

# **MAST ACADEMY OUTREACH**

## **MIDDLE SCHOOL PROGRAM**

### **Adventures Aboard**

### **WOW**

**(Weather on Wheels)**

**Highlights Teacher Instructions / Answer Keys**



**MAST Academy**

**Maritime and Science Technology High School**

**Miami-Dade County Public Schools**

**Miami, Florida**

**MAST ACADEMY OUTREACH  
WEATHER ON WHEELS  
MIDDLE SCHOOL PROGRAM  
ON-SITE HIGHLIGHTS TEACHER INSTRUCTIONS/ANSWER KEYS  
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## Weather on Wheels On-Site Package Teacher Instructions



**If you have not already done so, show the Weather on Wheels Pre-site DVD to your students.** Make a copy of the on-site package for each of your students. Distribute one package to each student the day of the Weather on Wheels visit. They will also need pencils or pens. Pencils will be provided only in an emergency.

Divided the class in half (Groups A and B), then divided each half into 6 teams of equal size, assigning each team a number from 1-6. If ESOL, ESE or other inclusion students are assigned to your class, make sure they are grouped with at least one student at grade-level reading ability. This grade-level student should be designated the group leader.



Students are not to carry books, book bags, etc. to Weather on Wheels. These will get in the way. Clipboards will be provided for all students.

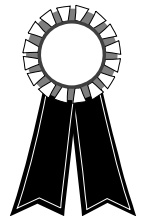


To save your student's photographs from lesson 1, you will need to provide **one** flash drive (USB drive).



When your students arrive at Weather on Wheels, a brief introduction will be given. Each team will then begin at the lesson with their assigned number. **THE TEACHER MUST HELP SUPERVISE STUDENTS WORKING AT THE STATIONS SET UP OUTSIDE WEATHER ON WHEELS.**

**After the Weather on Wheels visit, grade the on-site activities, using the answer key provided in this packet. Total the points. This grade will be used to award certificates to students who score 80% or higher. A Certificate of Achievement Request Form, along with a Program Evaluation Form, will be sent to you following the Weather on Wheels visit.**



Discuss the correct answers with your students. All questions that address "critical thinking skills" are preceded by the icon to the left.

**WEATHER STATION 1***6 total points: 3 for each story***EVERY PICTURE TELLS A STORY**

1. You will document your experience aboard Weather on Wheels by using the digital camera to take two photos of any of the Weather on Wheels stations and then writing about your photographs.
2. Look around and find something you want to photograph. If you are waiting to use the camera, you can look around, decide on what you want to photograph and start writing your story (see #3 below) before you take your photographs.
3. Write a story about each photograph. Use complete sentences in your story. Think about who or what is in your picture. If a person is in your photograph, what is he or she doing? If a computer is in your photograph, what is on the screen? If a piece of equipment or an instrument is in your photograph, what is it used for?

**FIRST PHOTOGRAPH**

This is a photograph of \_\_\_\_\_ *Stories will vary.*

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**SECOND PHOTOGRAPH**

This is a photograph of \_\_\_\_\_

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## WEATHER STATION 2

### RELATIVE HUMIDITY

26 total points: 2 for each question and part of table

The amount of water vapor in the air is called humidity. Relative humidity is the amount of water vapor in the air at a certain temperature; warmer air can hold more water vapor than cold air. If the relative humidity is 50%, then the air is holding half the amount of water vapor it is capable of holding. If the relative humidity is 100%, then the air contains all the water vapor it can possibly hold.

It is easy to find relative humidity using the **hygrometer** on the table by reading the number at the end of the pointer.

2. What is the relative humidity reading on the hygrometer? Answers will vary %

A **sling psychrometer** (Sigh-krom-a-ter) also measures relative humidity, but its use involves several steps. Follow the directions on the table for using the two sling psychrometers. Two people in your team should perform the activity at the same time and in the same manner, so that similar readings are obtained. Record both the wet and dry bulb temperatures and then follow the directions on the table to calculate the relative humidity.

Psychrometer	Dry Bulb Temperature	Wet Bulb Temperature	Relative Humidity
Student 1	<i>answers</i>	<i>vary</i>	<i>day to day</i>
Student 2	<i>answers</i>	<i>vary</i>	<i>day to day</i>

3. Find the average relative humidity (add two relative humidities above, divide by 2) varies %

4. Is the reading from the hygrometer (circle one) **higher than** **lower than** (it should be the same) the average relative humidity you calculated using the sling psychrometers?



5. Which instrument do you think gives you a less accurate reading? (Hint: For which instrument are you less likely to make a mistake?) Circle one. *Hygrometer* *Sling Psychrometer*

Why? Sling psychrometer introduces human error (speed of rotation, math errors, etc.)

6. Does today's relative humidity feel comfortable to you? **YES** **NO** *Answers based on opinion*

Why, or why not? Answers based on opinion

7. What does your body do to cool off when temperatures and humidities are higher than those in your "comfort zone?" your body sweats, or increases blood flow to the extremities



8. What does your body do to warm up when temperatures and humidities are lower than those in your "comfort zone?" your body shivers, or decreases blood flow to the extremities

9.

## WEATHER STATION 3 AIR PRESSURE

15 total points: 1 for each question, 8 for map

Air (barometric) pressure is the force exerted by the weight of the air above us. This weight creates a force on you much like the weight or force on a diver at the bottom of the ocean. The **barometer** is an instrument that measures changes in air pressure.

Read the directions on the poster for reading the **aneroid** ("without liquid") **barometer**. Look at the aneroid barometer on the table, and answer question 1 below.

1. What is the current barometric pressure in millibars (mb)? Answers will vary.

Hurricanes are areas of very low pressure (below 1000 mb.) The lower the air pressure the more intense the hurricane.

Look at the graph called "Air Pressure During Hurricane Katrina" and answer the following questions.

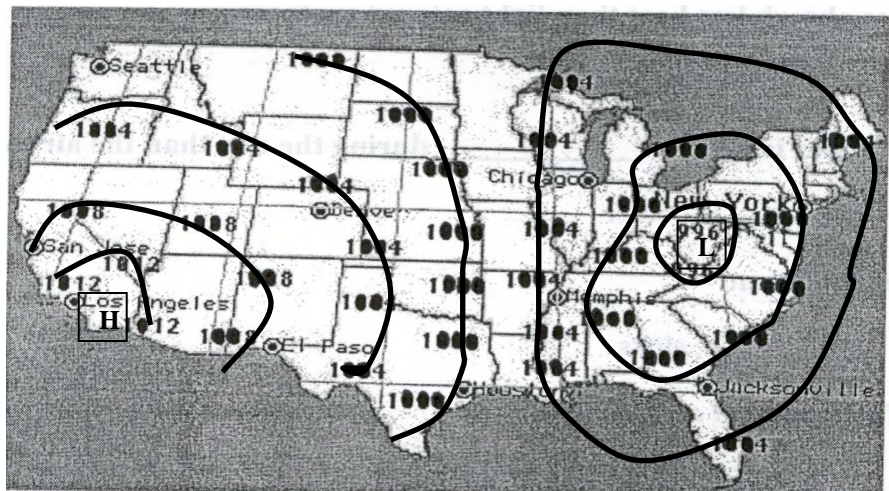
2. On what day was the air pressure the highest? 8/24/2005
3. What was the air pressure on that day? approximately 1007 mb
4. Hurricane Katrina hit New Orleans on August 29<sup>th</sup>. Was Katrina more or less intense the day before it hit New Orleans? (circle one) More Less

5. Explain your answer to #4. The air pressure was lower so the hurricane was more intense.

6. If Katrina had hit New Orleans on August 28th, do you think it would have caused (circle one) more or less damage?

7. Explain your answer to #6. Because it was more intense it would have done more damage.

Look at the sample weather map on the table. The thick black lines are called isobars. These lines connect locations of equal barometric pressure and form sets of curves that do not cross each other. On the map to the right (a different map than the sample map), use the yellow highlighters to draw in the isobars by connecting numbers of equal pressure. The first isobar is drawn for you.



Isobars can be used to identify "Highs" and "Lows". The pressure in a high is greater than the surrounding air and usually brings clear, sunny weather. The pressure in a low is lower than the surrounding air and usually means cloudy or rainy weather. On the map above, label with an "H" the center of a high pressure area, and label with an "L" the center of a low pressure area.

## WEATHER STATION 4 WIND

17 total points: 7 for the table, 2 for each question

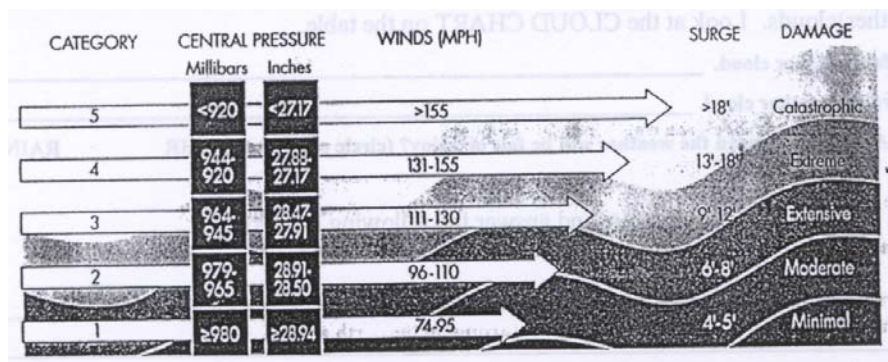
**Wind** is air in motion. It is caused by the unequal heating of the earth's land and water surfaces, which causes differences of pressure in the atmosphere. Follow the directions on the table for using the **TurboMeter** to record the wind speed in miles per hour.

1. **Wind Speed (MPH)** \_\_\_\_\_ *Answers will vary*

A **hurricane** is a powerful tropical cyclone (rotating storm) with winds *over 74 miles per hour*. Using the hurricane plotting chart, follow the track of Hurricane Katrina in 2005. Record in the chart below Katrina's coordinates in latitude and longitude for each of the dates shown (a key to latitude and longitude is above the map).

DAT(11:00 PM)	LATITUDE	LONGITUDE
Aug. 23, 2005	23.5	76.0
Aug. 24	26.0	78.0
Aug. 25	25.5	81.0
Aug. 26	24.5	83.5
Aug. 27	25.0	86.0
Aug. 28	27.5	89.5
Aug. 29	33.5	88.5

Hurricanes are classified according to both the intensity of the winds and the damage produced by the storm. The method used to measure the intensity and damage caused by a hurricane is called the Saffir-Simpson Scale which is shown below. This system categorizes storm intensity on a scale of one to five.



10. What category hurricane has winds of 111-130 MPH? Category 3

11. What category has a central pressure of <920 millibars? Category 5

12. Hurricane Hugo in 1989 was a Category 4 hurricane. What type of damage did it cause? Extreme

13. Hurricane Camille in 1969 and the Florida Keys Hurricane of 1935 are the only two Category 5 hurricanes to strike the United States. What was the storm surge? > 18 feet



## WEATHER STATION 5 CLIMATE

11 total points: 6 for the data table, 1 for each question

How does one distinguish weather from climate? One simple way to think of it is that climate is what we expect; weather is what we get. To describe climate, researchers look at the average weather over a number of years in a particular region during a particular season. In this activity, you will be comparing the subtropical climate in Miami to a desert climate in Phoenix, Arizona by using temperature, precipitation and relative humidity as your data.

1. Click on the book with the title “U.S. Climate Data.”
2. Click on the bar at the bottom right that says “List All Cites.”
3. Scroll down and click on **Miami, FL**. (Cities are listed alphabetically by state.)
4. Click on the bar that says “City Information.” There is a **yellow arrow** pointing to the month of January indicating that the information listed is for that month.
5. Record the **high temperature**, **precipitation (rain)** and **relative humidity** in the box for January in the data table below.
6. Click on March and record the data. Repeat for May, July, September, and November.

Miami	January	March	May	July	September	November
High Temperature	74 77		82	87	86	78
Precipitation (rain) in Miami (inches)	2.10 2.26		6.54	5.44	8.24	3.03
Relative Humidity	72 70		73	76	78	74

7. Click on the small square above the word “Miami.”
8. Scroll up to Phoenix, AZ and click on this city. Click on “City Information.”
9. Find and record the high temperature, precipitation (rain) and relative humidity for each month.

Phoenix	January	March	May	July	September	November
High Temperature	66 75		92	105	99	75
Precipitation (rain) in Phoenix (inches)	0.88 0.54		0.05	0.55	0.38	0.41
Relative Humidity	53 40		25	36	38	46

Using the data above, answer the following questions.

1. What city has the highest temperature for any month? (circle one) MIAMI **PHOENIX**
2. What city has the highest rainfall for any month? (circle one) **MIAMI** PHOENIX
3. What city has the highest humidity for any month? (circle one) **MIAMI** PHOENIX
4. Describe the climate in Miami? (circle all that apply) **HOT** **RAINY** **HUMID** DRY
5. Describe the climate in Phoenix? (circle all that apply) **HOT** RAINY HUMID **DRY**



How would your use of water be affected if the climate in Miami changed to that of Phoenix? You may need to conserve water year round

Click on the “Home” button to return to the main screen.















# WEATHER STATION 6 THE WEATHER MONITOR

14 total points: 8 for data chart, 1 for each question

The “Weather Monitor” collects information about the weather from the Weather Station set up outside. Using the poster on the wall to help you find the information on the computer screen, fill in the data table below.

Answers will vary

Time	Date	<b>Moon Phase</b>     				
Outside Temperature °F	Inside Temperature °F	Outside Humidity %	Inside Humidity %			
Dew Point °F	Heat Index °F					
Wind Chill °F	Wind Speed mph					
CURRENT Rainfall Day in	CURRENT Rain Rate in	Barometer mb				
Sunrise _____ AM Sunset _____ PM	Forecast (Circle one)	Wind Direction (draw an arrow)				
		     				

At the top of the screen, click on the 5<sup>th</sup> icon from the left. (The icon with 2 small graphs.) If the graph is not showing the current time on the horizontal axis, then click on the arrow at the bottom right of the scroll bar to move the graph to the current time. One click moves the graph forward one hour.

1. What does the red line represent? outside temperature
2. What does the blue line represent? dew point

**Dew point** is the temperature at which the atmosphere becomes 100% saturated (filled) with water. If the outside temperature falls to the dew point temperature, water vapor in the air will condense, and **dew** will form on the windows or grass. The dew evaporates once the outside temperature rises above the dew point.

3. On the graph shown on the computer screen, the outside temperature is higher than the dewpoint temperature. Under these conditions, would dew be able to form? \_\_\_\_\_ Yes X No

4. Why or why not? Because the outside temperature is higher than the dewpoint temperature.

5. If both the dew point and the outside temperature were the same, what would happen to the water vapor in the air?

Water vapor in the air would condense to form dew.

6. If there was dew on the bus window early this morning but it is now gone, what happened to it?  
It evaporated as the outside temperature increased.

At the top of the screen, click on the 3<sup>rd</sup> icon from the left to go back to the first screen.

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