



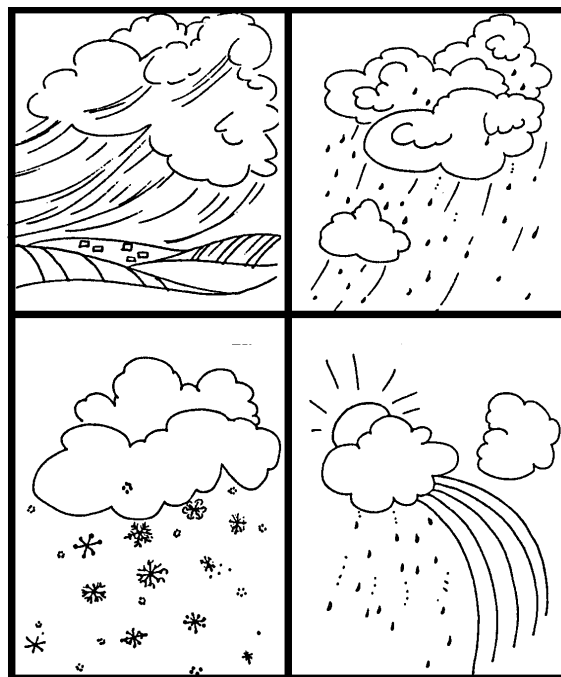
Water Cycle

The Earth's Gift



SECOND GRADE

ATMOSPHERE



1 WEEK
LESSON PLANS AND
ACTIVITIES

WATER CYCLE OVERVIEW OF SECOND GRADE

WATER

WEEK 1.

PRE: *Exploring the properties of water.*

LAB: *Experimenting with different soap mixtures.*

POST: *Analyzing the water cycle.*

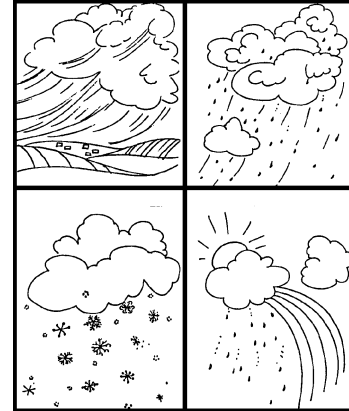
OCEANS

WEEK 2.

PRE: *Interpreting how water is recycled.*

LAB: *Distinguishing polluted, dirty, and clean water.*

POST: *Comparing solvents and solutes.*



ATMOSPHERE

WEEK 3.

PRE: *Distinguishing air.*

LAB: *Experimenting with air and water.*

POST: *Interpreting why water is important in the atmosphere.*

WEATHER

WEEK 4.

PRE: *Comparing climate and weather.*

LAB: *Exploring how topography influences climate.*

POST: *Discovering the four elements of weather.*

WATER CYCLE - ATMOSPHERE (2)

PRE LAB

Students demonstrate that air can move items.

OBJECTIVES:

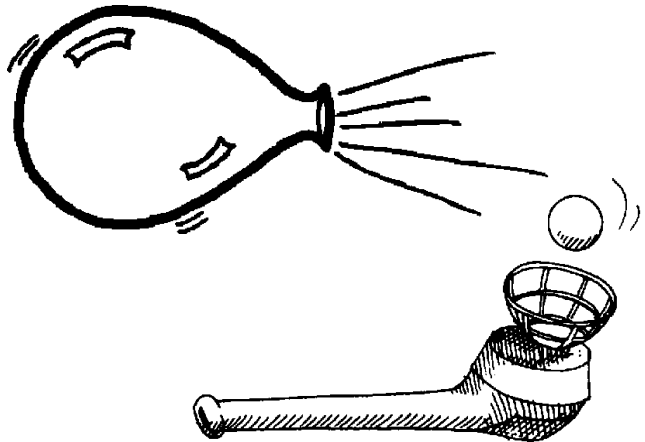
1. Distinguishing air.
2. Comparing the layers of the atmosphere.

VOCABULARY:

air
atmosphere

MATERIALS:

straws
glass of water
balloons
wave machine
Bernoulli pipe
Puddle Jumper
Tour of Bubbles
worksheet



BACKGROUND:

Air weighs over 5 quadrillion tons, but yet we can't see, smell, or feel it. Even so, air is a powerful force on Earth. Most organisms cannot live without air. Astronauts that go into space must take tanks of air with them. Divers that go under the ocean, must take air with them. If we climb a mountain that is too high, the air becomes less and less breathable. The downward force exerted by overlying air causes greater pressure at the bottom of atmosphere. Air molecules are actually "squeezed" by the weight of the air above.

The atmosphere is layered between the surface of the Earth and outer space. The layer we live on is called the troposphere. The air moves up and down, the winds blow, moisture builds up, and different types of weather are created. The layer above the troposphere is called the stratosphere which is 32 kilometers thick (20 miles). The upper part of the stratosphere contains a higher percentage of ozone. This layer of ozone is a form of oxygen that protects the surface of the Earth from the Sun's ultraviolet rays.

The next layer is called the mesosphere which is much colder than the stratosphere. The thermosphere is the next very thick layer which is divided into the ionosphere and exosphere. Radio waves from Earth hit the ionosphere and bounce back to Earth. This makes it possible for you to hear a radio station. Beyond the exosphere lies outer space.

Each of these layers acts as a unit because they have similar characteristics including chemical composition, temperature, and pressure.

PROCEDURE:

1. Give students worksheet and point out the information discussed in background. Show students the wave machine and illustrate how the clear liquid (kerosene) does not mix with the colored liquid (oil). This is similar to how the layers of the atmosphere interact.

2. If you want the students to prove that air is everywhere but is invisible, have a student put a straw into a glass of water and blow into it. They will see bubbles form, rise to the surface and pop. The student has caused air to move in the water.

Other demonstrations to show students:

a. Bernoulli's pipe - Blow in one side and the ball will be suspended if the ball is placed correctly over the stream of air. You can also be more dramatic by using a ping pong ball with a hair dryer blowing air underneath it. If placed in the correction position it will seem as the ball is suspended in air.

b. Tour of Bubbles - When you turn the long cylinder upside down, a small bubble will form slowly and rise, pushing the heavy liquid away from its path.

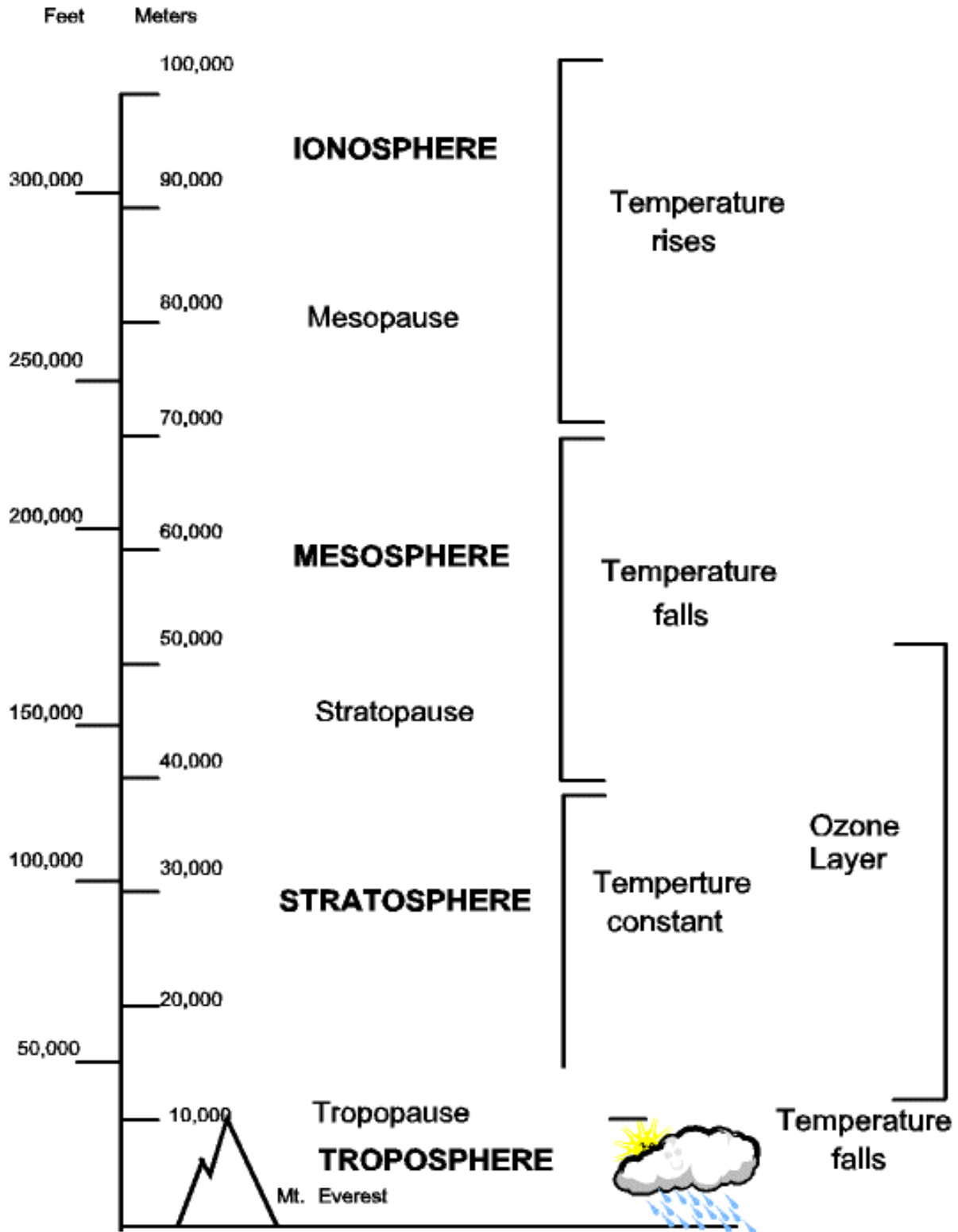
c. Puddle Jumper - When you twirl the base away from your body and let go, the design of the puddle jumper acts like a helicopter and uses the air to move.

d. You can also prove that air is all around by using a balloon and just blow into it. The balloon changes shape because of the air.

3. Use the worksheet for the students to color the different "spheres" of the atmosphere. The troposphere ends around 17,600 meters, the stratosphere ends around 48,000 meters, the mesosphere ends around 88,000 meters, and the ionsphere goes up to 200,000 meters. Notice that the exosphere does not fit into the scale of this diagram.

You may also tell students that flying through the troposphere can be "bumpy" if the weather is active. Modern jet airplanes avoid this problem by going into the stratosphere where the air is calm.

WATER CYCLE - ATMOSPHERE (2) PRE LAYERS OF THE ATMOSPHERE



WATER CYCLE - ATMOSPHERE (2)

LAB

Students simulate air pressure.

OBJECTIVES:

1. Exploring air pressure.
2. Discovering how air pressure works.

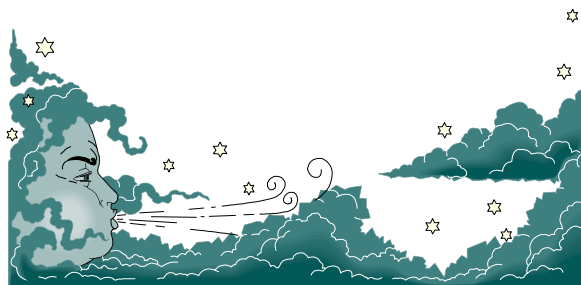
VOCABULARY:

air
air pressure

MATERIALS:

2 plastic glasses
straw
cardboard
paper
pan of water
1 paper towel
handboiler

Air is All Around Us by F. Branley (Harper Collins)



BACKGROUND:

Air pressure is difficult for children to understand because it is difficult to see and feel, unless someone makes them aware that it exists. The atmosphere has its own weight or air pressure. Air pressure is lower on the top of the mountains because there is less air to weigh down from above. Cold air is heavier than warm air, which is referred to as high air pressure. The warmer the air the lower the air pressure. Air with a high moisture content is heavier than without moisture.

Galileo Galilei was the first person to show air has weight and it was his student Evangelista Torricelli who invented the barometer. He noticed that the level of mercury changes in a glass tube open to air at the base.

PROCEDURE:

1. Show students the “handboiler.” When you hold the bottom of the handboiler you will notice that the liquid moves upward and looks like it is boiling. However, what is happening is that you are increasing air pressure in the vacuum. This causes the air to force the liquid (methyl alcohol) up the tube, the “boiling” is actually the rest of the air.

2. The air that is all around us can act as a force. The following experiments illustrate air pressure by doing several activities.

a. Since this experiment requires water, it is better to do experiments one at a time. Many of these activities should be done over the sink, over a bucket or tray, or do it outside. Tell students how long each exercise will take. On the students' lab sheets, the exercises are illustrated. Use the outline below to verbally review the instructions.

EXERCISE I

1. Fill a plastic glass 3/4 full of water.
2. Place a piece of cardboard enough to cover the top of the glass.
3. Hold the card tightly on top of the glass. Turn the glass upside down.

REASON: air pressure holds the cardboard to the glass.

EXERCISE II

1. Hold a small square piece of paper against one end of a straw.
2. Suck through the other end. Release the paper.

REASON: air pressure holds the paper against the straw

EXERCISE III

1. Take the same straw and hold your finger over one end.
2. Push the other end straight down into a glass of water.
3. Now put straw in without finger on top.
4. After the straw is submerged put finger on the top of straw and remove from glass.

REASON: air pressure prevents water from going into the straw and once water is in straw it prevents water from going out

EXERCISE IV

1. Using a large pan of water, put a glass with a paper towel inside the glass and turn glass upside down into the pan. The towel will not get wet.
2. Put one glass filled with water upside down, put another glass not filled with water next to the other glass. Move the glass full of air so that an edge is under the glass full of water, tipping it so that the air bubbles move up into the glass full of water. Air will transfer from one glass to the other.

3. You may want to refer to *Air is All Around Us* by F. Branley, if you would like more information.

WATER CYCLE - ATMOSPHERE (2)

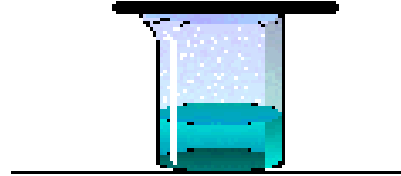
PROBLEM: Does air exert pressure?

PREDICTION: _____

EXERCISE 1.

MATERIALS: plastic clear glass, water, card

1. fill cup with water
2. put card on top
3. turn cup upside down quickly fill glass water



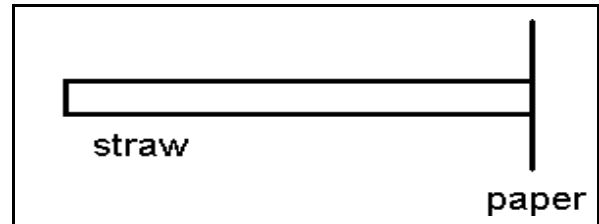
Describe what happens. _____

EXERCISE 2.

MATERIALS: piece of paper, straw

1. put paper against one end of straw
2. suck through the other end

Describe what happens?



EXERCISE 3.

MATERIALS: straw, plastic glass of water

1. take straw, put finger on one end
2. Push the other end into glass of water

Describe what happens? _____

3. put straw in without finger on top
4. put finger on top and remove straw

Draw what happens.

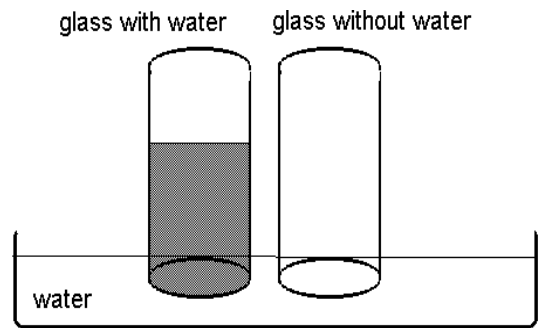
EXERCISE 4.

MATERIALS: plastic glass, paper towel, pan of water

1. put an upside down glass with a paper towel in a pan of water
2. put one glass filled with water upside down in water, put an empty glass next to the other
3. tip the empty glass next to the glass with water as in the diagram.

What happened after #2?

What happened after #3?



CONCLUSIONS: Give examples of how air exerts pressure.

WATER CYCLE - ATMOSPHERE (2)

POST LAB

Students make a paper model of thunder.

OBJECTIVES:

1. Exploring moisture in the atmosphere.
2. Interpreting why water is important in the atmosphere.

VOCABULARY:

gas
hygrometer
liquid
solid
sublimation



MATERIALS:

Flash, Crash, Rumble, and Roll by Franklyn M. Branley
hygrometer (to show)
paper

BACKGROUND:

There are five states of matter that are commonly recognized in the universe, solid, liquid, gas, plasma and Bose Einstein Condensate. However, on Earth only solid, liquid, and gas are common. Water is a substance that can easily move from one state of matter to another. The ability of water to change from a solid, liquid, and gas is important to move water through the atmosphere.

Water at normal Earth temperatures, is a liquid. When the temperature rises water evaporates into water vapor. Water vapor is part of our atmosphere. As water cools, water becomes a liquid again. If the water vapor freezes, it becomes solid in the form of snow or ice.

Water does not have to go from a solid, liquid to a gas. Water can vaporize directly from a solid and a gas can turn into a solid without going through the liquid phase. This is given the term sublimation. Another property of water which makes it an unique compound.

The movement of water in the atmosphere causes all types of weather. Without moisture in the atmosphere, our planet would be a desert.

Moisture in the air is measured by a hygrometer. In the 17th and 18th century there were many simple, but ingenious ways to measure how moist the air is. One English instrument from the 1700's consists of a pile of paper disks on one arm and a protractor

type device on the other. If the air is dry, the disks weigh less; if the air is humid they absorb water and weigh more, pulling the pointer up.

When the air is moist, water vapor begins to condensate into droplets. They usually require a surface on which to nucleate like dust, salt, or soot. The particles are called cloud condensation nuclei or CCN. There is about 5-6 million CCN in every liter of air.

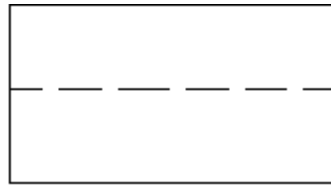
PROCEDURE:

1. Students should read *Flash, Crash, Rumble and Roll*, to get a feeling that there are specific steps that follow different weather patterns. In this book students see how dark clouds form and why there may be thunder or lightning associated with the clouds formation. This book also points out that the movement of moisture through the atmosphere can cause some very spectacular weather.

2. Thunder is the sound of air exploding. You may want to have students make a “banger” which creates a loud bang in the same way.

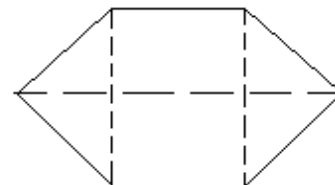
The directions to make a banger are:

a. Fold a 30 x 40 cm (or 12 x16 inch) paper in half.



a

b. Fold each of the corners.



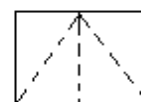
b

c. Fold “b” in half.



c

d. Bring two top corners down. Fold paper back on itself so two points face you. (End product should look like a triangle.)



d

Hold 2 corners together and flick your wrist. Loud bang occurs as air is compressed.

3. Use some of the pictures in the book and have the students decide at which point water is in its liquid, solid, or gas form. Emphasize that water can change into all three states very easily. Water is in the clouds (gas, solid), rain (liquid), ocean (liquid), air (water vapor, gas), lakes (liquid), snow (solid), and rivers (liquid).

4. If you have a hygrometer, show students how to read it and what it means.