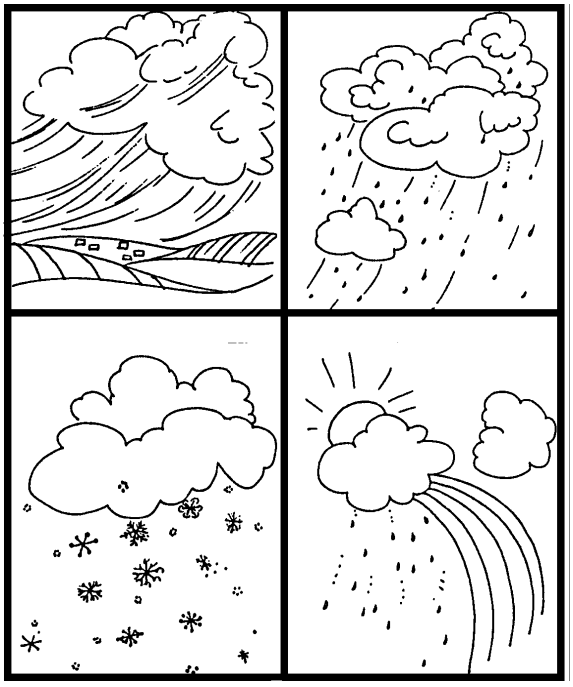
Water Cycle

The Earth's Gift

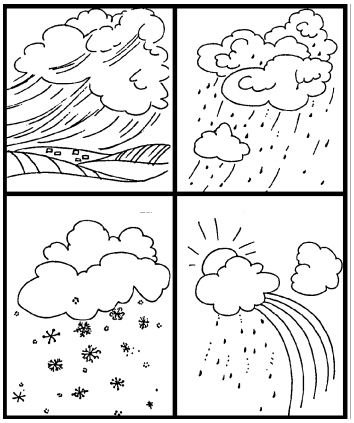
FOURTH GRADE

WATER



1 WEEK
LESSON PLANS AND
ACTIVITIES

WATER CYCLE
OVERVIEW OF FOURTH GRADE



WATER

WEEK 1.
PRE: *Comparing different reservoirs of water.*
LAB: *Experimenting with surface tension and capillary action.*
POST: *Discovering why icebergs float.*

OCEANS

WEEK 2.
PRE: *Comparing fresh and salt water.*
LAB: *Discovering that salt water is an electrolyte.*
POST: *Distinguishing bodies of salt water.*

ATMOSPHERE

WEEK 3.
PRE: *Discovering the affect of air pressure.*
LAB: *Comparing how substances heat up.*
POST: *Exploring how wind is created.*

WEATHER

WEEK 4.
PRE: *Exploring different weather fronts.*
LAB: *Comparing satellite photos and weather maps.*
POST: *Discovering weather and climate patterns of California.*

WATER CYCLE - WATER (4)

PRE LAB

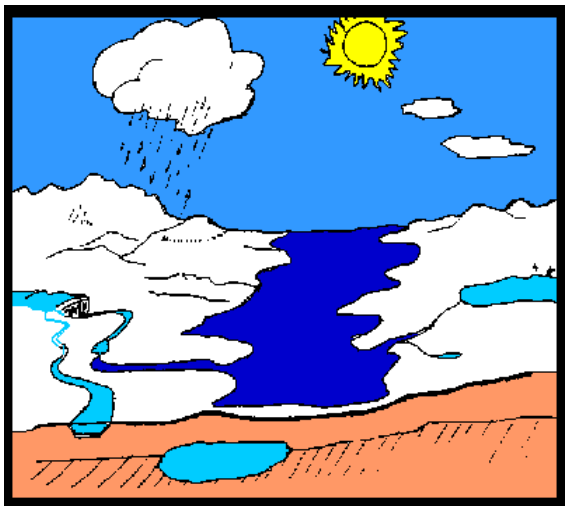
Students use a worksheet to review the water cycle.

OBJECTIVES:

1. Understanding the water cycle.
2. Comparing the different reservoirs of water.

VOCABULARY:

condensation
evaporation
ground water
lake
ocean
reservoir
water table



MATERIALS:

worksheet

BACKGROUND:

Water is our most common natural resource. It is essential to the biology and chemistry of all living things, it plays a major role in shaping the earth and is an active agent in many physical reactions. It is important to most life to keep it clean. There is plenty of water on Earth, but 97% of this water is saline (contains dissolved salts). Only 3% is fresh and about two thirds of that amount is locked up in polar ice caps and glaciers; about one third (1%) can be found as ground water, lakes, and in the atmosphere.

Water exists in three states of matter: solid (ice), liquid (water), and gas (vapor) at normal conditions. Water is a colorless, odorless, tasteless liquid with a melting point of zero degrees centigrade and a boiling point of 100 degrees centigrade.

Water is cleaned as it passes through nature's water cycle. When water evaporates to the gaseous phase, it leaves the dissolved impurities behind. Water can also be cleaned through other natural ways. Overtime, civilization have developed ways in which they can also clean water by taking advantage of part of the natural water cycle.

PROCEDURE:

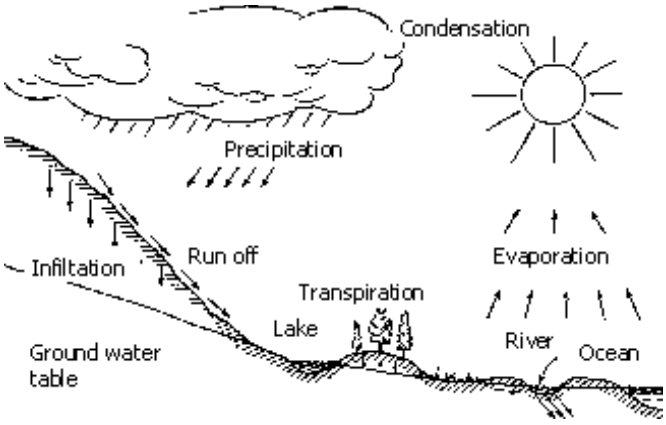
1. Water is important to our lives. Discuss with your students some of the reasons why water is necessary to humans and then write these reasons on the board. Hopefully,

your students should come up with the following reasons: drinking, for travel, watering plants, and for cleaning. Discuss the properties of water with your students.

2. It is important that you review how the water cycle functions. After you review, see if the students can derive the cycle by themselves by using the worksheet. Have the students generate a cycle on the board by having each student add a component to the cycle until the entire water cycle is drawn on the board.

3. Use the following definitions to help students create a water cycle using the worksheet.

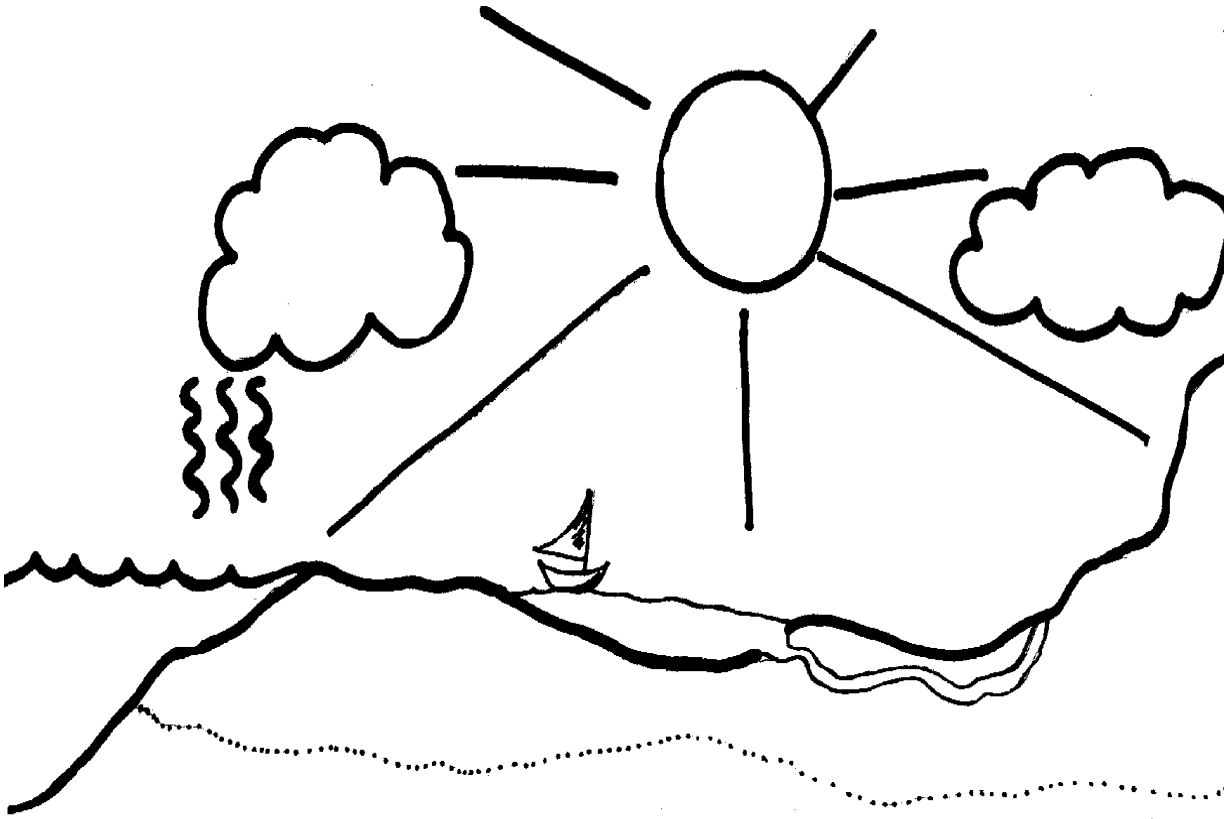
1. evaporation - the changing of liquid to water vapor
2. condensation - the changing of water vapor to a liquid
3. cloud - a visible mass of particles of water or ice in the form of fog, mist, or haze, suspended at a considerable height in the air
4. precipitation - forms of water vapor that are heavy enough to fall to the Earth's surface such as rain, snow, sleet, hail, and fog
5. infiltration - the process by which water seeps into the soil and become groundwater
6. spring - a source of water from the ground
7. marsh - a parcel of soft wet land, that can be either salt or fresh water
8. artisan water - underground water trapped under pressure in a porous layer between non-porous rock layers
9. water table - the level below which the ground is saturated with water
10. lake - a body of water larger than a pond and too deep in parts for rooted plants to live
11. river - a natural stream of water larger than a creek and emptying into an ocean, lake, or another river
12. ocean - the bodies of salt water that cover nearly three fourths of the surface of the Earth
13. groundwater - water found below the surface of the Earth
14. runoff - water that flows on the surface or through the ground into streams, rivers, lakes and oceans
15. transpiration - the evaporation of water from the leaves of plants



WATER CYCLE - WATER (4)

TRY AND LOCATE THE PARTS OF THE WATER CYCLE ON THE ABOVE CARTOON. USE THE NUMBERS. DRAW IN ITEMS THAT MIGHT NOT BE DRAWN.

1. EVAPORATION 2. CONDENSATION, 3. CLOUD, 4. PRECIPITATION, 5. PRECIPITATION, 6. SPRING, 7. MARSH, 8. ARTESIAN WATER, 9. WATER TABLE, 10. LAKE, 11. RIVER, 12. OCEAN, 13. GROUNDWATER, 14. RUNOFF, 15. TRANSPIRATION.



WATER CYCLE - WATER (4)

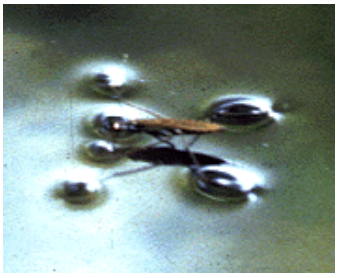
LAB

Students experiment with surface tension of water.

OBJECTIVES:

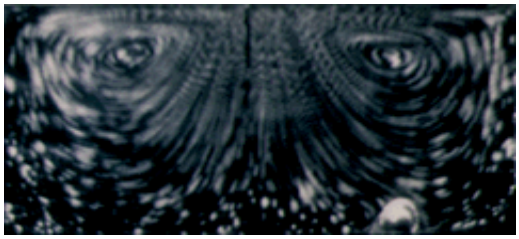
1. Exploring the properties of water.
2. Experimenting with surface tension and capillary action.

VOCABULARY:



capillarity
capillary action
surface tension

MATERIALS:



lab sheet
glasses of water
paper tissue
Water Cycle - Water (4)
food coloring (optional)

BACKGROUND:

Water is a transparent, odorless, and tasteless liquid. It illustrates the three states of matter: solid (ice), gas (steam), and liquid (water). The form it takes 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.

Another chemical quality of water is that water has a very large heat capacity, meaning that it can absorb a great deal of heat without itself becoming extremely hot. This fact makes the oceans large reservoirs of heat that greatly affect the overall weather and climate patterns of the world.

Water's surface tension (the ability of a substance to stick to itself) makes it an excellent substance to float heavy objects upon. Water not only sticks to itself, but also to other surfaces, and this allows it to move against gravity, which is very important to plants when transporting water form the soil to their leaves. This upward motion is known as capillarity or capillary movement.

PROCEDURE:

This lab consists of two parts. In the first experiment, the students will experiment with "floating" a pin on water by increasing the surface tension of the water. Experiment II has students trying to discover why capillary action works.

1. Discuss that surface tension is an important property of water. The molecules within the bulk of a liquid are attracted equally in all directions by the surrounding molecules. However, the molecules on the surface of a liquid are attracted only inward and sideways. This unbalanced molecular attraction pulls some of the surface molecules into the bulk of the liquid and a condition of equilibrium is reached when the surface area is reduced to a minimum. The surface of a liquid therefore behaves as if it were under a strain or tension. This force is called surface tension. We may define surface tension as the force which causes the surface of a liquid to contract. A liquid surface acts as if it were a stretched membrane. A steel needle carefully placed on water will float.

2. EXPERIMENT I. Can a pin float? Give the students a pin, a glass of water, and a piece of paper tissue. Have them experiment to see if the pin will float. Don't give them too many clues, except the definition of surface tension. After a few minutes, illustrate how to float the pin by putting the tissue on the surface of the water, then laying the pin gently on top, and then allowing the tissue to sink to the bottom of the glass. The pin will float as the tissue drops to the bottom. The students have to be careful not to break the surface tension or else the pin will sink.

3. EXPERIMENT II. One of the reasons why water rises in thin capillary tubes is due to surface tension. Water is brought up to the surface of the soil and to the roots of plants by this action. The thinner the tube the higher it will rise. You may want to use food coloring to help see the rise easier.

4. After the students complete the experiments they will realize that capillary action is caused by surface tension and that in a thin capillary tube, the water molecules climb up the sides of the tube because of surface tension.

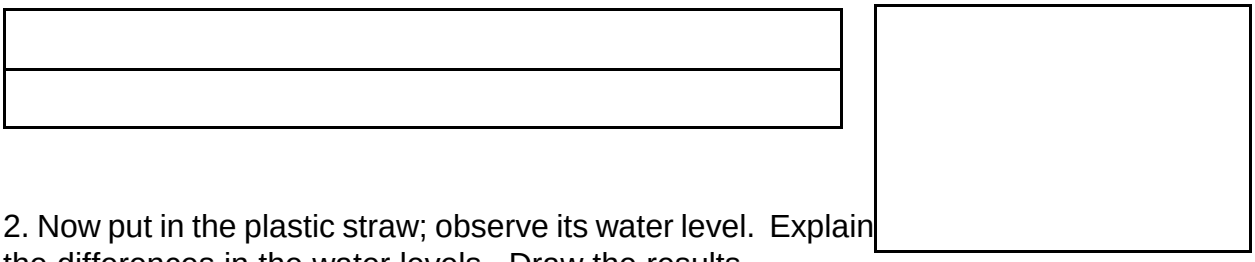
WATER CYCLE - WATER (4)

PROBLEM: Why can a pin float in water and how can water rise up a thin tube by itself?
PREDICTION:_____
EXPERIMENT I **MATERIALS:** pin, glass of water, paper tissue
PROCEDURE: Try to get the pin to float. Remember the principles of surface tension that your instructor reviewed.
Describe the set-up that allowed the pin to float._____
_____

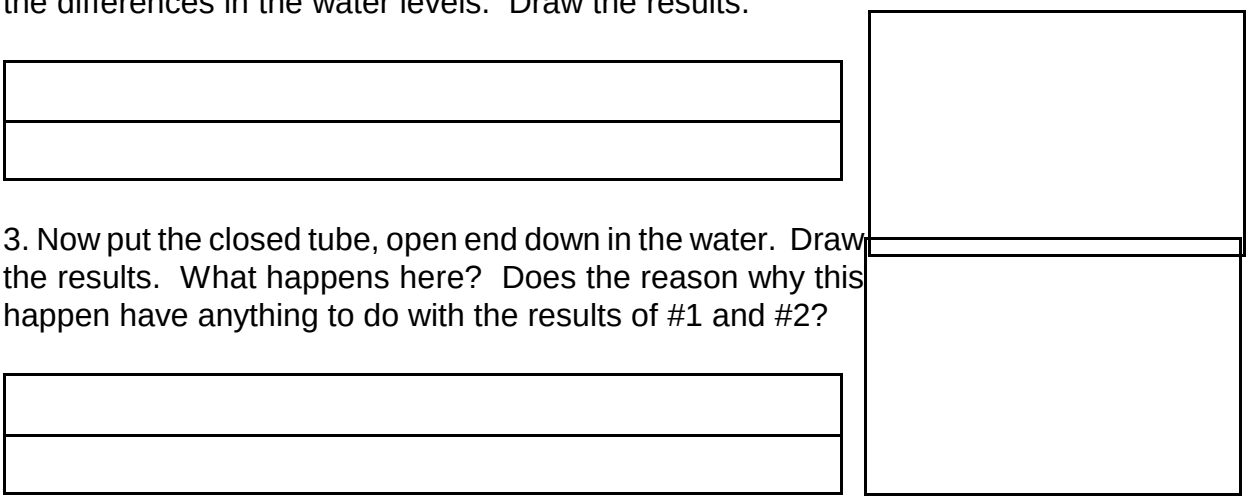
How did surface tension help the pin float? _____
_____

EXPERIMENT II. **MATERIALS:** clear straw, plexiglass tube, glass capillarity tube, small closed tube, glass of water.

PROCEDURE: Place the plexiglass tube and the glass capillary tube in a glass of water.
1. Predict in which tube the water level will rise highest. Draw the results.



2. Now put in the plastic straw; observe its water level. Explain the differences in the water levels. Draw the results.



3. Now put the closed tube, open end down in the water. Draw the results. What happens here? Does the reason why this happen have anything to do with the results of #1 and #2?

CONCLUSION:

WATER CYCLE - WATER (4)

POST LAB

Students research icebergs and the Titanic.

OBJECTIVES:

1. Explaining properties of water.
2. Discovering why icebergs float.

VOCABULARY:

surface tension

MATERIALS:

worksheet
Internet

BACKGROUND:

Students have learned that the hydrogen and oxygen in water is held together by a covalent bond, which refers to the sharing of electrons. Water has a more specified bond called a hydrogen bond, which allow water molecules to join together in a tight structure. All this tightness of bonding accounts for many of water's remarkable properties. Hydrogen bonds account for the unusual cohesive power shown by water's high surface tension. It also explains the ability of water to adhere strongly to a wide variety of substances thereby "wetting" them. Students do not have to remember all these properties, but the key objective is for them to understand that how water molecules "hold hands" plays an important part of how water reacts.

Many students may have heard about the Titanic. On its maiden voyage from England to the United States, the unsinkable ship hit an iceberg and sunk in the early 1900's. Many stories have been written about the lives of the rich and famous who perished on that voyage. But how could ice cause so much damage?

When temperature decreases, the bonding of the water molecule becomes strong and prevents the molecule from contracting or shrinking. At 4°C the molecules begin to arrange themselves along the directional lines of the bond, leaving gaps or openings between these bonds. The water expands until at 0°C, it solidifies in a structure which is a very open crystalline structure. The same general pattern occurs during the formation of snowflakes, which are branching ice crystals grown out of moist air. Snowflakes have a hexagonal, or six-sided, structure, the outline which is formed by the bases of six tetrahedrons.

Water is a weird and awesome substance!

PROCEDURE:

1. Have the students research icebergs, which is ice that floats in the oceans. Only fresh water will freeze, so the ice in icebergs is salt free. Ice is actually less dense than liquid water because of how the molecules "freeze." Use the internet and use a search engine to find out more information.

2. Students may be interested in learning more about Titanic. They are probably curious on how a big ship could not see the danger of an iceberg. If you look at the worksheet, you can see the bulk of the iceberg floats under the water, so a ship could hit the iceberg without running into the portion that is above water.

3. Students can color the iceberg and write a story on the iceberg that brought down the Titanic.

WATER CYCLE - WATER (4)