LESSON 66 LAB

Feeling Humid
Humidity, Condensation

Name _____

Date _____ Period _____

Purpose

To explore water vapor density and determine the amount of water vapor in the air.

Materials

- room-temperature water
- 250 mL beaker
- 2 thermometers
- spray bottle with water
- rubber bands
- cheesecloth or paper towel
- ice cubes
- stirring rod

Part 1: Condensation on Glass

Procedure

1. Put about 150 mL of room-temperature water into a 250 mL beaker. Record the water temperature. Look for condensation, or moisture on the outside of the glass. Make a table like the one here to record your data.

Time	Temperature (°C)	Condensation?
Before ice		
0 s (ice added)		
30 s		

2. Add ice to the water until the beaker is close to full. Start timing. Stir, and record the temperature again. Continue to look for condensation.
3. Continue stirring and recording the temperature every 30 sec. Note the temperature at which condensation first forms on the outside of the beaker. Record this temperature and stop.

Analysis

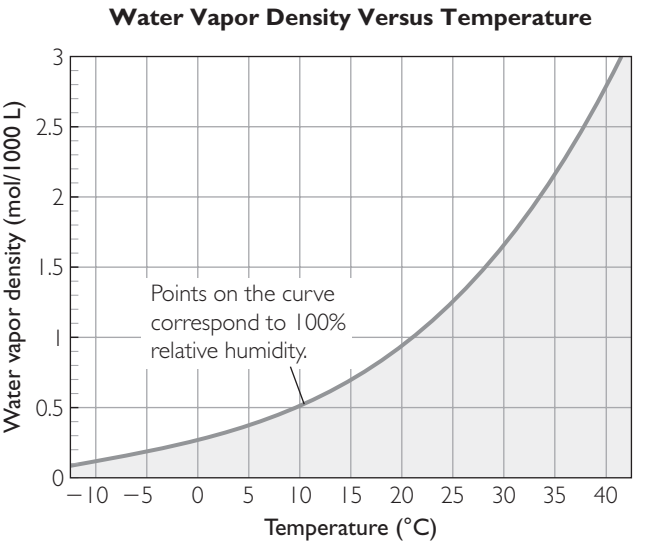
1. At what temperature did water form on the outside of the beaker?

2. Where did the water come from that ended up on the outside of the glass?

3. Imagine that the water vapor density of the air in your lab increases significantly. What effect do you think this would have on the formation of water on the beaker?

4. Imagine repeating the experiment on a day when the temperature in the lab is 10 °C cooler. What effect would this have on the formation of the water on the beaker?

There is a limit to the amount of water vapor that can be present in the air. This limit depends on the air temperature. The graph shows the maximum water vapor density in the atmosphere at different temperatures, expressed in mol/1000 L.



5. On the *x*-axis of the graph, find the condensation temperature you recorded in your data. What is the water vapor density of the air at this temperature in moles/1000 L?

6. What is the maximum water vapor density possible at a temperature of 40 °C?

7. At what temperature is the maximum water vapor density equal to 0.71 mol per 1000 L? Explain in simple language what this number means.

8. Is it possible for the water vapor density in the air to reach 1.50 moles/1000 L at a temperature of 25 °C? Explain why or why not.

Part 2: Wet-Bulb Thermometer

Procedure and Questions

1. Record the temperature of the room with the dry thermometer.
2. Dip the cheesecloth or paper towel in water and wrap it around the bottom of the second thermometer. If necessary, use a rubber band to hold it in place.

3. Securely holding the middle of each thermometer, carefully wave them both in the air for 2 minutes. Record the temperature of each thermometer.

Dry-bulb temperature	Wet-bulb temperature	Difference

1. What happened to the temperature of the thermometer with the cheesecloth wrapped around it? How can you explain the change in temperature?

2. Use the Handout—Relative Humidity to determine the humidity of the air in your classroom.

3. When the difference in bulb temperatures is smaller, is the relative humidity higher or lower? How can you explain this?

4. What would you notice about the difference between the wet-bulb temperature and the dry-bulb temperature if the air in the room contained very little moisture?

5. **Making Sense** What is water vapor density? What does it mean that water vapor density reaches a maximum at a specified temperature?

6. **If You Finish Early** When the water vapor density reaches the maximum amount at a given temperature, the humidity is considered to be 100%. Under which conditions is the water vapor density greater—50% humidity at 10 °C, or 25% humidity at 25 °C? Explain your thinking.