Relative Humidity (%)

Dry-Bulb Temperature (°C)	Difference Between Wet-Bulb and Dry-Bulb Temperatures (C°)															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
–20	100	28														
–18	100	40														
–16	100	48														
–14	100	55	11													
–12	100	61	23													
–10	100	66	33													
–8	100	71	41	13												
–6	100	73	48	20												
–4	100	77	54	32	11											
–2	100	79	58	37	20	1										
0	100	81	63	45	28	11										
2	100	83	67	51	36	20	6									
4	100	85	70	56	42	27	14									
6	100	86	72	59	46	35	22	10								
8	100	87	74	62	51	39	28	17	6							
10	100	88	76	65	54	43	33	24	13	4						
12	100	88	78	67	57	48	38	28	19	10	2					
14	100	89	79	69	60	50	41	33	25	16	8	1				
16	100	90	80	71	62	54	45	37	29	21	14	7	1			
18	100	91	81	72	64	56	48	40	33	26	19	12	6			
20	100	91	82	74	66	58	51	44	36	30	23	17	11	5		
22	100	92	83	75	68	60	53	46	40	33	27	21	15	10	4	
24	100	92	84	76	69	62	55	49	42	36	30	25	20	14	9	4
26	100	92	85	77	70	64	57	51	45	39	34	28	23	18	13	9
28	100	93	86	78	71	65	59	53	47	42	36	31	26	21	17	12
30	100	93	86	79	72	66	61	55	49	44	39	34	29	25	20	16

Overview:

Relative humidity (RH) indicates how much moisture is in the air at a certain temperature. This weather variable is important to meteorologists since it closely relates to the "chance of precipitation." It also plays an important role on our "moisture comfort level." High humidity with high temperatures produces that hot, sticky, oppressive weather. Dry air along with cold temperatures produces low relative humidity readings, which can cause dry skin condition. From day to day (even hour to hour), the relative humidity is constantly changing due to changes in air temperature, moisture amount and the dewpoint temperature. Overall, when the relative humidity is heading toward 100%, there is a better chance of precipitation.

Relative humidity is measured by using a sling psychrometer, the same instrument used to measure the dewpoint temperature. This instrument has two thermometers, a dry-bulb thermometer that measures the air temperature and a wet-bulb thermometer. As the instrument is swung, the moisture on the wet-bulb evaporates, removing heat from the thermometer bulb, causing the temperature to decrease. Obtaining the difference between the dry-bulb temperature and the wet-bulb temperature readings and using the RH chart, one can arrive at the relative humidity. But remember, this weather variable is constantly changing, as weather does.

The Chart:

This chart has the same layout as the Dewpoint chart. From a sling psychrometer, get the air temperature by reading the dry-bulb thermometer and then get the lower wet-bulb temperature. Subtracting these two temperatures gives the number (in degrees) to use in the top section labeled "Difference Between Wet-Bulb and Dry-Bulb Temperatures." Using this difference number and its corresponding column, move down until you reach the correct Dry-Bulb Temperature row. At the intersection of these two numbers will be the RH value. For example, what is the RH if the dry-bulb temperature is 14°C and the wet-bulb temperature is 8°C? Solution: The difference between the dry-bulb and the wet-bulb temperatures is 6°C. Go to this column at the top of the RH chart. Staying in this column, move down stopping at the Dry-Bulb Temperature row of 14°C. At the intersection position, the answer shown is 41% RH.

Additional Information:

- As the air temperature gets closer to the dewpoint temperature, the RH will increase.
- The RH will be 100% when the air temperature is the same as the dewpoint temperature.
- The RH in a cloud is 100% and the air is saturated with moisture and condensation has occurred.
- Clouds are composed of very small, floating liquid droplets.

Remember: A cloud has already reached the dewpoint temperature and condensation has occurred, producing these very small floating "dew" drops. When many of these droplets join and become large and heavy enough to fall to the Earth, precipitation is produced. Precipitation cleans the atmosphere by removing suspended particles.

Set 1 — Relative Humidity (%)

1. A parcel of air has a dry-bulb temperature reading of 16°C and a wet-bulb temperature reading of 13°C. What is the relative humidity?

   (1) 11%
   (2) 13%
   (3) 71%
   (4) 80%

   1 _____

2. What is the relative humidity when the air temperature is 29°C and the wet-bulb temperature is 23°C?

   (1) 6%
   (2) 20%
   (3) 54%
   (4) 60%

   2 _____

3. A parcel of air has a dry-bulb temperature of 18°C and a wet-bulb temperature of 10°C. What are the dewpoint and the relative humidity?

   (1) 5°C and 19%
   (2) –5°C and 19%
   (3) 2°C and 33%
   (4) –2°C and 33%

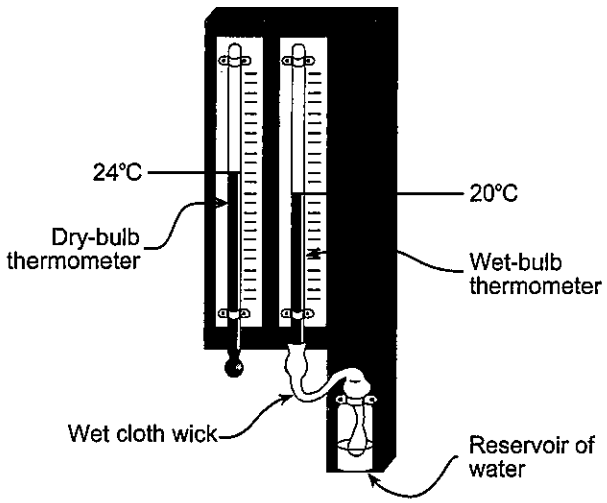
   3 _____

4. A student used a sling psychrometer to measure the humidity of the air. If the relative humidity was 65% and the dry-bulb temperature was 10°C, what was the wet-bulb temperature?

   (1) 5°C
   (2) 7°C
   (3) 3°C
   (4) 10°C

   4 _____

Base your answers to questions 5 through 6 on the accompanying diagram, which shows a hygrometer located on a wall in a classroom. The hygrometer's temperature readings are used by the students to determine the relative humidity of the air in the classroom.



5. Based on the temperature readings shown in this diagram, determine the relative humidity of the air in the classroom.

   _____

6. Besides relative humidity, identify another weather variable of the air in the classroom that may be determined by using both temperature readings on the hygrometer.

   _____

Set 2 — Relative Humidity (%)

7. A sling psychrometer shows a dry-bulb reading of 14°C and a wet-bulb reading of 9°C. What are the dewpoint and the relative humidity?

   (1) −10°C and 16%
   (2) −10°C and 50%
   (3) 4°C and 16%
   (4) 4°C and 50% 7 _____

8. What is the difference between the dry-bulb temperature and the wet-bulb temperature when the relative humidity is 28% and the dry-bulb temperature is 0°C?

   (1) 11°C
   (2) 2°C
   (3) 28°C
   (4) 4°C 8 _____

9. The data below represent some of the weather conditions at a New York State location on a winter morning.

Air temperature (dry-bulb temperature)	0°C
Relative humidity	81%
Difference of temperature	?

What was the **dewpoint** at this time? (Hint: find "Difference")

(1) 1°C (3) −3°C
(2) 2°C (4) −5°C 9 _____

10. What is the relative humidity within a fog?

    _____

11. When you see a cloud are you seeing water vapor, or water droplets?

    _____

Base your answers to questions 12 through 14 on the weather information below.

A student using a sling psychrometer obtained a dry-bulb reading of 20°C and a wet-bulb reading of 16°C for a parcel of air outside the classroom.

12. State the relative humidity. _____

13. State the change in relative humidity as the air temperature and the dewpoint temperature get closer to the same value.

    _____

14. Why does the wet-bulb become colder than the dry-bulb when the sling psychrometer is swung through unsaturated air?

    _____

    _____