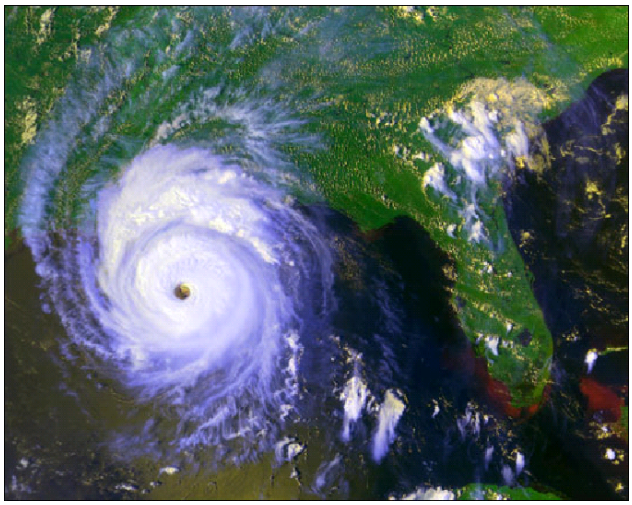
# MAST ACADEMY OUTREACH

## ELEMENTARY PROGRAM

# Adventures Aboard

# WOW
## (Weather on Wheels)

## Pre-Site Packet




***MAST Academy***

**Maritime and Science Technology High School**

**Miami-Dade County Public Schools**

**Miami, Florida**

**MAST ACADEMY OUTREACH**

**ELEMENTARY PROGRAM**

**WEATHER ON WHEELS PRE-SITE PACKET**

## Table of Contents

**M-DCPS Competency Based Curriculum**
**WEATHER ON WHEELS (WOW) GRADE 5**

**GOAL**
**To identify, analyze and evaluate South Florida weather phenomena.**

**DADE COUNTY COMPETENCY BASED CURRICULUM OBJECTIVES**

**SCIENCE:**

I-1 Construct an appropriate data table for organizing data. Make a table containing vertical columns for the manipulated variable. Subdivide the column for the dependent variable to reflect the number of trials.
I-2 Construct a graph with a curved line and describe the relationship before and after the curve changes direction.
1-3 Develop a specific problem statement that clearly defines the following conditions: variables that will be changed or manipulated and the measurable outcome(s) to be investigated.
III-1 Research ways in which the oceans influence weather and climate.
III-2 Explain the relationship between the weather and ocean currents.

**MATH:**

II-18 Determines sums, differences, products, and quotients of common fractions, mixed numbers, and decimals using manipulatives, diagrams, and whole language.
II-22 Solves real-world problems involving: addition, subtraction, multiplication, and division of whole numbers, decimals, fractions, and mixed numbers using an appropriate method.
II-1 Communicates measurement concepts using oral and written language.
II-6 Solves real-world problems involving measurement using concrete and prictorial models for temperature.
II-20 Uses a conversion table to solve real-world problems involving measurement.
IV-6 Applies the appropriate rule to complete a table or a chart.
V-2 Compares and interprets information from different types of graphs including graphs from content-area materials and periodicals.
V-6 Analyzes and explains orally and in writing the implications of graphed data.

**SOCIAL STUDIES:**

I-2 Apply basic map and globe skills such as determining directions, using scale, and interpreting a map legend.

I-3 Recognize that the United States, Canada, and Mexico are part of the North American continent.

V-5 Construct tables, charts, and graphs.

VI-3 Identify and describe current global issues; e.g., environmental concerns, peace, food, hunger, ethnic cleansing.

**LANGUAGE ARTS:**

5.1-2.8 Uses reference research components, pictures, graphs, charts, maps, and captions to compare and contrast information.

5.1-3.10 Uses reading strategies and critical thinking to understand information presented in a story or informational text.

5.11-7.15 Shares and discusses all individual writing with a group or partner.

5.11-8.3 Uses pictures, graphs, charts, maps, word walls, and personal word banks to explore the meaning of words.

5.IV-9.6 Listens and speaks respctfully to persons of all racial/ethnic backgrounds to gain and share information, ideas, values and points of view reflecting their cultures.

5.V-10.6 Follows oral and written directions for test-taking and to complete daily assignments.

## WEATHER INSTRUMENTS

**On Weather on Wheels, you will use a variety of weather instruments to collect data. Below is a description of each instrument and what it measures.**

***Read the descriptions, then complete the matching lesson that follows on the next page.***

A **sling psychrometer** measures relative humidity. It contains two thermometers; one is kept dry, while the other is kept wet by wrapping a wet piece of cloth around the bulb. Spinning the psychrometer evaporates moisture on the wet thermometer, resulting in a lower reading. By comparing the readings on both thermometers, the relative humidity can be calculated.

A **hygrometer** also measures relative humidity. It consists of a scale with a strand of fiber connected to a pointer. As the humidity decreases, the fiber tightens; increasing humidity loosens the fiber.


An **aneroid barometer** measures air pressure or barometric pressure. It consists of a small metal can with some of the air removed. Changes in air pressure will push in or push out the sides of the can; a lever mounted on the can, attached to a pointer, will measure these pressure changes. Air pressure will be measured in inches and millibars.

An **anemometer** measures wind speed. You will measure wind speed, in miles per hour, using a TurboMeter, a hand-held anemometer. You will also measure wind speed using the three-cup anemometer at our weather station.

A **wind vane** determines the direction the wind is blowing. The wind vane at our weather station is located above the three-cup anemometer.

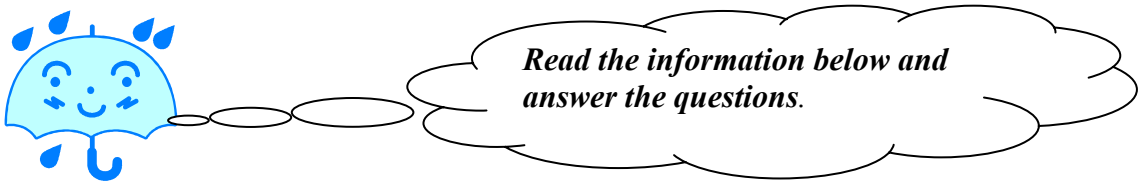
## WEATHER INSTRUMENTS

***In the space provided below, write the name of the weather instrument described in each statement. You can use each instrument more than once.***

hygrometer  aneroid barometer  wind vane
anemometer  sling psychrometer

1. This consists of a scale with a strand of fiber connected to a pointer. _____
2. This measures air pressure. _____
3. This consists of small cups that rotate. _____
4. This measures relative humidity using two thermometers. _____
5. This measures wind speed. _____
6. This measures barometric pressure. _____
7. This consists of a small metal can with some of the air removed. _____
8. This measures wind speed in mph. _____
9. This determines wind direction. _____
10. This has a wet and dry thermometer. _____
11. This has a fiber that tightens as humidity decreases. _____
12. This measures air pressure in millibars. _____
13. Spinning this instrument evaporates moisture on the wet thermometer. _____

# TEMPERATURE




**The Fahrenheit Scale**

In 1714, Gabriel Fahrenheit, a Dutch Physicist, created a standardized temperature scale by placing four fixed points of reference on a thermometer. He found his first fixed point by placing a mercury thermometer in a mixture of ice water and salt. He called this temperature reading zero degrees.

For his second fixed point, Fahrenheit decided to call the temperature of the healthy human body $96^0$. Later on, more accurate thermometers measured the average temperature of the human body to be higher.

The Fahrenheit scale is still used in the United States.

1. What is the actual temperature of the average healthy human body? _____

   Fahrenheit established his third fixed point by marking one-degree lines of equal distance from 0 to 96. He ran experiments to find where the liquid in a thermometer was when ice begins to melt.

2. Based on his experiment with fixed points at zero and $96^0$ , what did he find the melting point of ice to be? _____

   Fahrenheit fixed a fourth point on his thermometer to mark the boiling point of water.

3. What is the boiling point of water on Fahrenheit's scale? _____

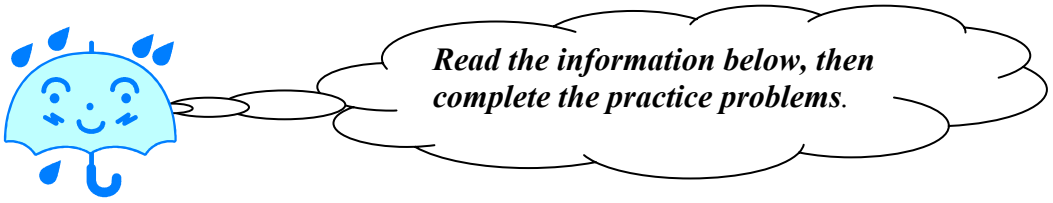
**The Celsius (Centigrade Scale)**

Anders Celsius, a Swedish Astronomer, simplified the Fahrenheit scale in 1742. He reasoned that only the melting point of ice and the boiling point of water should act as fixed points on a thermometer. He chose these as fixed points because at sea level, the melting point of ice and the boiling point of pure water are always the same. He called the melting point of ice $0^0$, and the boiling point of pure water $100^0$.

4. How many equal units is the Celsius scale divided into?_____

Celsius originally called his scale the Centigrade scale. The name was changed tot he Celsius scale in his honor in 1954. The Celsius scale is used in most countries around the world, as well as in the scientific community.

## RELATIVE HUMIDITY




**Humidity** refers to the amount of moisture in the air. Warmer air can hold more moisture than colder air. By comparing how much water vapor is in the air to how much water vapor the air can hold, we get a percentage called the **relative humidity**. When the relative humidity reaches 100%, we say the air is **saturated** or has reached the **dewpoint**. At this point if the temperature cools even more, or if more water evaporates and tries to escape into the air as a gas, the moisture that the air cannot hold is forced out as drops of water. These could be in the form of dew, frost, fog, or clouds, depending on where and when the change is taking place.

On Weather on Wheels, you will measure relative humidity using two instruments; a **hygrometer** and a **sling psychrometer**. Reading the hygrometer is easy; simply look at where the black arrow is pointing. Reading the sling psychrometer is a little more involved. You will have to spin thepsychrometer for about one minute, then read the temperature (in Celsius) on both the **wet bulb** and **dry bulb** thermometers. You will then have to calculate the relative humidity using a **relative humidity conversion chart**.

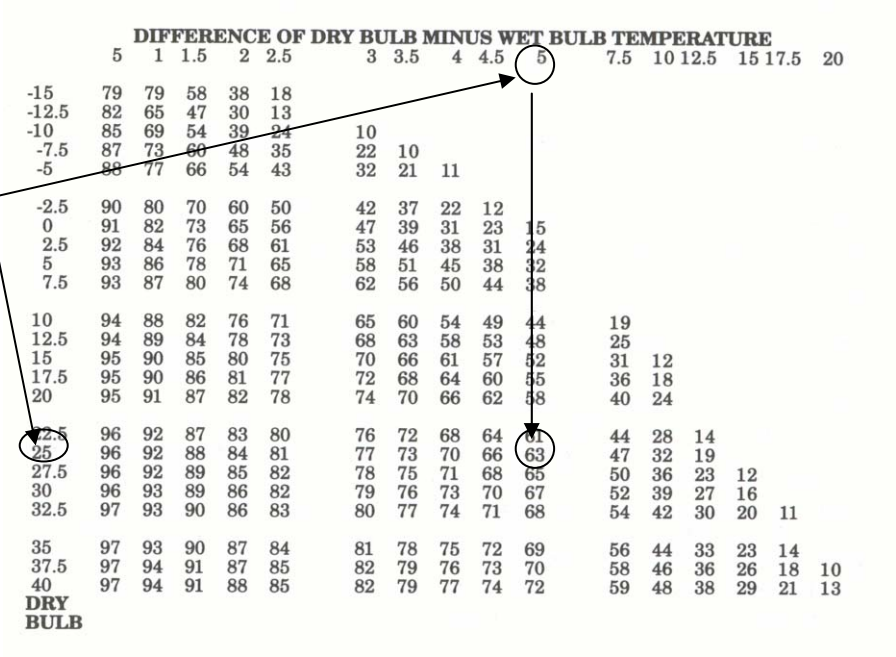
On the right is a typical relative humidity conversion chart (using Celsius.) The **dry bulb** temperatures are shown in the first column (on the left), while the **difference of dry bulb minus wet bulb temperature** is shown in the first row (on top.)

**DIFFERENCE OF DRY BULB MINUS WET BULB TEMPERATURE**

| DRY BULB | 5 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 7.5 | 10 | 12.5 | 15 | 17.5 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -15 | 79 | 79 | 58 | 38 | 18 | | | | | | | | | | | |
| -12.5 | 82 | 65 | 47 | 30 | 13 | | | | | | | | | | | |
| -10 | 85 | 69 | 54 | 39 | 24 | 10 | | | | | | | | | | |
| -7.5 | 87 | 73 | 60 | 48 | 35 | 22 | 10 | | | | | | | | | |
| -5 | 88 | 77 | 66 | 54 | 43 | 32 | 21 | 11 | | | | | | | | |
| -2.5 | 90 | 80 | 70 | 60 | 50 | 42 | 37 | 22 | 12 | | | | | | | |
| 0 | 91 | 82 | 73 | 65 | 56 | 47 | 39 | 31 | 23 | 15 | | | | | | |
| 2.5 | 92 | 84 | 76 | 68 | 61 | 53 | 46 | 38 | 31 | 24 | | | | | | |
| 5 | 93 | 86 | 78 | 71 | 65 | 58 | 51 | 45 | 38 | 32 | | | | | | |
| 7.5 | 93 | 87 | 80 | 74 | 68 | 62 | 56 | 50 | 44 | 38 | | | | | | |
| 10 | 94 | 88 | 82 | 76 | 71 | 65 | 60 | 54 | 49 | 44 | 19 | | | | | |
| 12.5 | 94 | 89 | 84 | 78 | 73 | 68 | 63 | 58 | 53 | 48 | 25 | | | | | |
| 15 | 95 | 90 | 85 | 80 | 75 | 70 | 66 | 61 | 57 | 52 | 31 | 12 | | | | |
| 17.5 | 95 | 90 | 86 | 81 | 77 | 72 | 68 | 64 | 60 | 55 | 36 | 18 | | | | |
| 20 | 95 | 91 | 87 | 82 | 78 | 74 | 70 | 66 | 62 | 58 | 40 | 24 | | | | |
| 22.5 | 96 | 92 | 87 | 83 | 80 | 76 | 72 | 68 | 64 | 61 | 44 | 28 | 14 | | | |
| 25 | 96 | 92 | 88 | 84 | 81 | 77 | 73 | 70 | 66 | 63 | 47 | 32 | 19 | | | |
| 27.5 | 96 | 92 | 89 | 85 | 82 | 78 | 75 | 71 | 68 | 65 | 50 | 36 | 23 | 12 | | |
| 30 | 96 | 93 | 89 | 86 | 82 | 79 | 76 | 73 | 70 | 67 | 52 | 39 | 27 | 16 | | |
| 32.5 | 97 | 93 | 90 | 86 | 83 | 80 | 77 | 74 | 71 | 68 | 54 | 42 | 30 | 20 | 11 | |
| 35 | 97 | 93 | 90 | 87 | 84 | 81 | 78 | 75 | 72 | 69 | 56 | 44 | 33 | 23 | 14 | |
| 37.5 | 97 | 94 | 91 | 87 | 85 | 82 | 79 | 76 | 73 | 70 | 58 | 46 | 36 | 26 | 18 | 10 |
| 40 | 97 | 94 | 91 | 88 | 85 | 82 | 79 | 77 | 74 | 72 | 59 | 48 | 38 | 29 | 21 | 13 |

Lets say that after spinning the sling psychrometer for one minute, you obtain a wet bulb temperature of 20° C, and a dry bulb temperature of 25° C. To calculate the relative humidity from the wet and dry bulb thermometer readings:

- Find $25^0$ C in the dry bulb column.
- Find the difference of dry bulb minus wet bulb temperature (25° C minus $20^0$ C = 5° C) in the top row.
- Read down this column until you reach the row of the dry bulb temperature ($25^0$ C.) The number where this column and the dry bulb temperature row meet is the relative humidity. In this example, the relative humidity is 63%.



**DIFFERENCE OF DRY BULB MINUS WET BULB TEMPERATURE**

| DRY BULB | 5 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 7.5 | 10 | 12.5 | 15 | 17.5 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -15 | 79 | 79 | 58 | 38 | 18 | | | | | | | | | | | |
| -12.5 | 82 | 65 | 47 | 30 | 13 | | | | | | | | | | | |
| -10 | 85 | 69 | 54 | 39 | 24 | 10 | | | | | | | | | | |
| -7.5 | 87 | 73 | 60 | 48 | 35 | 22 | 10 | | | | | | | | | |
| -5 | 88 | 77 | 66 | 54 | 43 | 32 | 21 | 11 | | | | | | | | |
| -2.5 | 90 | 80 | 70 | 60 | 50 | 42 | 37 | 22 | 12 | | | | | | | |
| 0 | 91 | 82 | 73 | 65 | 56 | 47 | 39 | 31 | 23 | 15 | | | | | | |
| 2.5 | 92 | 84 | 76 | 68 | 61 | 53 | 46 | 38 | 31 | 24 | | | | | | |
| 5 | 93 | 86 | 78 | 71 | 65 | 58 | 51 | 45 | 38 | 32 | | | | | | |
| 7.5 | 93 | 87 | 80 | 74 | 68 | 62 | 56 | 50 | 44 | 38 | | | | | | |
| 10 | 94 | 88 | 82 | 76 | 71 | 65 | 60 | 54 | 49 | 44 | 19 | | | | | |
| 12.5 | 94 | 89 | 84 | 78 | 73 | 68 | 63 | 58 | 53 | 48 | 25 | | | | | |
| 15 | 95 | 90 | 85 | 80 | 75 | 70 | 66 | 61 | 57 | 52 | 31 | 12 | | | | |
| 17.5 | 95 | 90 | 86 | 81 | 77 | 72 | 68 | 64 | 60 | 55 | 36 | 18 | | | | |
| 20 | 95 | 91 | 87 | 82 | 78 | 74 | 70 | 66 | 62 | 58 | 40 | 24 | | | | |
| 22.5 | 96 | 92 | 87 | 83 | 80 | 76 | 72 | 68 | 64 | 61 | 44 | 28 | 14 | | | |
| 25 | 96 | 92 | 88 | 84 | 81 | 77 | 73 | 70 | 66 | 63 | 47 | 32 | 19 | | | |
| 27.5 | 96 | 92 | 89 | 85 | 82 | 78 | 75 | 71 | 68 | 65 | 50 | 36 | 23 | 12 | | |
| 30 | 96 | 93 | 89 | 86 | 82 | 79 | 76 | 73 | 70 | 67 | 52 | 39 | 27 | 16 | | |
| 32.5 | 97 | 93 | 90 | 86 | 83 | 80 | 77 | 74 | 71 | 68 | 54 | 42 | 30 | 20 | 11 | |
| 35 | 97 | 93 | 90 | 87 | 84 | 81 | 78 | 75 | 72 | 69 | 56 | 44 | 33 | 23 | 14 | |
| 37.5 | 97 | 94 | 91 | 87 | 85 | 82 | 79 | 76 | 73 | 70 | 58 | 46 | 36 | 26 | 18 | 10 |
| 40 | 97 | 94 | 91 | 88 | 85 | 82 | 79 | 77 | 74 | 72 | 59 | 48 | 38 | 29 | 21 | 13 |

**PRACTICE:** Use the relative humidity conversion chart to solve the following problems.

| | Dry Bulb Temperature | Wet Bulb Temperature | Relative Humidity |
|---|---|---|---|
| 1. | $25^0$ C | $22.5^0$ C | _____ % |
| 2. | $30^0$ C | $27^0$ C | _____ % |
| 3. | $27.5^0$ C | $23^0$ C | _____ % |
| 4. | 32. $5^0$ C | $25^0$ C | _____ % |

## CLOUD MODELS

***Using the cloud chart on the next page as a guide, make a model of cloud types by gluing different kinds of cotton on a piece of blue construction paper. Label each cloud type. Below are hints to help you get started.***

- To make cumulus clouds, puff up a ball of cotton and paste it on the paper.
- For stratus clouds, cut off a piece of sheet cotton, pull the layers apart, and glue each layer on the diagram.
- For cirrus clouds, pull a cotton ball or some sheet cotton into thin, wispy strands. Glue the strands onto the paper.
- Use a black marker to turn some clouds into nimbus clouds; it will look like a thunderstorm is brewing.

***Use the cloud models as a reference to identify the types of clouds in the sky today. Answer the following***

1. Which clouds are the highest? _____
2. Which clouds are the lowest? _____
3. Which clouds are the largest? _____
4. What are middle altitude clouds called? _____
5. Which clouds are made of ice crystals? _____
6. Why are they icy? _____

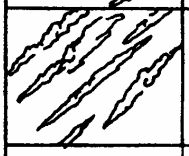
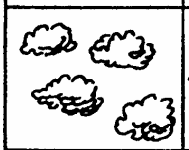
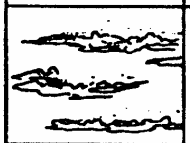
7. Both cumulonimbus and nimbostratus clouds bring rain. What do you think the root word *nimbus* means? _____

8. Altocumulus and altostratus are higher in the sky than cumulus or stratus clouds. What do you think the prefix *alto* means? _____

9. What is the difference between cumulus and altocumulus clouds? _____

10. How are cirrocumulus and cirrostratus clouds the same? _____

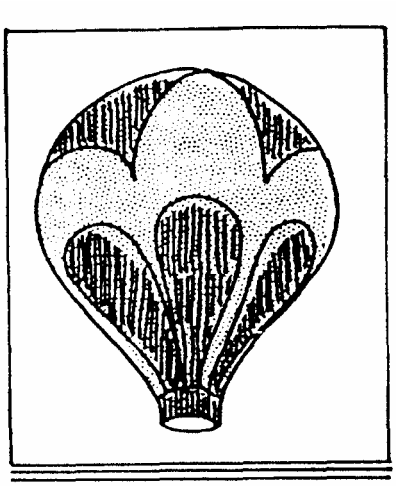
## Cloud Chart

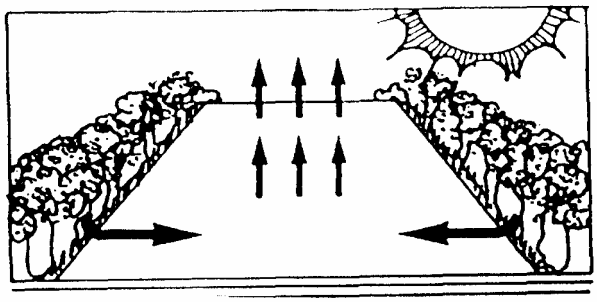
| Shape | Name | Altitude | Description |
|---|---|---|---|
|  | Cirrus | Above 20,000 FT | Thin, wispy, made of ice crystals. On bright night, moon can be seen. |
|  | Cirrocumulus | Above 20,000 FT | Thin, white puffs of ice crystals. Form ripples in high sky. |
|  | Cirrostratus | Above 20,000 FT | Thin sheet of white ice crystals. Makes sky look milky. |
|  | Altocumulus | 20,000 FT– 6,000 FT | Small, puffy globules ranging from white to gray in color. |
|  | Altostratus | 20,000 FT– 6,000 FT | Thin, layered veil. Sun seen as bright spot. |
|  | Stratus | Below 6,000 FT | Low, uniform, gray layers. Usually form drizzle. |
|  | Cumulus | Below 6,000 FT | Dense, white, and billowy with flat base, single or closely packed. |
|  | Cumulonimbus | Very Low | Large, towering, dark gray, usually form thunderstorm or heavy rain. |
|  | Nimbostratus | Very Low | Densely layered, dark gray. Usually form overcast sky or dense, steady rain. |

## HOW WINDS START

***Read the following passages and answer the questions on the next page.***

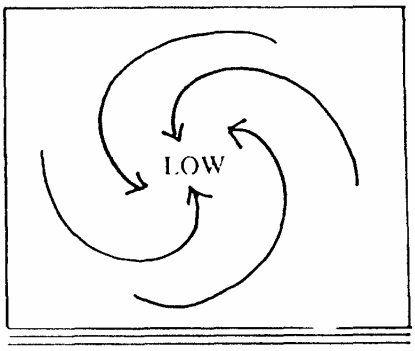
Hot air balloons rise because air expands and gets lighter when it is heated. Colder, heavier air around it pushes the warm air up (and the balloon with it.) Air over a fire in a fireplace gets hotter than the air in the room, so it expands and gets lighter. The air gets pushed up the chimney, carrying smoke with it. When sunshine heats the ground, the air touching the ground gets hotter, so it expands and gets lighter and rises. Scientists call these places where air is rising LOW PRESSURE AREAS, or LOWS. They call the places where air is sinking HIGH PRESSURE AREAS, or HIGHS.





If a small area like a field is heated, air from cooler places nearby will move in to fill the space left by the warm air as it rises. If a large area like a desert is heated, the rising air may bring in a dust storm. When this happens over a warm ocean, a hurricane may start.

Wind doesn't blow in straight lines. When air blows from a HIGH towards a LOW, it always curves. North of the equator it curves counterclockwise around the LOW. South of the equator it curves clockwise. This is because the earth is spinning. The man who first described the way the earth's spin forces the wind to curve was named CORIOLIS, so this force is called the CORIOLIS FORCE.



## HOW WINDS START

1. It is hotter near the ceiling than near the floor in most rooms. This is because
   a. people walking around stir up the air near the floor making breezes near the floor.
   b. Windows don't go clear to the ceiling.
   c. Warmer air is lighter than cooler air, so it rises.

2. On a sunny day at the beach, the sand is hotter than the water, so a breeze will blow
   a. from the beach to the water.
   b. from the water to the beach.
   c. along the shore.

3. You can tell from the article that
   a. riding in hot air balloons is fun.
   b. the direction the earth turns affects which way the wind blows.
   c. smoke rises because it is lighter than air.

**Understanding the Coriolis Effect**

You will need a globe and a piece of chalk or a washable marker.

Pick up the chalk and hold it directly on the center of the North Pole. Another student is to hold the globe still.

Looking down from the North Pole, begin to draw a straight line through the Northern Hemisphere to the equator.

Now, put the chalk up on the North Pole again.

This time ask your partner to slowly turn the globe in a clockwise direction while you are drawing the line.

4. Are you able to draw a straight line as the globe was turned? _____

5. In what direction did the line curve as the globe turned? _____

6. Because of the earth's rotation, all objects in motion, including the wind, curve to the **right or left** (circle the correct answer) in the Northern Hemisphere and the **right or left** (circle the correct answer) in the Southern Hemisphere.

## THE NOAA WEATHER RADIO

*Read the information and answer the questions that follow.*

NOAA Weather Radio is a service of the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce. It provides continuous broadcasts of the latest weather information directly from National Weather Service offices. Taped weather messages are repeated every four to six minutes and are routinely revised every one to three hours, or more frequently if needed. Most of the stations operate 24 hours daily.

The broadcasts are tailored to weather information needs of people within the receiving area. For example, stations along the coasts provide weather information for boaters, anglers, and others engaged in marine activities, as well as general weather information.

During severe weather, National Weather Service forecasters interrupt the routine weather broadcasts and substitute special warning messages. The forecasters also activate specially designed warning receivers. Such receivers sound an alarm indicating that an emergency exists, alerting the listener to turn the receiver up to a higher volume; or they are automatically turned on so that the warning message is heard.

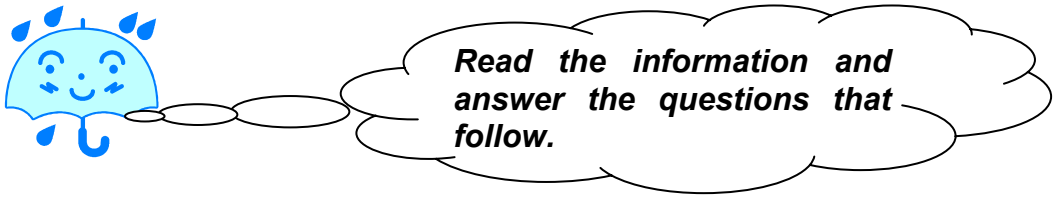
NOAA Weather Radio broadcasts are made on one of three high-band FM frequencies. These frequencies are not found on the average home radio. However, a number of radio manufacturers offer special weather radios to operate on these frequencies. Also, there are now many radios on the market which offer standard AM/FM frequencies plus the so-called “weather band” as an added feature.

**Answer the following questions.**

1. What do the letters NOAA stand for? _____
2. Where does the weather information you hear on a NOAA weather radio come from? _____
3. How often are NOAA weather messages repeated? _____
4. How often are NOAA weather messages revised? _____
5. How many hours a day can you listen to a NOAA weather broadcasts? _____

6. If you were a boater living along the coast, what type of information do you think you can hear about on a NOAA broadcast? _____
7. Do all radios have the frequencies to receive NOAA weather broadcasts? _____

## WHEN LIGHTNING STRIKES




Each day lightning strikes somewhere. Right now about two thousand thunderstorms are occurring around the world, and many have severe lightning. We cannot stop the lightning. But, we can understand it so that we can protect ourselves. Let's see what lightning is all about!

Nobody knew what lightning was until about 1752. That's when Ben Franklin flew a kite during a thunderstorm and discovered that lightning is electricity. It is a sudden release of electric charges that have been stored in the clouds. Stored up electricity is called static electricity. But, don't ever fly a kite during a thunderstorm as Ben did. It's extremely dangerous. Today we marvel that Ben wasn't killed when he did it!

During a thunderstorm, clouds become loaded with electric charges. When there are too many, the electricity flows to the earth, or to another cloud, making a flash of lightning. The charge may reach one hundred million volts. There are different kinds of lightning. Sheet lightning covers a wide area and may occur between clouds or inside a cloud. Forked lightning has two or more streaks and usually goes from cloud to cloud or from cloud to ground. Streak lightning is the kind we usually see. It occurs between clouds or between a cloud and the ground. Heat lightning is streak lightning that is far enough away so we hear no thunder and cannot actually see the streak.

A lightning flash may be two or three hundred feet long; sometimes it's much longer, as much as five or more miles. The flash looks quite wide. But most of what you see is glowing air. The flash itself may be only as wide as a pencil. It's very hot. Sometimes the temperature reaches 30,000$^0$C - that's five times hotter than the sun.

When Weather on Wheels comes to your school, you will learn how to protect yourself from being struck by lightning. Below are some things you can do in class and at home to help you understand static electricity and lightning.

### Things You Can with Static Electricity

1. Comb your hair when it is dry. Do you hear anything? _____
   What happens to your hair? _____

2. Blow up a balloon. Rub it on your sleeve, then hold it to a wall. What happens?

3. Turn on the water so it just barely flows in a steady stream. Rub a comb on your sleeve. Then hold the comb near the stream of water. What happens?

4. Rub a comb with silk then plunge it into a bowl of dry puffed rice cereal. What happens?


After lightning, you may hear thunder. The lightning pushes the air from its path. It makes the air expand quickly. That's what makes the noise.

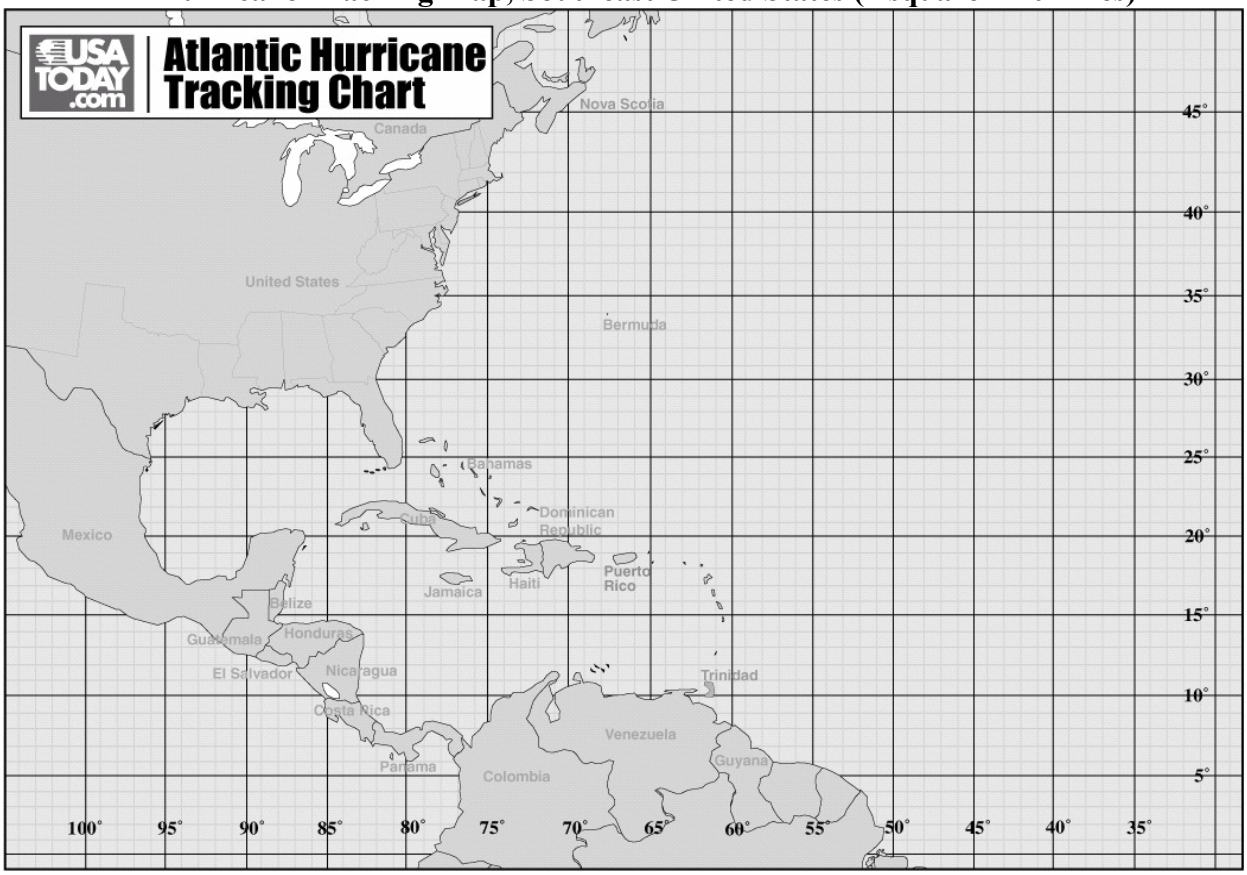
5. Blow into a small paper bag until it is full of air and tie it at the top so the air does not escape. With both hands, quickly push hard on the bag. What do you hear?

## TRACKING A HURRICANE

You are a meteorologist studying the effects of Hurricane Jeanne. The latitude and longitude coordinates from Sept. 19 – 27, 2004 are listed in the table below the map. Your first task is to determine the exact path of the storm by placing an X on the map for each pair of coordinates.

***Place an X for each pair of coordinates taken at 9:00p.m. on each day. Then answer the questions on the following page.***

**Hurricane Tracking Map, Southeast United States (1 square = 70 miles)**



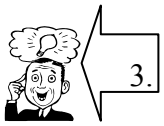

| Date | Latitude | Longitude |
|---|---|---|
| Sept. 19 | 23 | 72 |
| Sept. 20 | 26 | 71 |
| Sept. 21 | 27 | 69 |
| Sept. 22 | 27 | 67 |
| Sept. 23 | 25 | 70 |
| Sept. 24 | 26 | 72 |
| Sept. 25 | 26 | 76 |
| Sept. 26 | 27 | 81 |
| Sept. 27 | 30 | 83 |

## TRACKING A HURRICANE

**Questions:**

1. In what direction did Hurricane Jeanne travel from Sept. 19 to Sept. 20? _____

2. Approximately how many miles did the hurricane travel between Sept. 19 and Sept. 20?_____
(Hint: Look above the map. One square is equal to how many miles?)



3. How did you get your answer? _____

_____

4. From Sept. 20 to Sept. 24, describe the path of Hurricane Jeanne?_____

_____

5. What does this tell you about the path of a hurricane?_____

_____

6. In what direction was Hurricane Jeanne moving from Sept. 25 to Sept. 26?_____

7. On what date did Hurricane Jeanne make landfall? _____

8. Pretend you are in charge of issuing hurricane warnings. Remember, you must issue a warning at least 12 hours before the hurricane hits so that people have time to evacuate the area. On what day would you have issued a warning for the east coast of Florida? _____

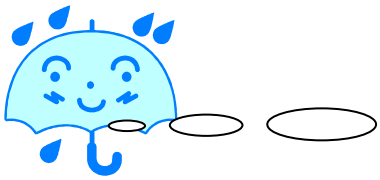
_____

9. On what date would you have issued hurricane warnings for northern Florida.? _____

10. Why would you have issued hurricane warnings for northern Florida on that date? _____

_____

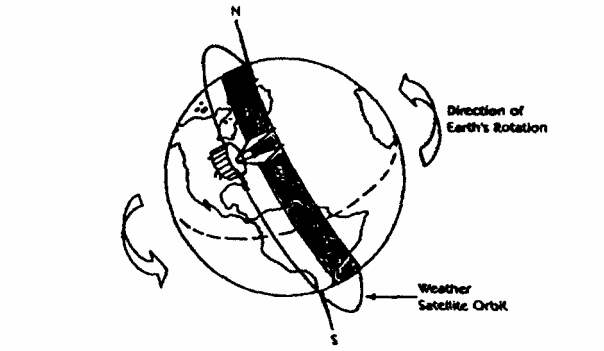
## WEATHER SATELLITES



***Read the information and answer the questions of the following page.***

The National Aeronautics and Space Administration (NASA). launched TIROS (television Infrared observational Satellite), our nation's first series of weather satellites on April 1, 1980. Attached to the bottom of each TIROS satellite were two tiny cameras, one wide-angle and one narrow-angle that recorded images of Earth's cloud cover as our planet rotated on its axis. Because the satellites had to keep spinning in order to maintain their orientation, the cameras aboard TIROS photographed different strips of cloud cover with each turn of the satellite. Through the images these satellites sent back to Earth, meteorologists could monitor cloud patterns over large portions of Earth for the first time. The first TIROS cameras, however, could record only the dayside of Earth. Night photographs were impossible. Later, newer types of satellites, TIROS 9 and 10, were placed in polar orbits that were sun-synchronous.

**Weather Satellite in Polar Orbit**



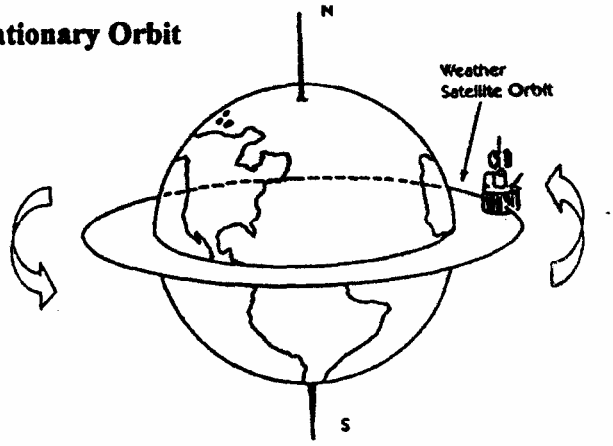

It was not until 1964, when NASA launched NIMBUS, that recording at night became possible. NIMBUS could remain stable without having to spin, so its sensors could face Earth constantly. In addition, NIMBUS carried infrared radiometers capable of taking the first night images of clouds. The NIMBUS satellites also carried test models of space-borne instruments that would eventually lead to our current weather satellites, which can scan all of Earth 24 hours a day.

The TOS (TIROS Operational System) series was launched by NASA in 1966. These improved satellites gathered even more sophisticated kinds of weather information that the earlier satellites. Four years later in 1970, the ITOS (Improved TIROS Operational System) series of weather satellites was launched. ITOS carried a scanning radiometer enabling the satellite to take images of Earth from space around-the-clock.

The newest generation of weather satellites is the GOES (Geostationary Operational Environmental Satellite) series. GOES satellites are positioned above the equator, where they travel at a speed matching Earth's rotation. Therefore, the satellite can see one side of Earth at all times.

In 1970, the operation of weather satellites was transferred to NOAA (National Oceanic and Atmospheric Administration.) NASA stills contributes to research and development of satellites. NOAA manages the processing and distribution of the millions of bits of data and images that the weather satellites produce daily. Most of the weather photographs on television originate on the GOES satellites. We see them after computers have enhanced the data, usually making the clouds appear white and superimposing the clouds on a map with lines dividing states or regions.

**Weather Satellite in Geostationary Orbit**




**Questions:**

1. Compare the diagrams of the polar orbit and the geostationary orbit. How are they different?

   _____

   _____

2. Look up the words geostationary and synchronous in a dictionary. Define the terms.

   geostationary - _____

   synchronous - _____

3. How does a sun-synchronous satellite differ from a geostationary satellite?

   _____

   _____

## SUGGESTED WEATHER ACTIVITIES

You and your class are not limited to the lessons in this package. Below are some other easy-to-do lessons that you can do with your students.

1. **Sky Collage** – Have students cut out magazine pictures that use the sky as a dominant visual. Make individual collages or a collage mural.

2. **Sky Painting** – Take easels outside one day and have students paint like the masters!

3. **Sky Question Chart** – The students will begin to ask questions about the sky. When they do, record the questions on a sky question chart. Each day post your own question for the students to answer.

4. **Sky Checks** – Allow time for sky observations daily. Take 5 minutes to go outside or look out the window. Have students verbally express what they see. Have students write their observations in a sky journal.

5. **Cloud Shapes** – Encourage students to see familiar shapes in the sky such as animals, giants, mountains, ice cream sundaes, etc. Have students draw what they see or write a poem.

6. **Sky Flags** – Students can make their own flags by drawing pictures of the sky for the kind of day – sunny flag, cloud flag, rain flag, etc. Display these in the classroom each day.

7. **Sky T-Shirts** – Students can desigh their own sky t-shirts.

*8.* **How can you tell which way the wind is blowing?** Have students observe the flag on the flagpole, smoke rising, leaves blowing, etc. Take students outdoors when the wind is blowing. To establish wind direction, stick a wet finger in the air. The side of the finger that feels the coolest is the direction the wind is coming from. This will lead to a discussion of naming that direction. Remember, wind direction is always designated as the direction the wind is coming *from.*

9. **Each day check the weather page of the local newspaper** to see predictions for the next day. See if they are accurate. **Have students listen to the evening forecast.** Keep track of the accuracy of these reports.

10. **Beaufort Wind Scale (see next page) –** Place this scale on a bulletin board. Have students estimate wind speed by the clues given on the scale.

## BEAUFORT WIND SCALE

| Beaufort Number | Wind Description | Speed Mph | Criteria |
|---|---|---|---|
| 0 | Calm | 0 | smoke rises vertically |
| 1 | Light air | 1-3 | direction shown by smoke drift, but not by wind vanes |
| 2 | Slight breeze | 4-7 | wind felt on face; leaves rustle; wind vane moved by wind |
| 3 | Gentle breeze | 8-12 | leaves and small twigs in constant motion; wind extends light flag |
| 4 | Moderate breeze | 13-18 | raises dust and loose paper; small branches are moved |
| 5 | Fresh breeze | 19-24 | small trees with leaves begin to sway |
| 6 | Strong breeze | 25-31 | large branches in motion; whistling heard in utility wires |
| 7 | moderate gale | 32-38 | whole trees in motion; inconvenience felt in walking against wind |
| 8 | fresh gale | 39-46 | break twigs off trees; generally impedes progress |
| 9 | strong gale | 47-54 | slight structural damage occurs; roof shingles blown free |
| 10 | Whole gale | 55-63 | trees uprooted; considerable structural damage occurs |
| 11 | Storm | 64-75 | widespread damage; very rarely experienced |
| 12 | hurricane | 75+ | extreme destruction |

## ANSWER KEYS (100 Total Points)

**Weather Instruments (13 points total)**

1. Hygrometer
2. aneroid barometer
3. anemometer
4. sling psychrometer
5. anemometer
6. aneroid barometer
7. aneroid barometer
8. anemometer
9. wind vane
10. sling psychrometer
11. hygrometer
12. aneroid barometer
13. sling psychrometer

**Temperature (8 total points)**

1. $98.6^0$F
1. $32^0$F
2. $212^0$F
3. 100

**Relative Humidity (4 total points)**

1. 81%
2. 79%
3. 68%
4. 54%
5.

**Cloud Models (10 total points)**

1. cirrus
2. nimbostratus
3. cumulus
4. altostratus and/or altocumulus
5. cirrus, cirrocumulus and cirrostratus
6. These clouds are icy because they are so high in the sky where it is very cold.
7. rain
8. high
9. Altocumulus clouds are higher and smaller.
10. They are both the same height or they are both made of ice crystals.

**How Winds Start (12 total points)**

1. C
2. B
3. B
4. no
5. to the right
6. right, left

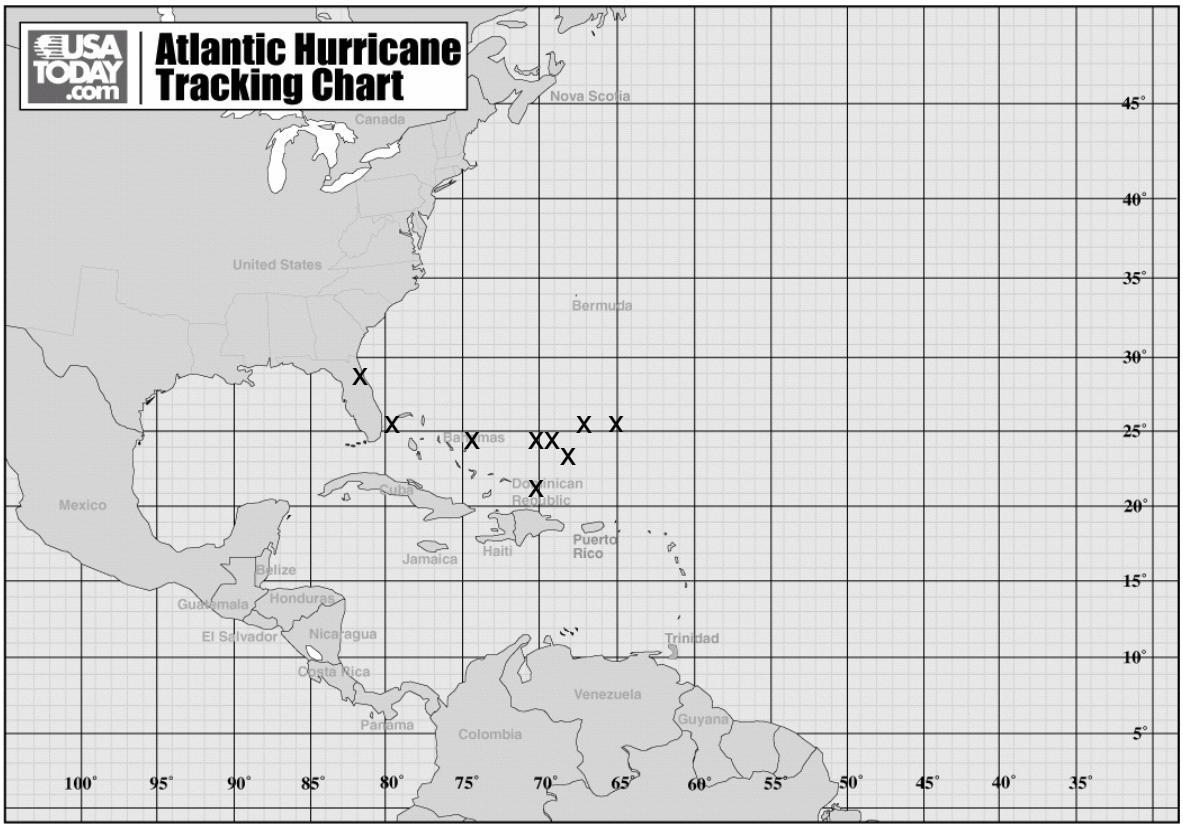
**The NOAA Weather Radio (15 total points – 1 for each question except 2 points for question 6))**

1. National Oceanic and Atmospheric Administration
2. National Weather Services office
3. every 4 to 6 minutes
4. every 1 to 3 hours
5. 24 hours a day
6. time of tides, sea conditions such as height of waves, choppy, calm, etc.
7. no

**When Lightning Strikes (10 total points – 2 for each experiment and questions)**

1. You may hear a crackle sound. Hair may be attracted or "stick" to the comb.
2. The balloon sticks to your sleeve.
3. The stream of water is "pulled" or attracted toward the comb.
4. The puffed rice is attracted to or "sticks" to the comb.
5. You hear a bang or pop.

**Tracking a Hurricane (25 total points – 1 point for each X on the map and 1 point for questions 1, 2, 4, 6, 7, 9; 2 points for questions 8, 10; and 3 points for questions 3, 5)**




1. northeast
2. 2800 miles
3. 3 suares north and 1 square east; 4 x 70 = 280 miles (see scale above right of map 1 square = 70 miles)
4. Hurricane Jeanne goes northeast and then circles back to go south and then west.
5. It is unpredictable.
6. west
7. Sept. 26
8. Sept. 25
9. Sept. 26
10. Because it was at least 12 hours before it struck northern Florida.

**Weather Satellites (7 total points – 2 points for questions 1 and 2; 3 points for question 3))**

1. The polar orbit goes from North pole to South Pole while the geostationary orbit goes around the equator.
2. geostationary – stays a fixed point in relation to the earth.
   Synchronous – moving at the same rate
3. A sun-synchronous satellite moves so that it is always in sunlight. Its position above the earth is not always at the same point. A geostationary satellite stays at the same position over the earth.

The School Board of Miami-Dade County, Florida, adheres to a policy of nondiscrimination in employment and educational programs/activities and strives affirmatively to provide equal opportunity for all as required by:

**Title VI of the Civil Rights Act of 1964** - prohibits discrimination on the basis of race, color, religion, or national origin.

**Title VII of the Civil Rights Act of 1964**, as amended - prohibits discrimination in employment on the basis of race, color, religion, gender, or national origin.

**Title IX of the Education Amendments of 1972** - prohibits discrimination on the basis of gender.

**Age Discrimination in Employment Act of 1967 (ADEA)**, as amended - prohibits discrimination on the basis of age with respect to individuals who are at least 40.

**The Equal Pay Act of 1963**, as amended - prohibits sex discrimination in payment of wages to women and men performing substantially equal work in the same establishment.

**Section 504 of the Rehabilitation Act of 1973** - prohibits discrimination against the disabled.

**Americans with Disabilities Act of 1990 (ADA)** - prohibits discrimination against individuals with disabilities in employment, public service, public accommodations, and telecommunications.

**The Family and Medical Leave Act of 1993 (FMLA)** - requires covered employers to provide up to 12 weeks of unpaid, job-protected leave to "eligible" employees for certain family and medical reasons.

**The Pregnancy Discrimination Act of 1978** - prohibits discrimination in employment on the basis of pregnancy, childbirth, or related medical conditions.

**Florida Educational Equity Act (FEEA)** - prohibits discrimination on the basis of race, gender, national origin, marital status, or handicap against a student or employee.

**Florida Civil Rights Act of 1992** - secures for all individuals within the state freedom from discrimination because of race, color, religion, sex, national origin, age, handicap, or marital status.

**School Board Rules 6Gx13- 4A-1.01, 6Gx13- 4A-1.32, and 6Gx13- 5D-1.10** - prohibit harassment and/or discrimination against a student or employee on the basis of gender, race, color, religion, ethnic or national origin, political beliefs, marital status, age, sexual orientation, social and family background, linguistic preference, pregnancy, or disability.

*Veterans are provided re-employment rights in accordance with P.L. 93-508 (Federal Law) and Section 295.07 (Florida Statutes), which stipulate categorical preferences for employment.*

REVISED 8/1/01