**Measuring Relative Humidity Using a Psychrometer**

**Hypothesis**

Predict whether a wet thermometer will read a temperature that is the same as a dry one? If not, will it read a higher temperature (warmer) or lower temperature (cooler)?

**Materials**

2 thermometers 1 rubber band

1 cup of room temperature water 1 paper towel

**Procedures**

1. Select two thermometers that are reading the same temperature.

2. Wrap the paper towel around the bulb of one of the thermometers and hold it there with the rubber band.

3. Wet the paper towel completely (in the cup of water) and lay it out. Wait 5 minutes.

4. After 5 minutes record the temperature of both thermometers (Be sure to indicate units). [*There should be a difference in the temperatures of the two thermometers.*]

Trial 1

Dry Bulb Temperature \_\_\_\_\_ Wet Bulb Temperature \_\_\_\_\_

Trial 2

Dry Bulb Temperature \_\_\_\_\_ Wet Bulb Temperature \_\_\_\_\_

5. Record the two temperatures and subtract them to get the difference.

Trial 1 Trial 2

Temperature Difference \_\_\_\_\_ Temperature Difference \_\_\_\_\_

6. Use the chart on the next page to estimate the relative humidity.

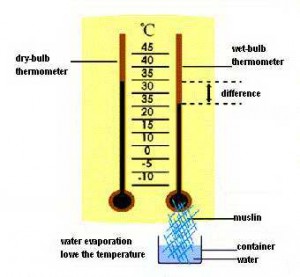
Trial 1 Trial 2

Relative Humidity \_\_\_\_\_ Relative Humidity \_\_\_\_\_

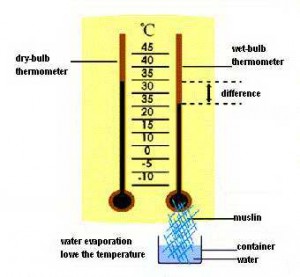
**Conclusion** (based on hypothesis)

1. Can you think of why the wet bulb temperature is less than the dry bulb temperature?

2. What relationship is observed between the temperature (of the dry bulb thermometer) and the relative humidity?



27 °C



22 °C

*Relative Humidity Chart in %*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Dry Bulb (°C) | Difference in temperature (°C) | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 10 | 88 | 77 | 66 | 56 | 45 | 35 | 26 | 16 | 7 | -- |
| 11 | 89 | 78 | 67 | 57 | 47 | 38 | 28 | 19 | 11 | 2 |
| 12 | 89 | 79 | 68 | 59 | 49 | 40 | 31 | 33 | 14 | 5 |
| 13 | 89 | 79 | 69 | 60 | 51 | 42 | 33 | 25 | 16 | 9 |
| 14 | 90 | 80 | 70 | 61 | 52 | 43 | 35 | 27 | 19 | 11 |
| 15 | 90 | 80 | 71 | 62 | 54 | 45 | 37 | 29 | 22 | 14 |
| 16 | 90 | 81 | 72 | 63 | 55 | 47 | 39 | 31 | 24 | 17 |
| 17 | 91 | 82 | 73 | 64 | 56 | 48 | 41 | 33 | 26 | 19 |
| 18 | 91 | 82 | 73 | 65 | 57 | 50 | 42 | 35 | 28 | 21 |
| 19 | 91 | 82 | 74 | 66 | 58 | 51 | 44 | 37 | 30 | 24 |
| 20 | 91 | 83 | 75 | 67 | 59 | 52 | 35 | 38 | 32 | 26 |
| 21 | 91 | 83 | 75 | 68 | 60 | 53 | 47 | 40 | 34 | 27 |
| 22 | 92 | 84 | 76 | 69 | 61 | 54 | 48 | 41 | 35 | 29 |
| 23 | 92 | 84 | 77 | 69 | 62 | 56 | 49 | 43 | 37 | 31 |
| 24 | 92 | 84 | 77 | 70 | 63 | 57 | 50 | 44 | 38 | 32 |
| 25 | 92 | 85 | 77 | 71 | 64 | 57 | 51 | 45 | 40 | 34 |
| 26 | 92 | 85 | 78 | 71 | 65 | 48 | 42 | 46 | 41 | 35 |
| 27 | 93 | 85 | 78 | 72 | 65 | 59 | 53 | 47 | 42 | 37 |
| 28 | 93 | 86 | 79 | 72 | 66 | 60 | 54 | 49 | 43 | 38 |
| 29 | 93 | 86 | 79 | 73 | 67 | 61 | 55 | 50 | 44 | 39 |
| 30 | 93 | 86 | 80 | 73 | 67 | 61 | 56 | 50 | 45 | 40 |
| 31 | 93 | 86 | 80 | 74 | 68 | 62 | 57 | 51 | 46 | 41 |
| 32 | 93 | 87 | 80 | 74 | 68 | 63 | 57 | 52 | 47 | 42 |
| 33 | 93 | 87 | 81 | 75 | 69 | 63 | 58 | 53 | 48 | 43 |

Trial 2

The dry bulb thermometer reads 32 °C.

The wet bulb thermometer reads 24 °C.

Trial 1

ANSWERS

4. After 5 minutes record the temperature of both thermometers (Be sure to indicate units).

Trial 1

Dry Bulb Temperature 27 °C Wet Bulb Temperature 22 °C

Trial 2

Dry Bulb Temperature 32 °C Wet Bulb Temperature 24 °C

5. Record the two temperatures and subtract them to get the difference.

Trial 1

Temperature Difference 5 °C

Trial 2

Temperature Difference 8 °C

6. Use the chart on the next page to estimate the relative humidity.

Trial 1

Relative Humidity 65%

Trial 2

Relative Humidity 52%

**Conclusion** (based on hypothesis)

*I predicted that the wet bulb would show a lower temperature than the dry bulb after five minutes and I was correct. This means the situation is cooler.*

1. Can you think of why the wet bulb temperature is less than the dry bulb temperature?

*Evaporation of the water from the paper towel will release heat and therefore, cool down the thermometer (lower temperature).*

2. What relationship is observed between the temperature (of the dry bulb thermometer) and the relative humidity?

*In this experiment and generally speaking, relative humidity will decrease with increased temperature if the water content remains the same. Notice the dry bulb thermometer went from 27 °C to 32 °C (temperature increase) but the relative humidity decreased from 65% to 52%.*