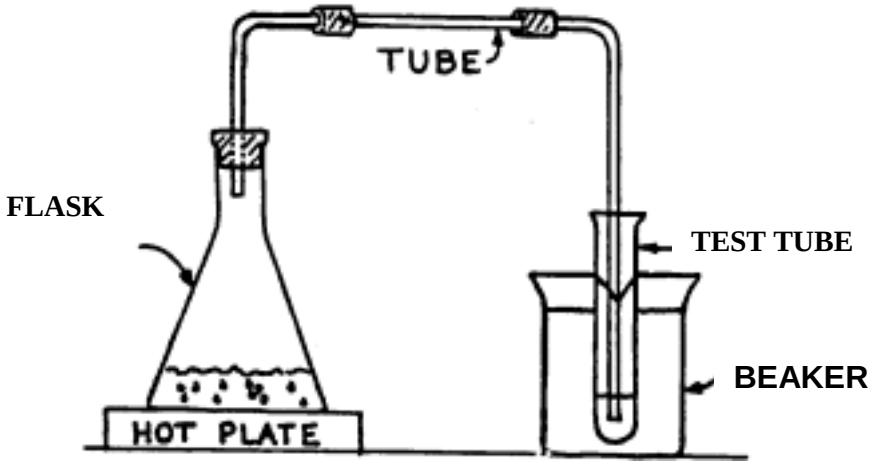
LESSON CLUSTER 9
Explaining Condensation and the Water Cycle

Demonstration 9.1: Distilling Dirty Water

Answer the questions below as your teacher is demonstrating the distillation of dirty water.



I. Describe the appearance of the substances:

a) In the flask of boiling liquid: _____

_____

_____

b) In the glass tubing: _____

_____

_____

c) In the test tube: _____

_____

_____

2. What kinds of molecules would you expect to see with magic eyeglasses:

a) In the boiling liquid: _____

_____

_____

b) In the glass tubing: _____

_____

_____

c) In the test tube: _____

_____

_____

3. Do you think that all of the substances in the flask are boiling? _____

Why or why not? _____

_____

_____

4. Explain what is happening (in terms of substances and molecules):

a) In the flask of boiling liquid: _____

_____

_____

b) In the glass tubing: _____

_____

_____

c) In the test tube: _____

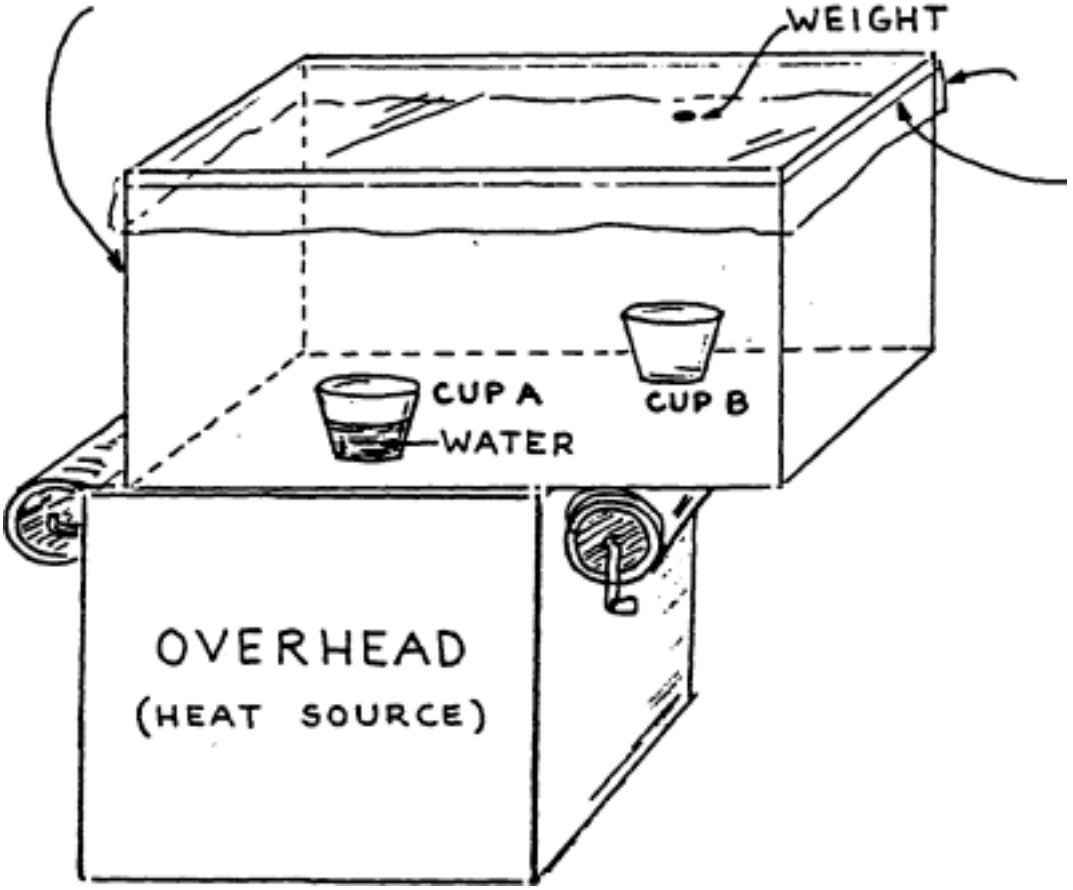
_____

_____

Demonstration 9.2: Purifying Water Without Boiling

Answer the questions below as your teacher is demonstrating the water cycle.

TWO GALLON TERRARIUM



1. Label these things in the illustration above:

   a) a place where water is evaporating.
   b) a place where water is condensing.
   c) a place where there is dirty water.
   d) a place where there is water vapor.
   e) a place where there is pure water.

2. What do you think is happening to the amount of water in Cup A?

_____

Explain what is happening to the water in Cup A in terms of substances and molecules.

_____

_____

_____

3. What do you see on the underside of the plastic wrap, especially under the weight?

_____

Explain where the drops of water are coming from in terms of substances and molecules.

_____

_____

_____

4. Cup A has water, salt, and food coloring in it. Cup B has pure water. Why can't the salt and food get over to Cup B?

_____

_____

5. Do you think the air in the container has water in it? _____

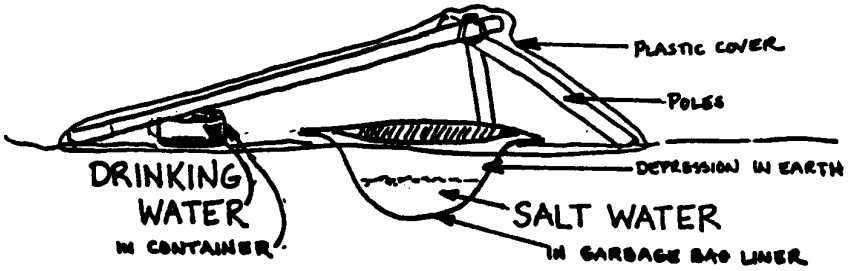
Why can't you see the water in the air? _____

_____

_____

Question Set 9.3: Evaporating and Condensing

CONDENSATION **SPREADING OF WATER VAPOR** **EVAPORATION**



1. Where inside the solar still would you expect to find these kinds of molecules:

   a) water molecules:_____

   b) Salt molecules:_____

   c) Nitrogen and oxygen molecules: _____

2. If you looked at both the salt water and the drinking water in the solar still with magic eyeglasses, what differences would you expect to see in the molecules?

   _____

   _____

3. Suppose you have just taken a hot shower with the bathroom door closed. The mirror in the bathroom gets cloudy. Explain how this happens. Describe what happens to substances and molecules at each stage.

   a) Evaporating: _____

   _____

   b) Spreading:

   _____

_____

c. Cooling and Condensing: _____

_____

_____

4. Some bathrooms have a fan that blows air out of the bathroom. If you turn this fan on, there will be less fog on the mirror. Why?

_____

_____

_____

5. The water in the shower is soapy. Why doesn't any soap get on the mirror?

_____

_____

_____

6. Here are some other situations where water evaporates, then condenses:

- food covered with plastic wrap in the refrigerator
- soup warming on the stove (but not boiling) with a lid on the pot
- "seeing your breath" on a cold morning.

Pick one of these situations and answer the questions below.

Situation you picked: _____

a) Where does the water evaporate from? _____

b) Where does the water condense? _____

c) How do the water molecules get from the place where water evaporates to the place where water condenses?

_____

_____

_____

Question Set 9.4: The Water Cycle

1. My friend was upset with the people that make drinking glasses. "You know," he said, "they ought to learn how to make glasses that don't leak. Every time I fill up a glass with cold water, some of it seeps through to the outside of the glass!" How would you explain to my friend where the water really came from?

_____

_____

_____

2. Why does water condense on the outside of a cold glass but not on a cup of hot coffee?

_____

_____

_____

3. My friend was puzzled over something else. "I don't understand," she said, "how the rivers of the world can empty billions of gallons of water into the oceans every day, but the oceans never seem to get any fuller. What's happening to all that water?" Can you answer my friend's question?

_____

_____

_____

4. Sometimes dew forms on grass when the grass cools off at night. Explain how this happens.

_____

_____

_____

5. BONUS: The magicians in "Bartholomew and the Oobleck" made millions of tons of oobleck by boiling a few pounds of a variety of things in one little pot on Mount Neekatave. Could such a thing actually happen? Explain:

_____

_____

Question Set 9.5: Explaining Precipitation

1. Complete the chart below:

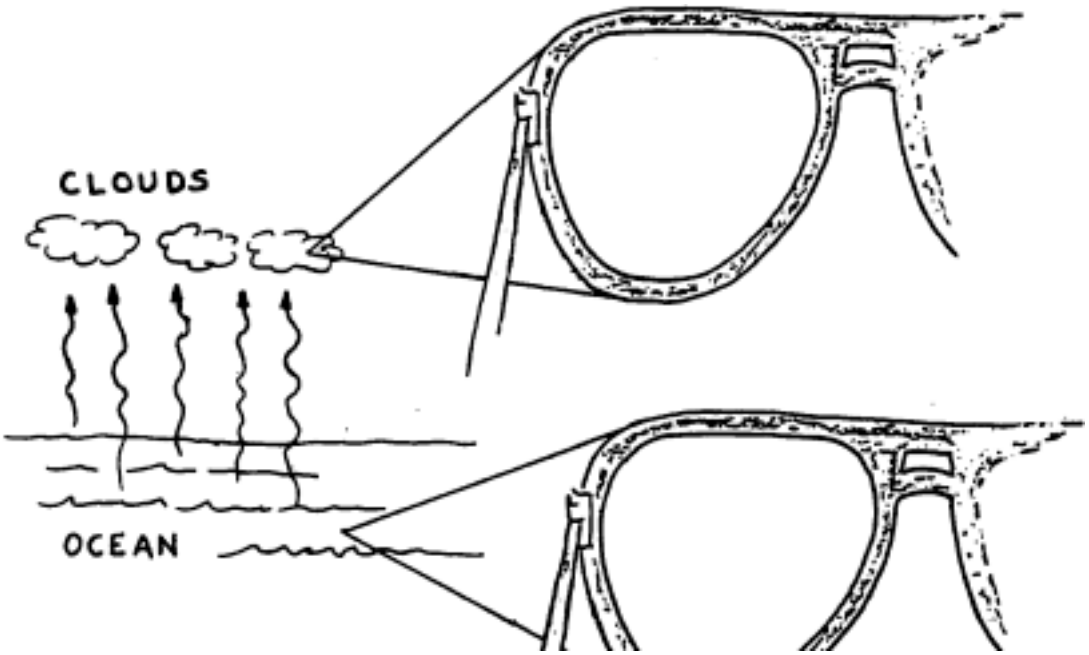
Type of Precipitation	**How it Happens**		
	Evaporation	**Spreading**	**Cooling and Condensation**
Clouds and rain	Water evaporates from oceans, plants, etc…		Air cools off and water vapor condenses into droplets (clouds). Drops fall to Earth (rain).
Fog		Water vapor mixes with air.	
Dew	Water evaporates from oceans, plants, etc…		

2. How is dew like the fog on a bathroom mirror (see Question Set 9.3)?

_____

_____

_____



3. The illustration above shows water evaporating from the ocean, rising, and condensing to form clouds.

a) Use the magic eyeglasses to draw the molecules that you would expect to see in the ocean and inside a cloud droplet.

b) How are the ocean water and the water in the cloud droplet different?

_____

_____

_____

Question Set 9.6: Cluster Review

1. Identify each of the changes in substances below as: expansion, dissolving, melting, evaporating, boiling, and condensation.

a) _____ : when you "see your breath" on a cold day.

b) _____ : a metal bill gets larger when it is held in a flame

c) _____ : soup bubbles on a stove

d) _____ : salt is heated in a furnace until it turns into a liquid

e) _____ : salt is stirred in water until the grains disappear

f) _____: the sun comes out and "burns the dew off the grass"

g) _____ : fog forms on the inside of a car windshield

2. a) Water vapor is invisible. What is the “steam” that you see above boiling water?

_____

b) How did the “steam” form?

_____

_____

3. I am alone on the desert and the Bad Guys have put poison in my water supply. What could I do to get drinking water?

_____

_____

_____

_____

4. Sometimes the windows of my kitchen get steamy when I cook soup in the winter. Give a three-step explanation of how this happens. Mention both substances and molecules for each step.

a) Boiling:

_____

_____

_____

b) Spreading:

_____

_____

_____

c) Cooling and Condensing:

_____

_____

_____

5. Raindrops keep falling on my head when I go outside on a rainy day. What are some of the places that the water in those raindrops has come from?

_____

_____

_____

6. How did the water molecules get from lakes and rivers to the raindrops that fell on my head?

_____

_____

_____