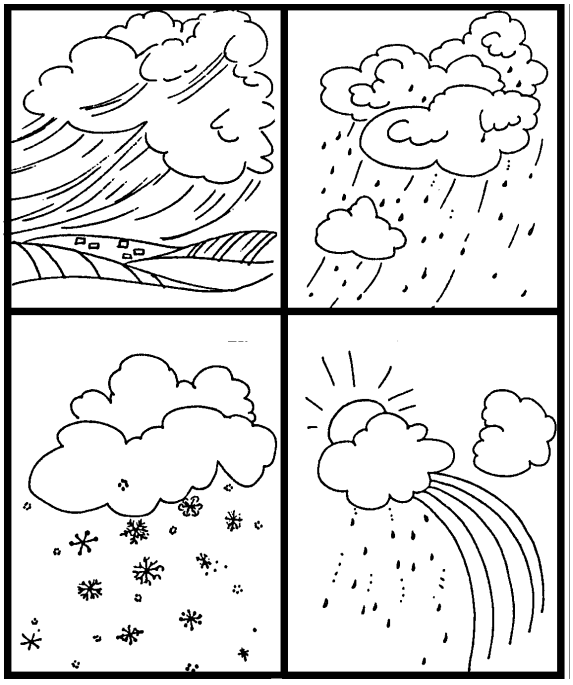
Water Cycle

The Earth's Gift

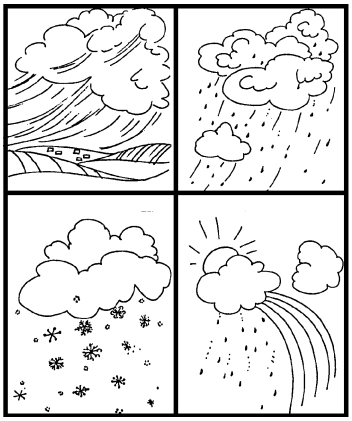
THIRD GRADE

WATER



1 WEEK
LESSON PLANS AND
ACTIVITIES

WATER CYCLE
OVERVIEW OF THIRD GRADE



WATER

WEEK 1.
PRE: *Comparing the different components of the water cycle.*
LAB: *Contrasting water with hydrogen peroxide.*
POST: *Investigating a water molecule.*

OCEANS

WEEK 2.
PRE: *Discovering an ion.*
LAB: *Exploring why salts dissolve in water.*
POST: *Comparing bodies of salt and fresh water.*

ATMOSPHERE

WEEK 3.
PRE: *Comparing the atmosphere, hydrosphere, and lithosphere.*
LAB: *Exploring atmospheric pressure.*
POST: *Contrasting the atmospheric gases.*

WEATHER

WEEK 4.
PRE: *Discovering how water condenses from air.*
LAB: *Experimenting with precipitation, and evaporation.*
POST: *Investigating the dew point.*

WATER CYCLE - WATER (3)

PRE LAB

Students use a worksheet to trace the water cycle.

OBJECTIVES:

1. Exploring the movement of water.
2. Comparing the different components of the water cycle.

VOCABULARY:

condensation
evaporation
ground water
reservoir
water cycle

MATERIALS:

worksheet

BACKGROUND:

The hydrologic or water cycle is a major driving force on our planet. Water is in constant motion, evaporating into the atmosphere to and from oceans, lakes, rivers, and streams. When the atmosphere can no longer support the moisture within the clouds we experience rain, snow, hail, or sleet. Some water is locked in the form of ice at the polar caps and in glaciers. Water is returned to the system through drainage, which results from the melting of snow that has accumulated during the winter months. This water flows on the surface of the Earth and percolates through the Earth as groundwater. Water is not actually consumed but is continuously recycled. When water is heated, it changes from the liquid to the gas water vapor. This process is called evaporation. When water vapor is cooled, as it would be if it were taken higher in the atmosphere, this gas will condense, or change back to liquid form.

We can see water vapor condensing when we watch clouds. A cloud is nothing more than water vapor that has condensed back to a liquid form. A cloud is made of extremely tiny drops of water which can remain suspended in the air. A cloud is a colloid, or 2 states of matter (liquid and air). As a cloud grows, and more and more water condense in the same place, the cloud droplets get larger. Eventually, these cloud droplets will be too large to remain in the air. The cloud is then said to be saturated. A saturated cloud will usually precipitate its excess water, or cause it to fall. This is how it rains or snows. Moisture falling from clouds is called precipitation.

The cycle of evaporation, condensation, and precipitation of water is called the water or hydrologic cycle. Since clouds move across the sky, the precipitation does not

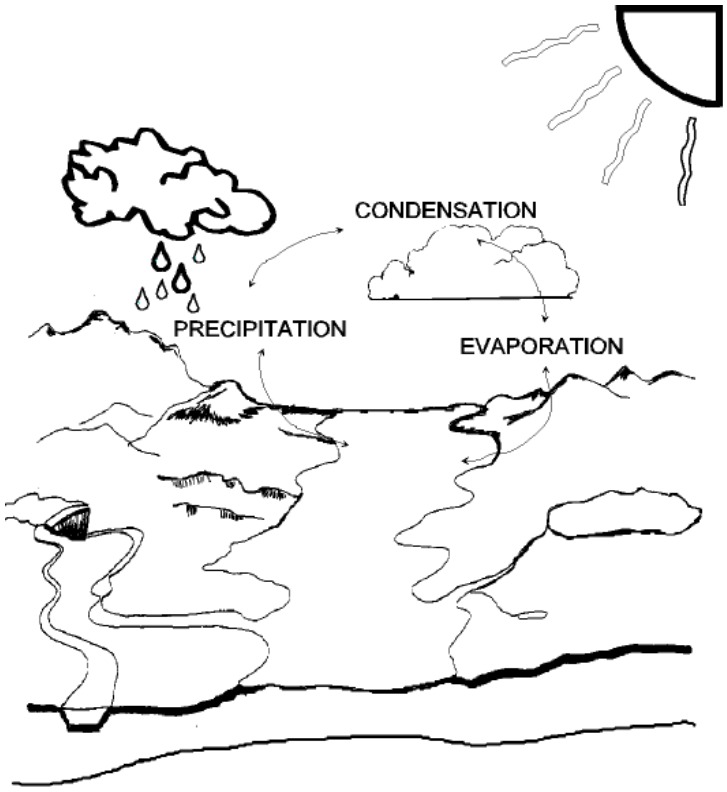
usually fall in the same place that the water came from. This is how the Earth spreads water across land areas and allows us to live in so many different areas.

PROCEDURE:

1. Using the enclosed diagram, students should trace the movement of water through the water cycle as well as find places where water can be stored and generated. Ask students if they think that snow produces a lot of or a little of water. They may be amazed that 10 inches of snow is required for 1 inch of rain.

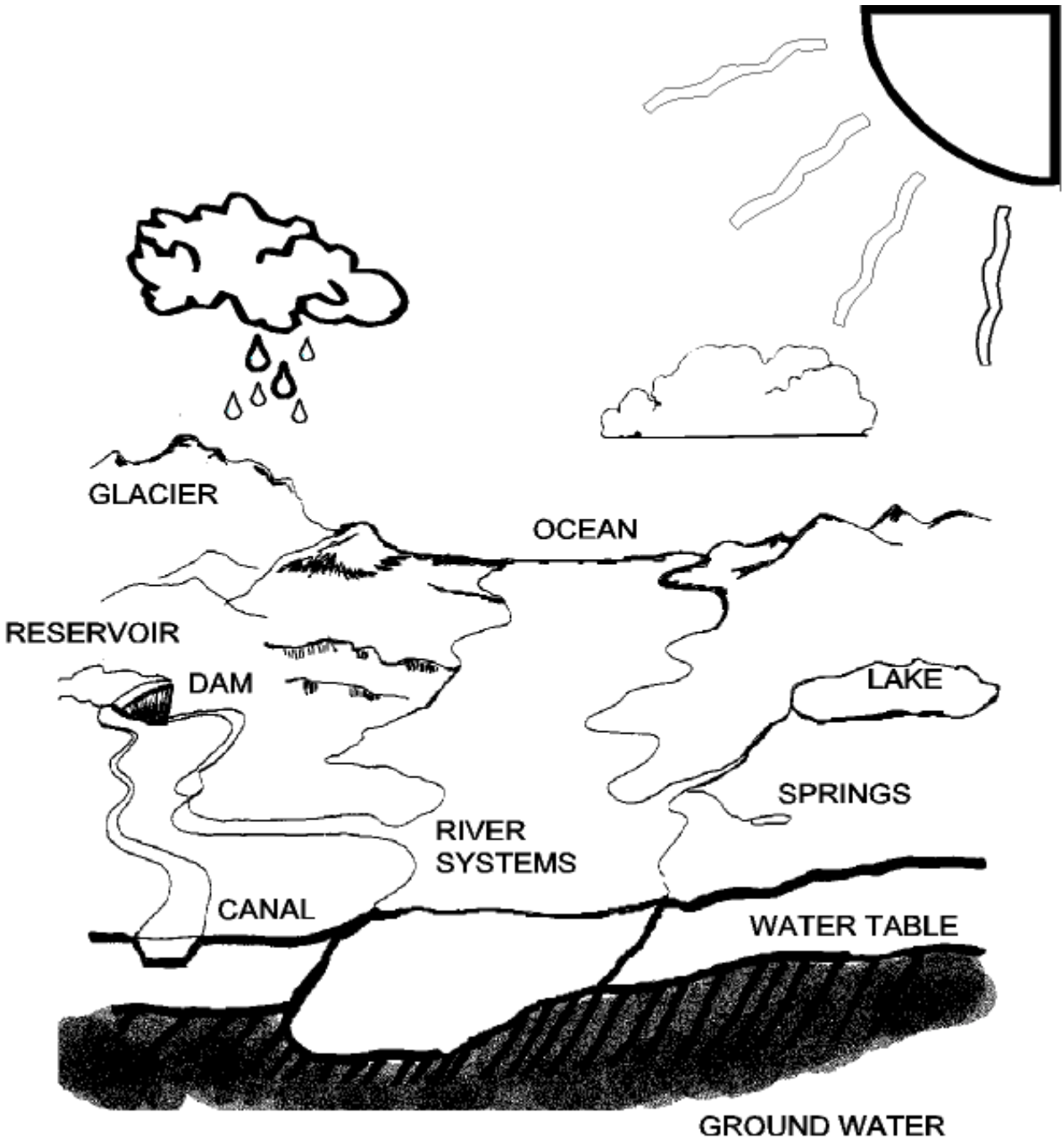
2. Have them notice that some water is trapped under the Earth and then emerges as springs. In this diagram, man-made features are illustrated to capture water, like reservoirs and dams.

3. Below is a diagram of the movements that students should be able to trace. Slowly go over each of the steps of the water cycle. See how much material they remember from previous grades. Make sure the students understand each of the vocabulary words.



WATER CYCLE - WATER (3) PRE

LABEL THE FOLLOWING:EVAPORATION, CONDENSATION, and PRECIPITATION
Show the movement of water by using an arrow to show direction.



WATER CYCLE - WATER (3)

LAB

Students compare water with hydrogen peroxide.

OBJECTIVES:

1. Contrasting water with hydrogen peroxide.
2. Exploring the chemistry of water.

VOCABULARY:

electron
hydrogen peroxide
hydrogen
neutron
oxygen
proton
water

MATERIALS:

periodic table placemats
lab sheet
hamburger meat
water
hydrogen peroxide

BACKGROUND:

Water is a transparent, odorless, tasteless liquid composed of the elements hydrogen and oxygen. It is a very good solvent, meaning that many substances can dissolve in it easily. Water is important to our lives, and without it we could not live. In fact, there are no living creatures that can live without water. It illustrates the three states of matter: solid (ice), gas (steam), and liquid (water).

The forms water take, depends upon the temperature. At low temperatures, the molecules do not move around as much and form a crystalline structure that is rigid (ice). In the liquid state, water molecules move more freely. Water molecules in the form of steam are moving very fast with large spaces between the molecules. Although ice is crystalline, it tends to have the molecules in a rigid structure that is spaced farther than the molecules of liquid water and this is quite important, for if ice were denser, it would sink in water. Imagine what would happen if icebergs grew from the bottom of the ocean instead of floating on the surface.

Water and hydrogen peroxide are made of the same elements: oxygen and hydrogen. However, hydrogen peroxide (H_2O_2) has 1 more oxygen than water (H_2O).

PROCEDURE:

1. Give students a periodic table placemat and have them look up hydrogen and oxygen. Notice that hydrogen and oxygen are both gases, but yet they produce water which is a liquid under normal conditions. They should then transfer the information in each of the boxes on the periodic table to the appropriate place on the lab sheet. Make sure you point out that hydrogen has 1 proton, 1 neutron, and 1 electron. This may be their first introduction to neutrons, protons, and electrons, so go slowly. The students can understand individual examples if you go over them carefully and make sure you explain as you go over.

2. Introduce that water and hydrogen peroxide are made of the same elements: hydrogen and oxygen. Water has 2 hydrogens and 1 oxygen, and hydrogen peroxide has 2 hydrogens and 2 oxygens. We would like the students to experiment with the properties of each of the liquids and then have them construct an "atomic" model to see if they can see why there is a difference. They will not be able to figure this out why the different number causes the difference, just to learn that there is a difference.

3. In the second part of this exercise have students look at water and hydrogen peroxide. Have them answer the questions on the lab sheet. Remember hydrogen peroxide smells different than water. Students should smell the two liquids by using a cupped hand to bring the odor to their nose. Do not have students put their nose over the liquid.

4. It also tastes different, but we don't recommend that you do this part. Also, put a drop of water, then hydrogen peroxide on a small piece of hamburger meat. Have the students notice that hydrogen peroxide reacts with the meat and causes fizzing. Students may not realize that hydrogen peroxide is used when they get a scratch or cut. What the hydrogen peroxide does is take out the oxygen in the meat, causing any bacteria (that needs oxygen) to die.

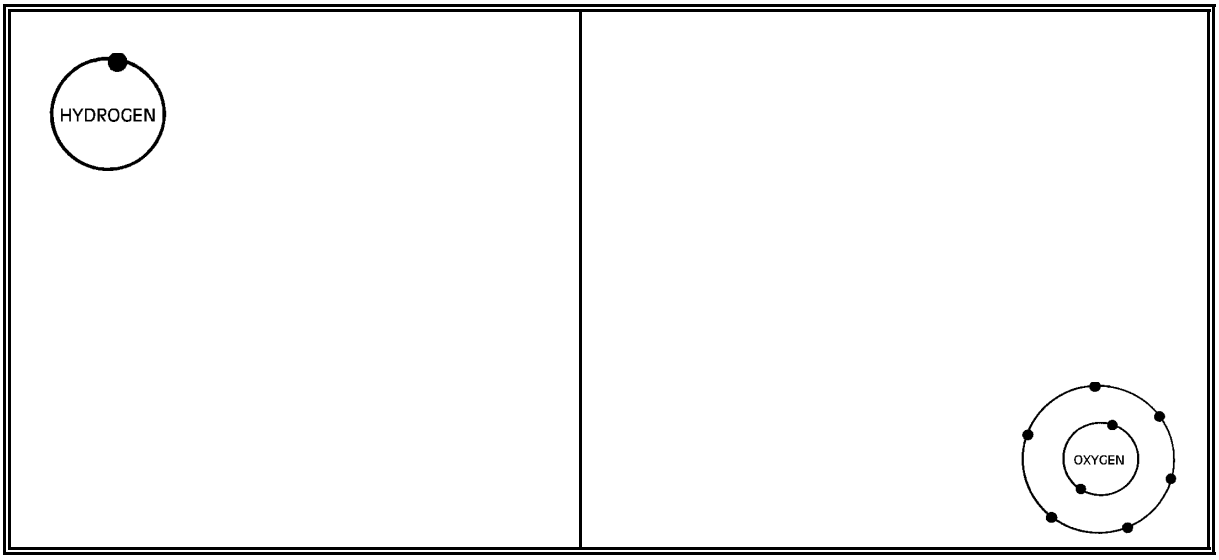
5. In Exercise 3 have the students cut out the hydrogen and oxygen atom. The black dots represent the number of electrons. The first shell can only hold 2 electrons. The second shell can only hold eight electrons. Tell the students that the outer shell of the oxygen must have 8 electrons. Have the students try and figure out how to put the atoms together to make the molecule satisfied. The clue on the student's lab sheet is actually the answer, x belongs to hydrogen and belongs to oxygen. The students will have a little trouble with this until they get the idea that the outer shell needs to be filled with the maximum amount of electrons.

WATER CYCLE - WATER (3)

PROBLEM: How does water differ from hydrogen peroxide?

PREDICTION: _____

EXERCISE I. Draw a hydrogen and an oxygen atom in the boxes below



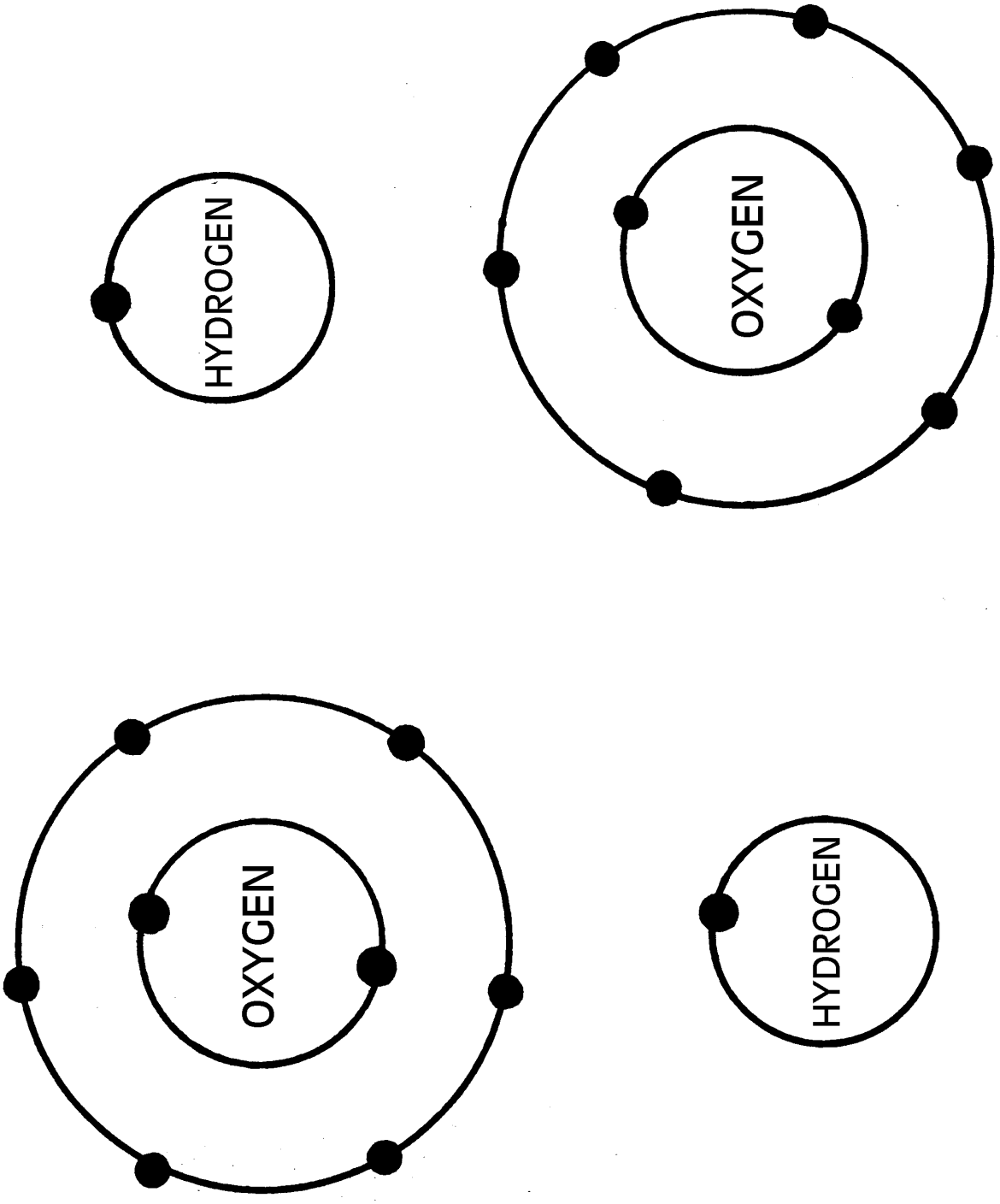
EXERCISE II. Look at both the water and the hydrogen peroxide and compare.

	WATER (H_20)	HYDROGEN PEROXIDE (H_20_2)
Smell		
Reaction with meat		
Feel		

EXERCISE III. See if you can construct an atomic model of both water (H_2O) and hydrogen peroxide (H_2O_2) using the enclosed sheets. Cut them out and following the information below. *RULE: OUTER SHELL MUST HAVE ONLY 8 ELECTRONS, INNER SHELL MUST HAVE ONLY 2 ELECTRONS. USE ENCLOSED SHEET TO HELP.*

CLUE:

WATER CYCLE - WATER (3) DURING



WATER CYCLE - WATER (3)

POST LAB

Students learn about angles in a circle.

OBJECTIVES:

1. Exploring why water is important.
2. Investigating a water molecule.

VOCABULARY:

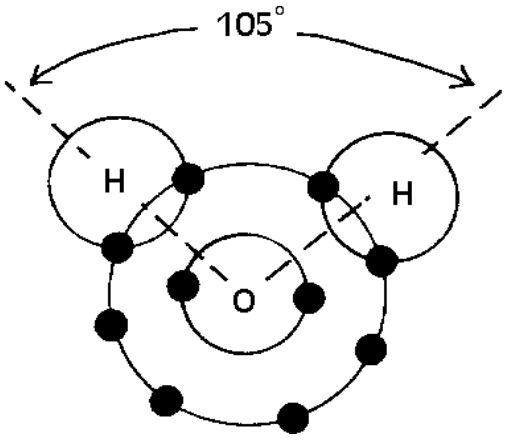
bond
covalent
hydrogen
ionic
oxygen
water

MATERIALS:

worksheet
hydrogen and oxygen cut outs from lab

BACKGROUND:

Water is very important to our everyday lives because of the manner in which hydrogen and oxygen "hold" hands. The water molecule is very strong, but the way it is arranged, allows many other substances that can "hide" between the hydrogen and oxygen. What makes water so important? Water is a peculiar substance with properties that make it an ideal fluid. If you theoretically calculate the boiling and freezing temperatures of water you will find that water has an unusually low freezing point and high boiling point compared to other molecules that have similar structures (sulfur, selenium, and tellurium).



How can you explain such a big difference? The molecular structure of water resembles that of Mickey Mouse's head (figure right). The hydrogen and the oxygen have a very tight covalent bond, where the hydrogen and the oxygen share electrons as they dance and twirl around in the molecule. The individual molecules of water are also held together very tightly by what is

specifically called a hydrogen bond. A hydrogen bond is much stronger than other bonds that molecules have. Ionic bond is one of those weaker bonds, and substances like salt can be easily be broken up. Water is a package of power that is hard to break, and it is this strength that allows other substances to dissolve or break up in water, hence the name, universal solvent.

PROCEDURE:

1. If students are not familiar with using a protractor go over how to determine angles with the paper protractor. You may want them to cut them out and show them how to measure.

2. Use the circle on the worksheet to figure out the different angles depending on how much practice they may need.

3. Have the students use two of the hydrogen and one oxygen to make representative model of how the elements are bonded. The two hydrogen's are 105º between each other as in the diagram in the background information.

WATER CYCLE - WATER (3)

protractor