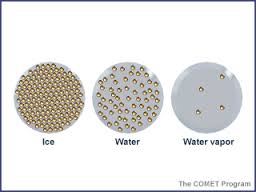
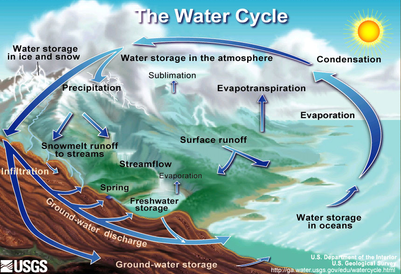
Chem 1 Hour\_\_\_\_\_ Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Wexler/Steinhorst  
Mysteries of Water: Freezing  
Date:



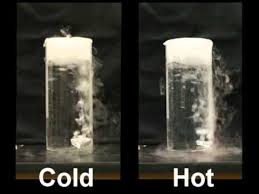
Activity 1. Describe the meaning of the above chart.



Activity 2. The Water Cycle  
A. Summarize the water cycle (use the above left figure as a reference).

B. Use the above right figure to explain why evaporated water (water vapor) rises and condensed water sinks as precipitation.

Activity 3. Hot water can freeze faster than cold water (The Mpemba Effect)

  
A situation in which hot water freezes faster is when a beaker of cold water and a beaker of hot water of equal mass are placed in a freezer compartment.  
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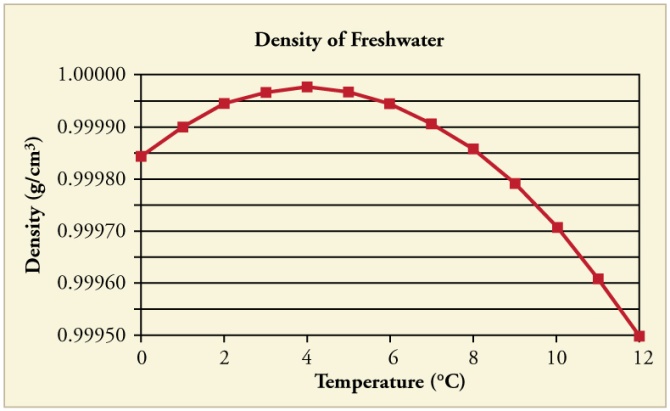
A. If water is at 4°C to start with, as the bottom water cools to below 4°C its density decreases and it rises to the top (see the chart in Activity 2. More dense water at the top (4°C) sinks. This rising and sinking of water is called convection. Freezing is therefore delayed: the convection currents will continue until the entire body of water is 0° C, at which point all the water finally freezes.

**Create a diagram in the space below that shows convection of cold water placed in a freezer:**

B. If the water is initially hot, cold water at the bottom of the beaker in direct contact with the freezer is denser than the hot water at the top, so no convection will occur and the bottom part will start freezing while the top is still warm. This effect, combined with the evaporation effect, may make hot water freeze faster than cold water in some cases. In this case, of course, the freezer will have worked harder during the given amount of time, extracting more heat from hot water."

**Create a diagram in the space below that shows why freezing starts at the bottom if hot water is placed in a freezer:**

**Lake bottoms don’t freeze**

****

A. Based on the above left diagram, why is it a good thing that lake bottoms don’t freeze in winter?

B. Based on the above right diagram, explain why water at the bottom does not freeze (that is, it never reaches O°C):