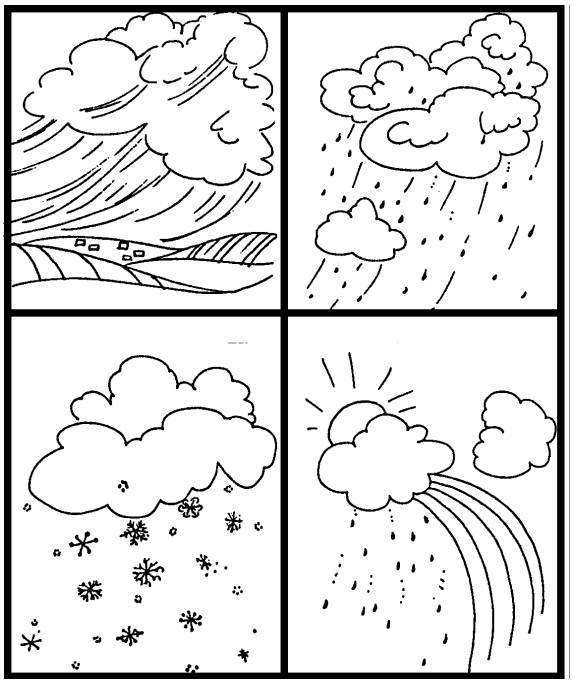
Water Cycle

The Earth's Gift

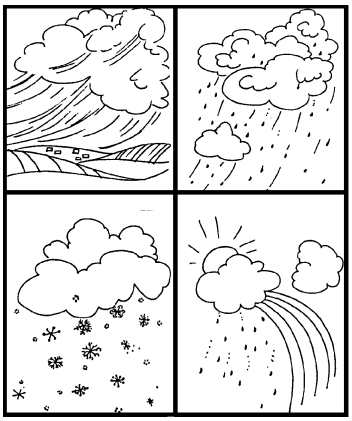
FOURTH GRADE

OCEANS



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 - OCEANS (4)

PRE LAB

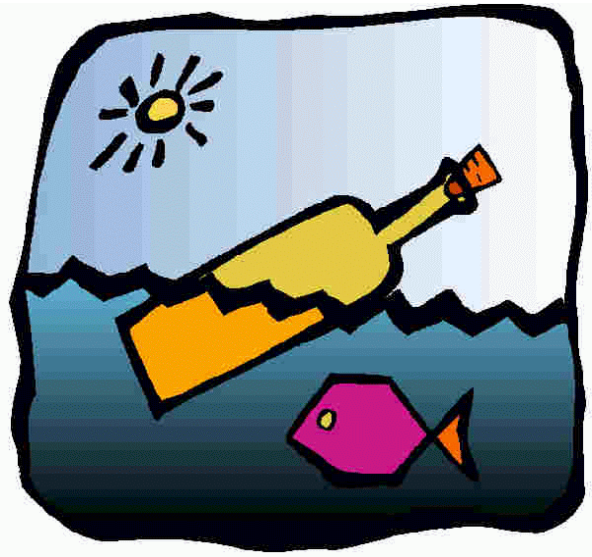
Students use a worksheet to explore floating.

OBJECTIVES:

1. Comparing the properties of fresh and salt water.
2. Exploring why substances float in water.

VOCABULARY:

density
dissolve
fresh water
mineral
salt water
solution



MATERIALS:

fresh egg
jug
water
salt

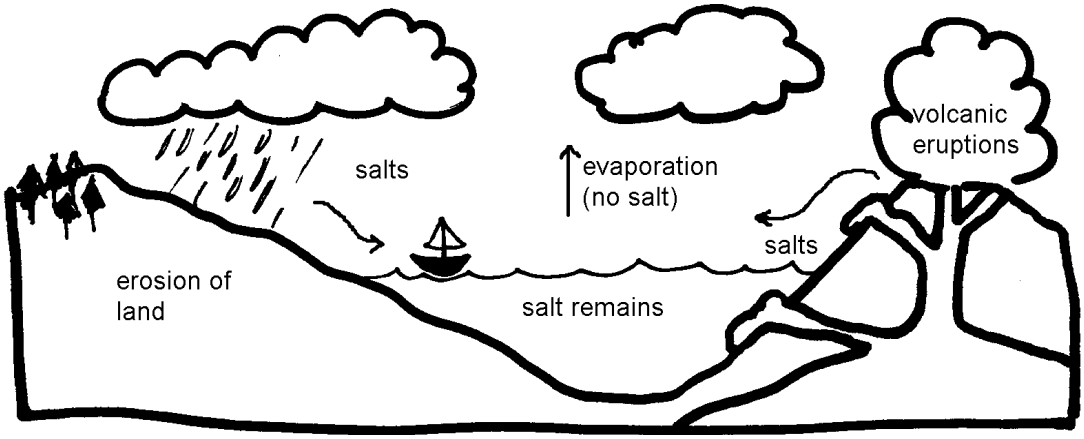
BACKGROUND:

Salt water is made during the movement of water on land over time. The components of rocks are eroded and become part of a "salty" solution. Remind students that the word "salt" refers not just to table salt, but to many chemicals that are classified as salts. Salt water or seawater has characteristics similar to fresh water with some noticeable differences because of the salts that are dissolved in water. The viscosity (i.e., internal resistance to flow) of seawater, for example, is higher than that of fresh water because of its higher salinity. The density of seawater also is higher. Seawater's freezing point is lower than that of pure water and its boiling point is higher.

It is easier to float objects in seawater than in fresh water. Many humans can “float” in seawater but not fresh water. The reason is that water with salt in it, is more dense. So objects that cannot float in fresh water may be able to float in seawater. Floating refers to having a substance rise to the top of another substance. For example, a balloon with helium will float in air because it is lighter (or less dense). If you forced an object to go under the water and let it go, it will float to the top.

PROCEDURE:

1. Use the diagram below to discuss how "salts" are eroded from land. Ask the students if clouds contain salts. The students should be able to realize that clouds do not have salts in them because only fresh water can evaporate into a gas.



2. Water can evaporate from a "salty" water solution by leaving the salts behind. Ask the students if there are any other bodies of water besides the oceans that are made up of salts. The Great Salt Lake in Utah and the Black Sea in Russia are both made up of salt water.

3. Discuss with students the different properties of pure water and salt water. Salt water is denser, conducts electricity because of its ionic content, and chemically has more ingredients.

4. Demonstrate with your students how the density of water can be changed by using salt. Place a fresh egg in a glass of fresh water and the egg will sink to the bottom. Stir salt into the glass of water (about 100 ml to 250 ml of water). Replace the egg and this time it will float because you have increased the density of the water.

5. Ask the students if it is easier to float in sea water or fresh water. Salt water can make any object float easier because it is denser than fresh water, therefore it can support bigger objects.

WATER CYCLE - OCEANS (4)

Explain what is floating on what in the following pictures.

WATER CYCLE - OCEANS (4)

LAB

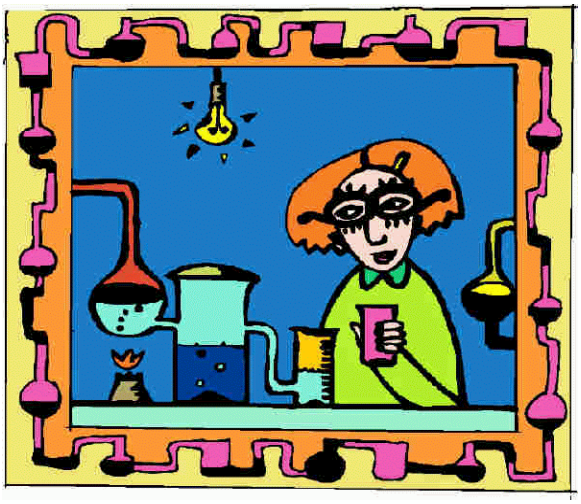
Students experiment with an electrolyte.

OBJECTIVES:

1. Discovering that salt water is an electrolyte.
2. Reviewing the properties of salt water.

VOCABULARY:

chloride
electrical circuit
electron
electrode
electrolyte
ion
sodium



MATERIALS:

glass beakers
water
salt
electrical circuit set-up with lightbulb
lab sheet

BACKGROUND:

Water is a compound that has strong "bonds" among its constituents. In other words, it is difficult to break apart the hydrogen and oxygen atoms without some sort of energy input. "Salts," on the other hand, usually have weak "bonds" and the atoms of salts can easily be separated into its appropriate ions. When a salt, like sodium chloride (table salt) is dissolved in water the sodium and chloride separate temporarily. The sodium atom will become a positively charged ion and the chloride atom will become a negatively charged ion. An ion is an atom or group of atoms that has a negative or positive electric charge. Negative ions are formed by atoms gaining electrons, and positive ions are formed by atoms losing electrons.

Substances that conduct electric current are called electrolytes. They are formed as a result of a dissociation into positively and negatively charged particles called ions, which migrate toward and ordinarily are discharged at the negative and positive terminals of an electric circuit, respectively. The most familiar electrolytes are acids, bases, and salts, which ionize when dissolved in such solvents as water. Many salts, such as sodium chloride, behave as electrolytes when dissolved in water. Pure water will not behave as

an electrolyte.

PROCEDURE:

1. Review with the students that fresh water is basically pure "water" whereas salt water has many other elements dissolved in water.

2. Students will discover in this lab that the ions in the water make salt water an electrolyte. An electrolyte is a nonmetallic electric conductor in which a current is carried by the movement of ions.

3. Go over the lab set-up with the students as diagramed on the students' sheet. The battery can be a six volt or smaller, depending on the type of bulb you have. (Remember if the voltage is too high it will burn out the light bulb). An electrode refers to whether a current enters or leaves a conductor.

4. Ask the students to determine if the light bulb will glow brighter if more salt is added. Yes, but there is a maximum point that the bulb will reach and will not glow any brighter. The salt acts as an electrolyte, making electricity transfer more efficiently. Fresh water has no ions that can make it act as a conductor. Have the students record their data on the graph. Then when you discuss the experiment with the students have the student write a summary of the class results.

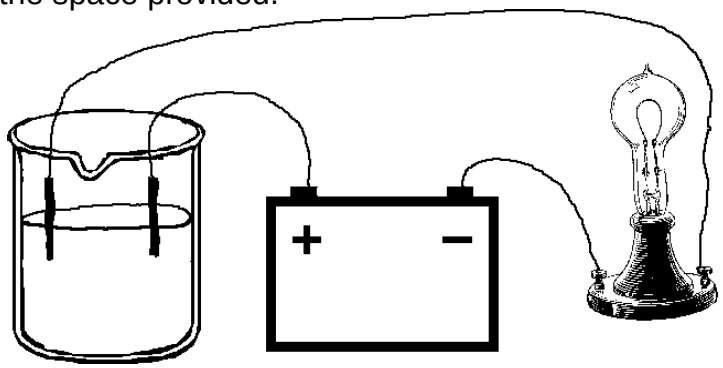
WATER CYCLE - OCEANS (4)

PROBLEM: Does salt water act differently than fresh water?

PREDICTION:_____

MATERIALS: 3 beakers, water, salt, electric circuit set-up with light bulb.

PROCEDURE: Fill each beaker with 250 ml of water. In one beaker add 1/2 ml of salt and stir (until salt dissolves); in another beaker add 1 ml of salt and stir. Test each liquid to see if it can light up the light bulb and complete an electric circuit. Make sure you clean the electrodes when going from one beaker of salt solution to the next. See how much salt you can put in before there is not difference in the light bulb. Follow the diagram below. Record what happens on the space provided.



RECORD: voltage used _____ voltage of bulb _____

	distilled water	tap water	1/2 ml salt				1 ml salt
experiment							
class results							

CONCLUSION: Can you explain the results of this experiment?

_____

_____

WATER CYCLE - OCEANS (4)

POST LAB

Students use a worksheet to compare the world's oceans.

OBJECTIVES:

1. Distinguishing bodies of salt water.
2. Comparing the properties of salt and fresh water.

VOCABULARY:

electrolyte
fresh
hydrogen
oxygen
seawater

MATERIALS:

worksheet
inflatable world globes

BACKGROUND:

The Earth's surface is 71% water and 97% of that water is sea water, while only 3% is fresh water. One of the most significant chemical properties of water is its ability to be a solvent. The liquid can hold in solution an exceptionally wide range of substances, including electrolytes (salts, which dissociate into ions in aqueous solution) and particulate matter small enough to remain suspended in solution.

The major inorganic solutes are the positive ions of sodium, potassium, calcium, and magnesium and the negative ions, chloride, sulphate, and bicarbonate/carbonate. When the total concentration of all these ions (i.e., the salinity, or salt content) is less than 3 grams per liter waters are regarded as fresh. Most fresh waters have salinities less than 0.5 gram per liter and are dominated by calcium, magnesium, and bicarbonate or carbonate ions. Salt waters are defined as those that have salinities greater than 3 grams per liter.

PROCEDURE:

1. Review the properties of sea water and how it differs from fresh water. You might want to introduce the information in the following manner:

FRESH WATER	SALT WATER
NOT AN ELECTROLYTE PURE HYDROGEN AND OXYGEN LESS DENSE THAN SALT "NEW" WATER (CREATED RECENTLY)	ELECTROLYTE CHEMICALLY DIVERSE MORE DENSE THAN FRESH "OLD" (BEEN IN THE SYSTEM FOR A LONG TIME)

2. Next have the students do the activity on the lab sheet. Have them color the land differently from the water and then have them label the information. Have available the inflatable globes that are used in other portions of this program.

3. ANSWERS: 1. 70-71%; 2. on map; 3. This map emphasizes the oceans, not the land. A Mercator projection makes it look like there is more land. This map is closer to a globe.

WATER CYCLE - OCEANS (4)

1. Guess what percent of the world is made up of oceans? _____
2. LABEL: Pacific Ocean, Atlantic Ocean, Arctic Ocean, Indian Ocean, South America, Europe, Antarctica, Africa, Australia, China, Russia, United States
3. Why does the map look different than most maps you have seen?

_____