Introduction to Measuring Tools

Rice Air Curriculum

Teacher Training

Measurement Overview

- Students will use GLOBE-certified instruments to take the measurements on Days 2-6
- Students record data on data sheets
- If possible, find a bench or table in an open area outside (>30 feet from nearest building) to serve as a measurement station
- Measurements should be taken in the same place every day

Rice Air Curriculum:
Ozone and Meteorology Data Sheet

Your name:_____

Measurement location: _____

Please choose three places where you will measure surface temperature (circle one for each):

Surface Temperature #1: Grass Barren Land Shrubs Concrete Asphalt Other: _____

Surface Temperature #2: Grass Barren Land Shrubs Concrete Asphalt Other: _____

Surface Temperature #3: Grass Barren Land Shrubs Concrete Asphalt Other: _____

	Day 1	Day 2	Day 3	Day 4	Day 5
Date					
Day of Week					

Beginning of class (Ozone strip exposed)

Time (hour:min)					
Wind Direction					
Air Temperature (°C)					
Surface Temp. (°C) #1					
Surface Temp. (°C) #2					
Surface Temp. (°C) #3					
Relative Humidity (%)					
Cloud Types (See Cloud Guide; List all types seen)					
Cloud Cover					

End of class (Ozone strip read)

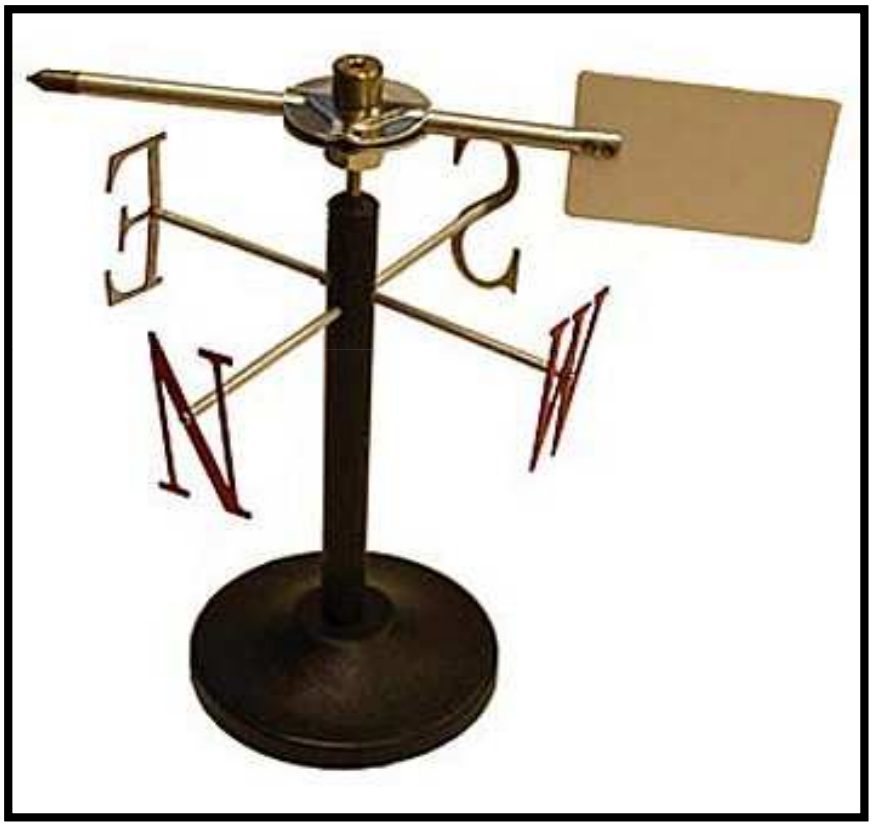
Time (hour:min)					
Wind Direction					
Air Temperature (°C)					
Surface Temp. (°C) #1					
Surface Temp. (°C) #2					
Surface Temp. (°C) #3					
Relative Humidity (%)					
Ozone Concentration (parts per billion)*					
AQI**					

*Enter M if the chemical strip gets damaged and can't be read

**This will be filled in during Lesson 7

Comments:

Wind Vane



1. Place pointer on wind vane base
2. Place wind vane on station, using compass to align North
3. The pointer points in the direction where the wind is coming <u>from</u>
4. Note: A “north wind” is a wind that blows <u>from</u> the north

Cloud Charts

- Teach students how to recognize different types of clouds
- Posters and flashcards included
- 101 suggested activities – coded by age-level appropriateness

Hygrometer
(Air Temperature and Relative Humidity)

1. Place instrument on station
2. Use C/F button to choose Celsius or Fahrenheit
3. Record air temperature and relative humidity at the beginning and end of the measurement period
4. Protect instrument by storing it in a dry place and <u>not</u> using it on wet days

Infrared Thermometer Gun (Surface Temperature)

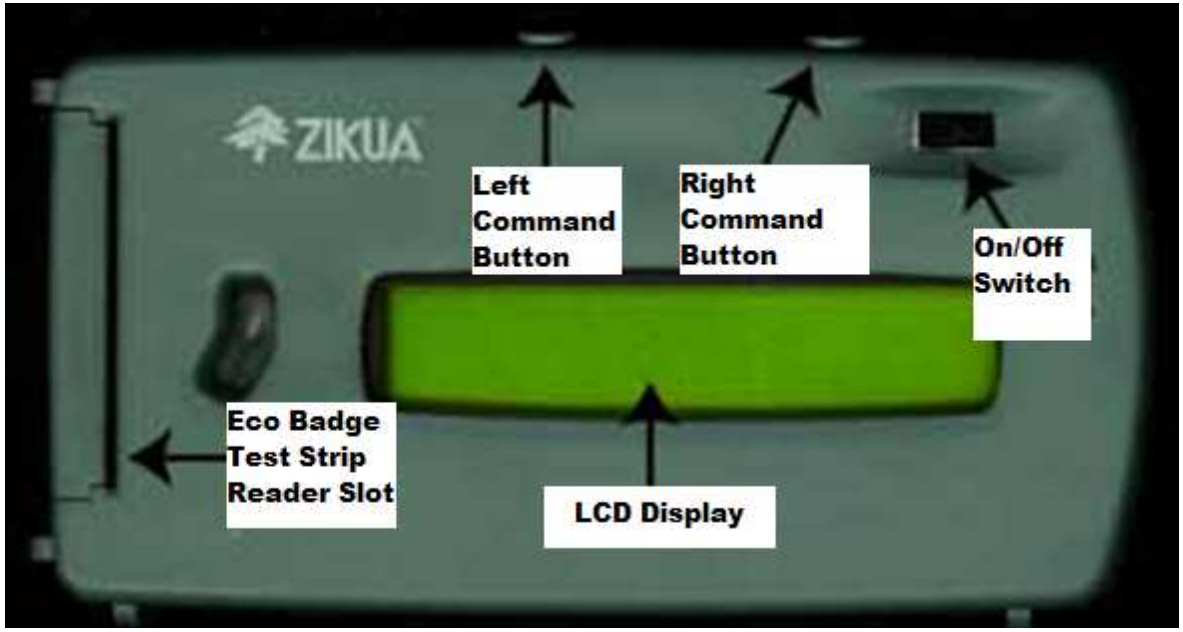
1. Wrap instrument in thermal glove (oven mitt cut with opening for front of device), **OR** equilibrate outside for 30 minutes
2. Students choose 3 places for surface temperature measurements (e.g., grassy area, concrete area)
3. Students point the instrument at the surface, pull the trigger, and record the temperature from the display
    - Caution: Remind students not to point the laser at anyone

Ozone Strips (Eco Badge Test Cards)

- Chemically sensitive strips that change color in presence of ozone
- Keep strips in a closed plastic pouch prior to use. Once the strip is exposed, it begins to react with any ozone that is present.
- Expose strip to freely moving outside air for 1 hour; Hold in place on station with clothespin or clip
- Avoid touching the chemical on the strip; doing so is not hazardous, but impairs the measurement
- Read the strip *in the field* by using the ozone scanner

Zikua Ozone Scanner

- Optical reader that measures ozone concentrations from strips
- Components:
  - LCD display
  - On/off switch
  - Two command buttons
    - Left button for scrolling
    - Right button for selecting values
  - Slot on the left side to insert Eco Badge ® Test Card
  - Screen brightness adjustment screw on back of unit



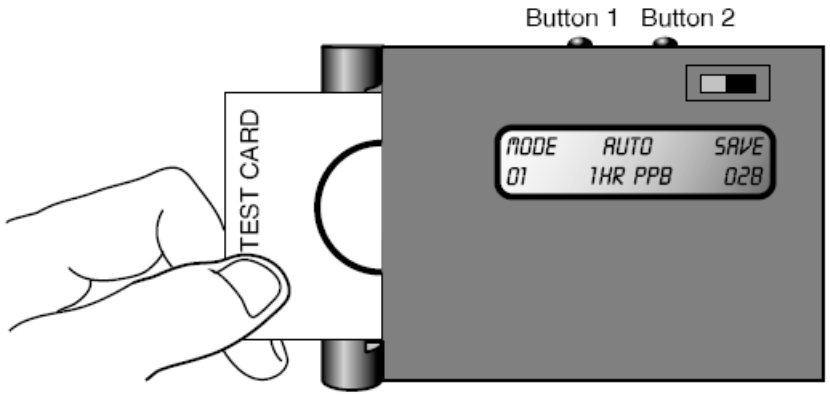
Credit: Vistanomics

Calibrating the Zikua

- Calibrating the Zikua uses an unexposed card to establish a baseline standard for reading exposed Test Cards.
- Calibration should be performed each time you begin a new series of Zikua readings and then every 15-20 tests.

1. Turn on the scanner away from direct sunlight.

2. Insert an unexposed one hour Test Card into the Zikua's Test Card slot. The printed side of the Card should face the LCD display. The number in the lower right of the LCD will change.



Calibration (continued)

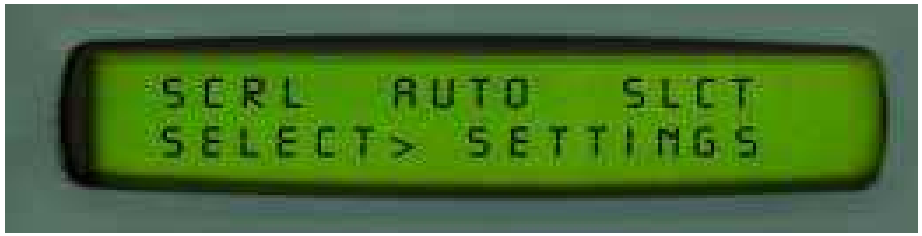
3. Press the left button repeatedly from the Settings display to Select the Calibration command (LCD screen below).

4. Press the right button. LCD shows “1 HR WHT = “(# may vary)

5. Press the left and right buttons at the same time to save your calibration. Turn off the scanner, and remove the unexposed Test Card from the slot. The Zikua is now ready to read exposed Test Cards.

Choosing Settings

1. Press the left button until the LCD shows the Settings command:



2. Press the right button to specify the Settings command. Press the right button repeatedly to scroll through duration options. You want to choose 1 HOUR.

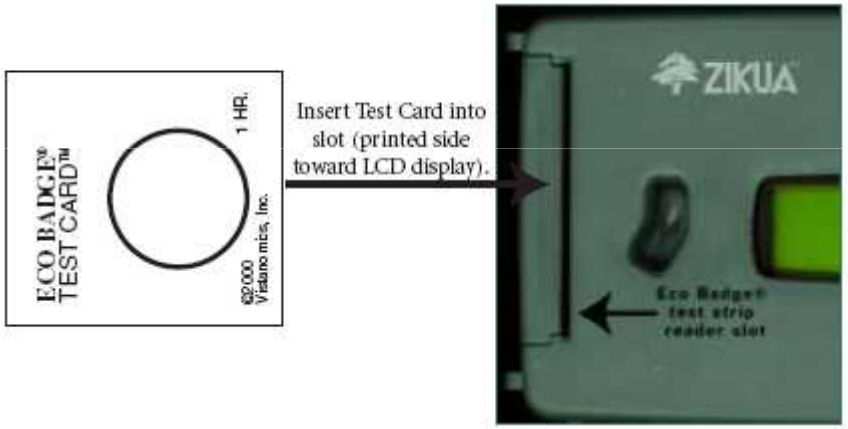
3. When the test duration you want to use is displayed, press the left button. Press the right button repeatedly to scroll through measurement options. Select PPB (Parts per billion).

4. Press the left and right buttons simultaneously to save settings

Reading the Exposed Test Cards

1. **Place the scanner on a flat surface in a shaded area, letting it adjust to outside conditions. Turn it on and let it run for at least 30 seconds. It should say MODE 01, AUTO 1 HR PPB. If not, adjust MODE by scrolling with left button to "RESET"; see previous slide to adjust the units.**

2. **Insert an exposed Test Card (printed side facing LCD) into Test Card slot.**



3. **The ozone concentration is the number in the <u>lower right</u> of the LCD. Record the number after the fluctuations have subsided, or the smaller number if fluctuations continue.**

Measurement Logistics

- Take measurements at consistent time each day
  - Could compare results across classrooms measuring at different times
- Meteorology measurements are taken at beginning and end of hour
- Ozone strip is placed at start of period, exposed for one hour, and then measured with scanner
- Need a plan for how students will work in teams

Reminders

- Full descriptions of all the GLOBE measurement protocols are available on Connexions or at www.globe.gov
- Student Safety:
  - Remind students to not directly look into the sun when observing the weather
  - Remind students to not point the laser of the Infrared Thermometer at anyone

Questions?