Student Activity

Conclusion
What do these results lead you to conclude? _____

_____

Did the ice contain salt? _____

Discussion
Write an equation or equations for the reaction which occurred.

_____

_____

What would the above activity suggest would happen to seawater approaching freezing wind and water temperatures at the poles?

_____

How could this activity be improved? _____

Activity 2 **The effect of increased salinity on density**

<u>Aim</u> **To see if saline water is denser than fresh water**

Materials To make a supersaturated or hyper-saline solution.

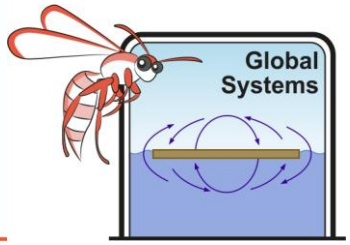
- A small beaker
- Hot water
- Salt (sodium chloride)
- A stirring rod or spoon
- A few drops of food dye

Method

1. Carefully pour hot water into the beaker until it is one third full
2. Add the salt
3. Stir vigorously until no more salt can be added
4. Leave to cool to room temperature

Materials To test differences in density between salt and fresh water

- A large test tube
- A test tube rack or beaker to hold it upright
- Hyper-saline water
- Fresh water (uncoloured)
- A Pasteur or transfer pipette
- Kitchen towel if necessary



Salinity & Density - Student Activity

Method

1. Pour the coloured hyper-saline water into the test tube until it is half full.
2. Wipe away any splashes of coloured solution.
3. Place upright in rack or beaker (DO NOT MOVE THE TUBE AGAIN UNTIL THE END OF THE EXPERIMENT!).
4. Fill the pipette with fresh water and very gently flow it down the side of the test tube to form a layer about 1cm thick.
5. Leave, observe and note observations.

Observations _____

_____

Conclusion

What can you conclude from the results of this experiment? _____

_____

Discussion

What happens to seawater when it comes in contact with cold sea ice and chill polar winds?

_____

Bringing it all together

From the results of our GCB experiments, explain how cold and salinity could drive the Global Conveyor belt.

_____

_____

_____

_____

Extra for experts. The Global Conveyor Belt is an example of thermohaline convection. What does "thermohaline" mean?

_____

_____