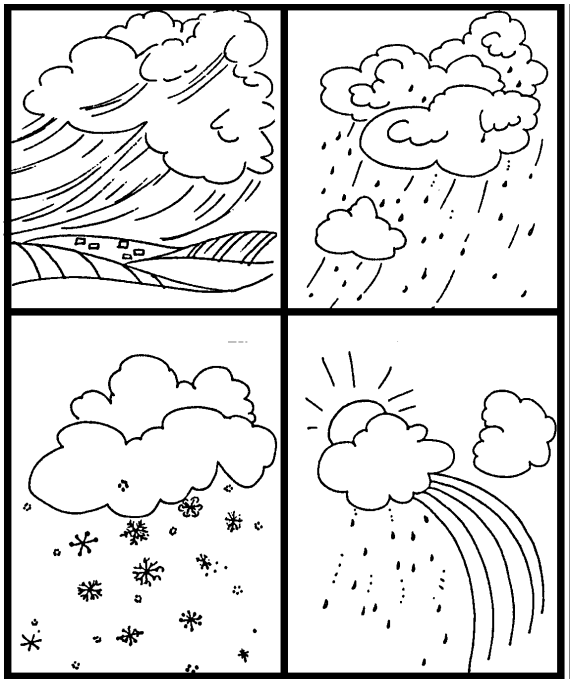
Water Cycle

The Earth's Gift

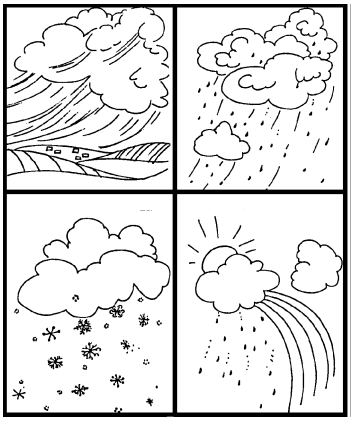
FIFTH GRADE

WATER



1 WEEK
LESSON PLANS AND
ACTIVITIES

WATER CYCLE
OVERVIEW OF FIFTH GRADE



WATER

WEEK 1.
PRE: *Analyzing why water is important.*
LAB: *Comparing the density of water to that of other liquids.*
POST: *Exploring how water is used in our society.*

OCEANS

WEEK 2.
PRE: *Distinguishing between fresh and salt water.*
LAB: *Exploring what lies under the oceans.*
POST: *Exploring estuarine systems.*

ATMOSPHERE

WEEK 3.
PRE: *Analyzing the composition of air.*
LAB: *Discovering that some components of air can be depleted.*
POST: *Distinguishing amongst different pollutants.*

WEATHER

WEEK 4.
PRE: *Comparing the different layers of the atmosphere.*
LAB: *Classifying clouds.*
POST: *Comparing an artist's interpretation of clouds.*

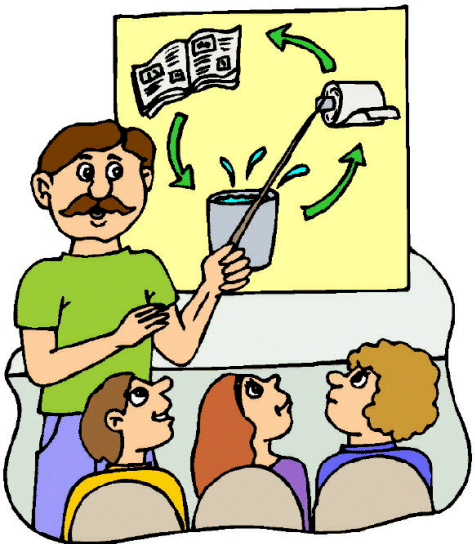
WATER CYCLE - WATER (5)

PRE LAB

Students use a worksheet to trace the water cycle.

OBJECTIVES:

1. Introducing the water cycle.
2. Analyzing why water is important.



VOCABULARY:

condensation
evaporation
precipitation
water cycle

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 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 0° centigrade and a boiling point of 100° centigrade.

Water can be easily cleaned through the water cycle. When water evaporates in the gaseous phase, it leaves all the impurities behind. Water can also be cleaned through other natural ways. Humans have created ways in which they can also clean water without going through a natural water cycle.

PROCEDURE:

1. For the next four weeks, students will look at the properties of water, oceans, the atmosphere, and the weather. Remember that all of these subjects are related and your lectures should reflect this.

2. Discuss with students the following major points about water or the hydrologic cycle. Draw the diagram of the water cycle.

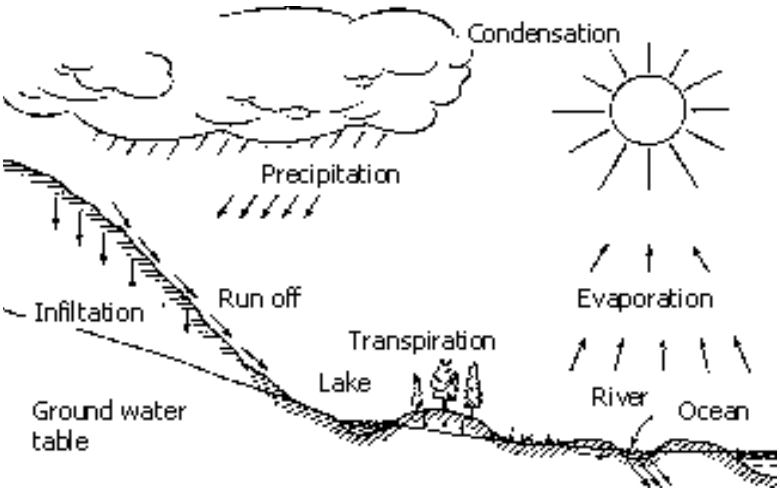
A. Water **precipitates** from clouds as rain, snow, sleet, or hail to the Earth's surface.

B. Depending on a number of factors such as soil type, slope, moisture conditions, and intensity of precipitation will either **infiltrate** into the ground or **runoff** into rivers and streams.

C. Virtually no water infiltrates through paved roads and parking lots, so almost all of it becomes **urban runoff**. Runoff from rivers, and streams is **stored** in large bodies of water such as lakes, estuaries, and oceans.

D. Water is returned to the atmosphere **evaporation** from the surface of land or water bodies, or through plants by a process called **transpiration.**

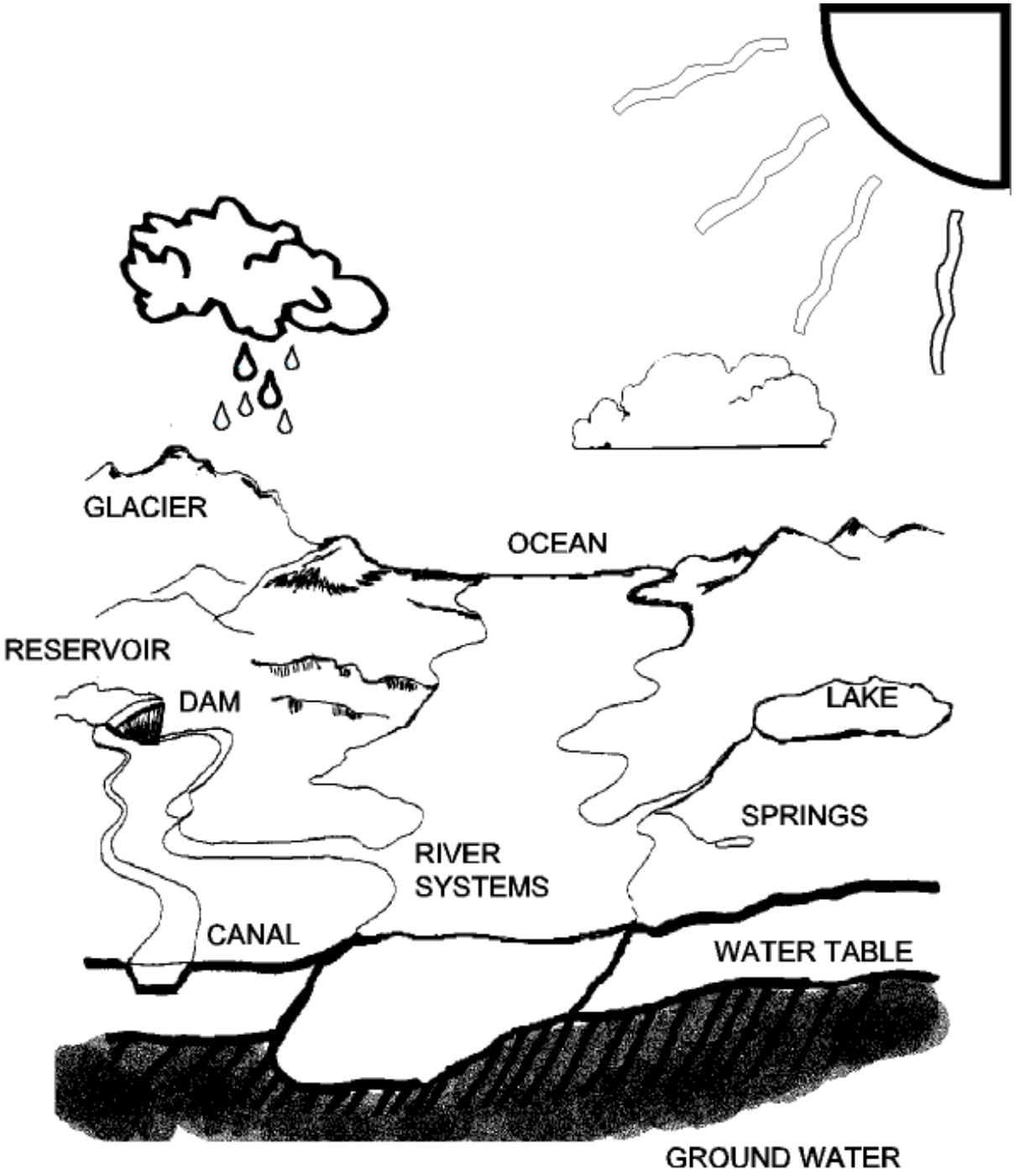
E. Clouds are formed by **condensation** of water vapor that evaporated from the land or oceans.



3. Hopefully this diagram should be familiar to students and they should be able to tell you about each of the components. Ask them which are human-made portions of the water cycle? (Reservoir, dams and canals.) Where does a spring get its water supply? (Usually from the ground water percolating up.) Where does water from the mountains wind up? (The oceans.) Which is the newest water? (Rain.) Oldest? (Oceans.)

WATER CYCLE - WATER (5) PRE

ILLUSTRATE THE WATER CYCLE BY USING AN ARROW TO SHOW THE DIRECTION OF THE MOVEMENT OF THE WATER. BE SURE TO LABEL BOTH EVAPORATION AND CONDENSATION.



WATER CYCLE - WATER (5)

LAB

Students experiment with liquids of different densities.

OBJECTIVES:

1. Discovering density.
2. Comparing the density of water to that of other liquids.

VOCABULARY:

clean up
density
oil
oil spill
water

MATERIALS:

plastic vials
ice water
hot water
salt water
food coloring
small dish
soap
cotton swabs
colored pencils or crayons
container
craft sticks

BACKGROUND:

Water is so common to students that they can't see its special properties, but water (without any additives) has characteristics that make it unique. It has a high boiling point, low freezing point, is tasteless, and odorless.

The density of a substance is the mass of that substance compared to the volume that the substance occupies. Density will vary depending upon the temperature. The density of water as a liquid is higher than that of water vapor. Other substances have other densities, in this lab we want the students to compare the different densities of certain liquids while comparing them to water. After the students complete the density portion of the lab, they can start thinking about the effects of oil pollution on water. Oil will float and cause a problem for organisms that live on the surface.

PROCEDURE:

1. This activity looks at the different densities of different liquids and how this information can be useful knowledge when cleaning an oil spill. Water is so common to students that they can't see its special properties, but water (without any additives) has characteristics that make it unique. It has a high boiling point, low freezing point, is tasteless, and odorless.

2. Write the chemical formula of water on the board and explain the components that make up water, namely, hydrogen and oxygen. Ask the students what the natural states of matter hydrogen and oxygen are usually found as (Gas). Make sure they know and understand the role of water in the water cycle.

3. The students should have a tub of water and they should pour oil on it representing an oil spill. Give them 3 substances: soap in a small vial, craft sticks, and an adsorptive substance like cotton swabs or crepe paper. Have the students design a way to capture the oil and clean up the spill.

4. Hopefully they learned that because oil is less dense than water it will float on the water. The oil can actually be "scraped" from the surface of the water and cleaned in that manner.

5. Discuss the effects of contamination and oil pollution on the environment, wildlife, and humans. After your discussion talk about some possible clean-up methods and how these methods might be useful.

WATER CYCLE - WATER (5)

PROBLEM: How can you remove oil from a spill that has occurred in water?

PREDICTION:_____

EXPERIMENT 1.

MATERIALS: plastic vials marked in fourths, ice water with yellow coloring, hot water with blue coloring, salt water with red coloring, oil

PROCEDURE:

1. Make a prediction of how you think the materials will layer. Draw a picture of your prediction in the space below.
2. Add each material to your vial in the order you predicted.
3. Add them slowly, one at a time.
4. Did it work? If not, try it again.
5. Make a drawing of the results and label the different layers, use colored pencils or crayons.

OBSERVATIONS:

PREDICTION	ACTUAL

EXPERIMENT 2.

MATERIALS AND PROCEDURE: Using a small dish of water, pour 1 tablespoon of oil onto it and try to figure out the best way to clean the oil spill. You have three items with which to clean it: soap, stick (non-absorptive), and paper, cotton swabs or some other absorptive material.

CONCLUSION: Which item cleaned the spill? (or could you clean it?)

_____

Describe how you were able to remove the oil.

_____

_____

WATER CYCLE - WATER (5)

POST LAB

Students learn about their local water supplier.

OBJECTIVES:

1. Investigating the importance of water.
2. Exploring how water is used in our society.

VOCABULARY:

conservation
drought
pollution
water supply

MATERIALS:

Internet
information from local water suppliers

BACKGROUND:

What has saved more lives than all the doctors and hospitals in history? The treatment of drinking water. If you're surprised, don't be. Waterborne disease is one of the world's most serious health threats, but is virtually eliminated by treating water.

The history of water treatment dates back to antiquity. Ancient Egyptian inscriptions describe water purification by boiling, exposure to sunlight, charcoal filtration, and settling in an earthen jar. In 400 B.C., Hippocrates, the Father of Medicine, suggested that water should be boiled and strained through a piece of cloth to remove particles. It wasn't until the early 20th century, however, that a method of purification was developed that virtually eliminated water borne diseases such as cholera and typhoid fever. We call it chlorination, and today it is the most widely used method for disinfecting water in the United States. It has been so successful that most of us take the safety and purity of our water for granted.

In the United States the following is a common way that water districts clean drinking water.

Ozonation - Ozone is the primary disinfectant of the water coming into the plant. Ozone-rich air is bubbled up through the water in a series of ozone contact chambers. In addition to being a highly effective disinfectant, the ozonation process also destroys compounds which cause unpleasant tastes and odors in the water.

Coagulation/Flocculation - After ozonation, the water moves on through a flash mixer where chemicals called coagulants are added. These coagulants react with particles in the water, causing them to clump together. The water then goes to the

flocculation basins, which use the hydraulic energy of the water for mixing to create "floc" particles which are large and heavy enough to settle to the bottom.

Sedimentation - The water then moves onto a double decked sedimentation basin where the heavier floc particles settle to the bottom, while the clearer water moves on to be filtered. A vacuum system removes the settled solids and deposits them in a solids holding basin.

Filter Press - The material removed in the sedimentation and filtration process contains a significant amount of water. In order to separate the water from the solids so that it can be recycled, the material is sent to a gravity thickener and then to a filter press where the remaining water is squeezed out. The compacted solids are then transported to a landfill for disposal.

Filtration - Following sedimentation, the clarified water is filtered through layers of anthracite coal and sand. The process removes any remaining particles that did not previously settle out, "polishing" the water to a high level of clarity. As the water leaves the plant, it receives a small dose of chlorine to keep it fresh and clean as it travels through the distribution system to customers. The pH of the water is adjusted for corrosion control and fluoride is added to benefit the community's dental health.

Students have learned the properties of water, but many still do not appreciate the value of water. Discuss the information with your students and have them become aware that in times of drought, we must conserve water in order to have water.

PROCEDURE:

1. Contact local water district, to see what information they may have for your class. You may want students to use the Internet to find out information on how water is managed throughout your state. Many cities have water departments that may give presentations on how they treat your water systems.

2. Once you get information you may want to chart the information. For example, in a state like California water is very important. Agriculture accounts for 87% of water use, domestic uses account for 8.5%, manufacturing accounts for 2%, and 2.5% is used for other purposes. You may want the students to make a pie chart using this information.

3. Ask students how much water does a leaky faucet waste. A leaky faucet causing a slow drip, wastes the following amount of water:

1/32 inch leak wastes 25 gallons in 24 hours
1/16 inch leak wastes 100 gallons in 24 hours
1/8 leak wastes 400 gallons in 24 hours
A 1/32 inch leak will waste in one year - 9,000 gallons of water!!

4. Ask students how much water is used in the following common activities. You may want to have them do a math exercise to add the amount of water used in a normal day by a household.

Shower = 25 gallons
Brushing teeth = 10 gallons
Bath tub = 36 gallons
Shaving = 20 gallons
Dishwashing = 30 gallons
Automatic dishwasher = 16 gallons
Washing hands = 2 gallons
Toilet flushing = 5 to 7 gallons
Washing machine = 60 gallons
Outdoor watering = 10 gallons per minute