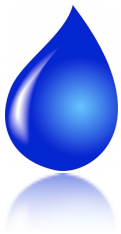
How Wet is the Air?
Teacher Page



Objective:
To understand a basic principle of of the atmosphere - relative humidity. Students should understand the concept of humidity, or how much water vapor is in the air once this activity has been completed. Students may be able to start relating how humid *it feels* compared to how humid *it is*.

Grade Level: 4-7

Time Required:
Once instruments are made (can be made by teacher in advance, or be made by students on Day 1), the activity itself will only take 15 minutes.

One day, or over time to collect data and see a change over a week, month, etc.

Materials:
- Cup or Pint sized milk carton; empty and clean
- Water
- Two small thermometers (preferably metal)
- Cotton balls, cotton shoelace or gauze
- String
- Clear tape

Background:
This exercise has the students taking measurements (could be daily for at least a week), to understand the benefits of collecting data over time and comparing their daily results. Using pictures of humid and wet climates compared to locations that are dry and arid can help bring this to a global scale.

Students should be able to find a number on a graph by using an X and Y coordinate, on the graph below. Remind them that they are finding a percentage, not a difference of degrees.

Students should understand the concept of evaporation. Applying dabs of different liquid with different evaporative properties such as rubbing alcohol, water and baby oil to the back of their hands helps them grasp the concept, as they can feel and see which ones evaporate quicker.

Evaluation:
If this exercise is performed over time, the students should be able to identify which days were more humid than the others by looking at the change in daily relative humidity.

The students should be able to identify climate regions of the globe that have a high percentage of relative humidity and regions that have low relative humidity.

The students should be able to explain why taking measurements and collecting scientific data over time ultimately gives them more information of a one day study. Collecting data over time allow them to see trends and the bigger picture of what is going in on in the atmosphere. One day of data doesn't tell them much as they can not compare it to anything else.

How Wet is the Air?

Teacher Page

Here's how to do it:

1. Tape the cotton ball (or other cotton material) over the bulb of the thermometer
2. Tape the thermometer to the side of the cup and get the cotton ball wet, squeeze it out so it is drop dripping
3. Tape the second thermometer (no cotton on tip) to the other side of the cup
4. Punch a small hole in the top of the cup, thread the string through the hole and tie s not so the string can not be pulled back out, you'll need about a 2' length form the cup
5. Go outside and swing the cup around, at waist hight, like you are twirling a lasso
6. Do this for one minute
7. Quickly look at the temperatures on both thermometers and write them down

What's Going On?

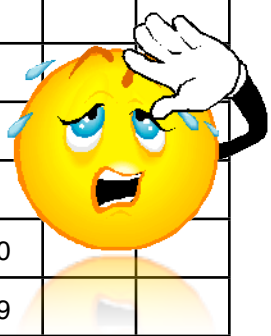
Main Take-Away Point :: The temperature of the thermometer with the wet bulb is always lower that the temperature of the dry thermometer bulb. This is because water is evaporating from the wet bulb thermometer and cooling it down. The drier the surrounding air, the faster the wet cotton ball will be evaporating, bringing the temperature down as it evaporates. The more humid the surround air is, the less evaporation will occur, keeping the two thermometer temperatures closer together.

The difference between the two temperatures gives a clue to the amount of water in the air. ***The bigger the temperature difference, the drier that air.*** The relative humidity (RH) is 100% when it's raining and almost 0% the driest deserts.

But Wait, There's More!

Use the chart given here to calculate the percentage of relative humidity of the air.

	Dry-Bulb Temperature minus Wet-Bulb Temperature (°F)												
Dry-Bulb Temperature (°F)		1	2	3	4	5	6	7	8	9	10	15	20	25
	30	89	78	67	56	46	36	26	16	6				
	35	91	81	72	63	54	45	36	27	19	10			
	40	92	83	75	68	60	52	45	37	29	22			
	45	93	86	78	71	64	57	51	44	38	31			
	50	93	87	80	74	67	61	55	49	43	38	10		
	55	94	88	82	76	70	65	59	54	49	43	19		
	60	94	89	83	78	73	68	63	58	53	48	26	5	
	65	95	90	85	80	75	70	66	61	56	52	31	12	
	70	95	90	86	81	77	72	68	64	59	55	36	19	3
	75	96	91	86	82	78	74	70	66	62	58	40	24	9
	80	96	91	87	83	79	75	72	68	64	61	44	29	15
	85	96	92	88	84	80	76	73	70	66	62	46	32	20
	90	96	92	89	85	81	78	74	71	68	65	49	36	24
	95	96	93	89	86	82	79	76	72	69	66	52	38	28



How Wet is the Air?
Teacher Page

Questions:

What is the relative humidity today? _____%

Does is *feel* any more or less humid than it felt yesterday? _____

What is the relative humidity for each day of the week?

Monday _____% Tuesday _____% Wednesday _____% Thursday _____% Friday _____%

Was it raining on any day that you tested for relative humidity? If so, indicate the day(s) and the relative humidity?

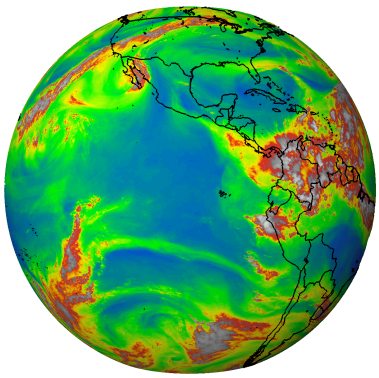
Why does the wet cotton ball thermometer cool more in dryer air?

Now that you have your own data set from a weeks worth of testing for relative humidity, can you see why collecting data for a long time would be helpful? Explain:

Where in the world would you expect to have a relative humidity of close to 100%? What about close to 0%?

Did others in your group get different values? Identify some some sources of error or biases that would cause such variations in your data collection.

Now that you know some things about relative humidity (water vapor in the air), name three ways it affects your daily life and the environment in which you live.



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