Rural Training Center – Thailand (RTC-TH)

REEEPP

F CUS

An innovative, non-traditional community-based environmental education program integrating math, science, geography, English language, and technology lessons for environmental stewardship using interactive experiential learning in outdoor settings at Ban Na Fa Elementary School, Nan Province, Thailand.

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Student Weather Observers at Ban Na Fa Elementary School

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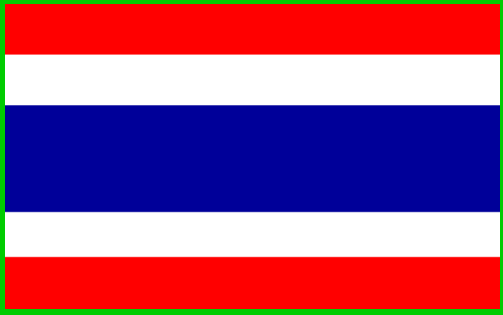
Created by G.K. Lee for the RTC-TH REEEPP



This is an English Language Training module of

REEEPP

Rural Environmental Education Enhancement Pilot Program

presented by

The Rural Training Center-Thailand

E-mail: rtc2k5@gmail.com

www.neighborhoodlink.com/org/rtct

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Integrated Learning at Na Fa

Na Fa Elementary students are using integrated learning to improve their studies.

The weather observation lessons combine math, science, technology and English. The students make the observations outdoors, outside of the classroom.

This makes the lessons fun and interesting.

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Each day, the students observe the weather at Ban Na Fa Elementary School.

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They begin by looking at the sky.

They are looking for clouds.

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They look to the north, south, east, and west.

North

West

East

South

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There are no clouds in the sky today.

The sky is clear.

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When they see a cloud, they must identify it.

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The students use a Cloud Chart to help them identify the clouds.

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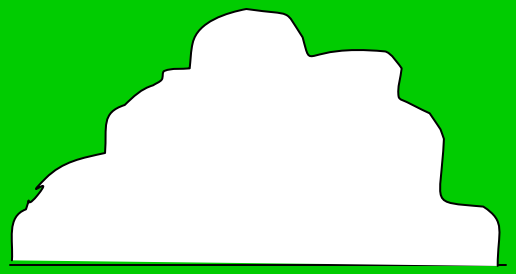
Clouds have three basic shapes or forms.

Lumpy or Puffy



Flat or Layered

Wispy or Thin

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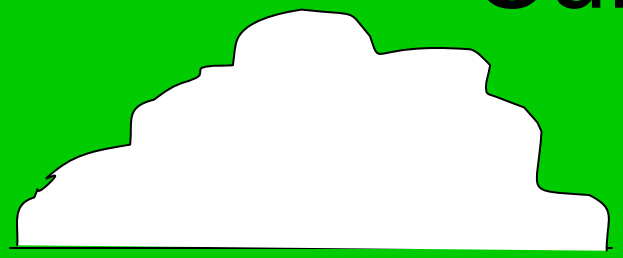
Lumpy or puffy clouds are called Cumulus clouds.



You can remember the name Cumulus because it has the same letters U and M as in the word LUMPY.

L **U** **M** P Y

C **U** **M** U L U S

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Flat or layered clouds are called Stratus clouds.

You can try to think that flat or layered clouds look thin, flat, and straight. The name Stratus start with S T R A the same letters as in the word straight.

S T R A I G H T

S T R A T U S

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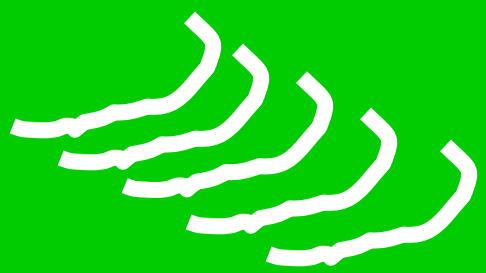
Wispy or thin clouds are called Cirrus clouds.



Cirrus clouds are very thin. It is easy to see through them. The start of the name Cirrus sound like the word “see” as in “see through”.

S E E THROUGH

C I R R U S

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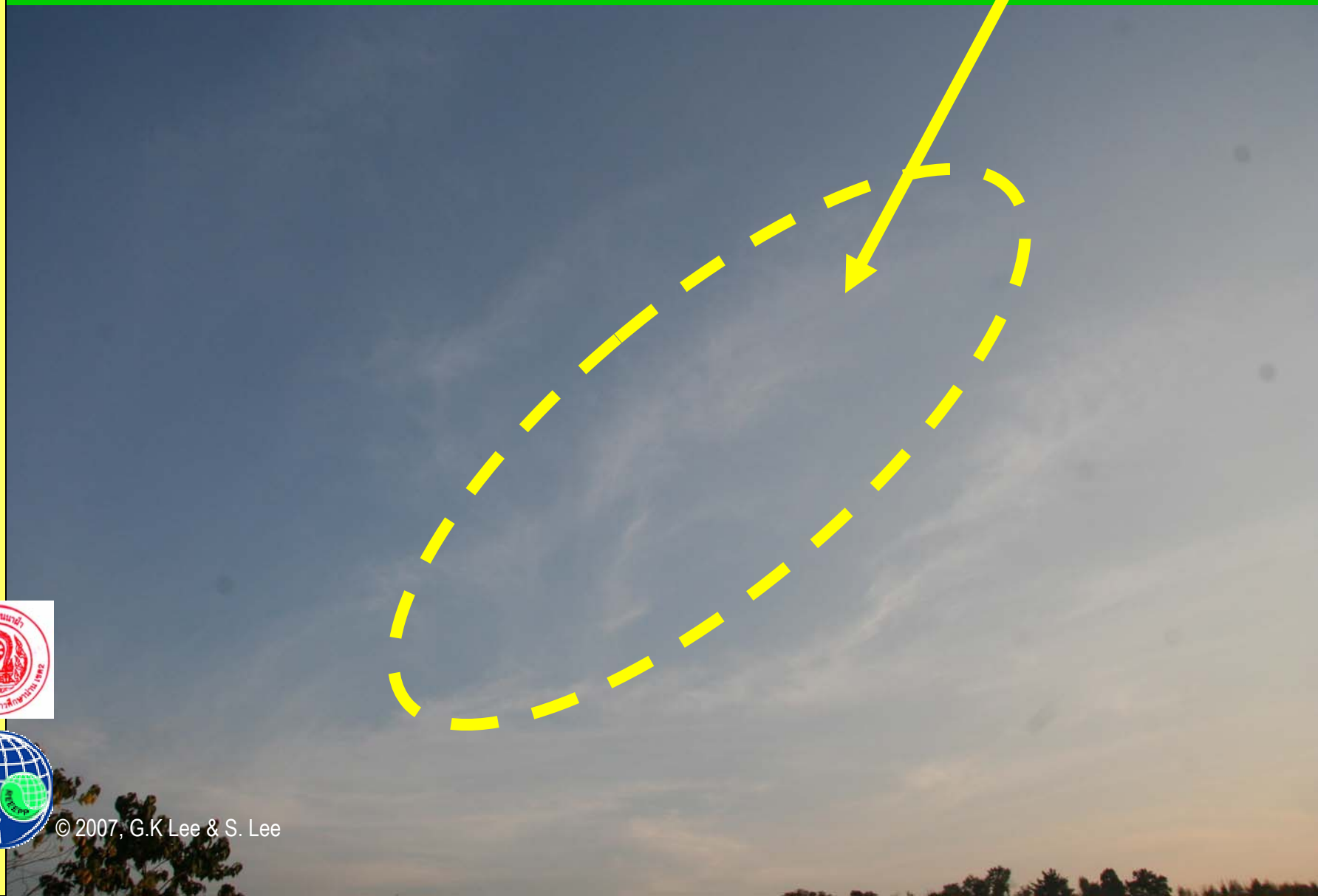
What kind of cloud is this?



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If you said “Cirrus”, you are correct!

It is a Cirrus cloud because it is thin enough to see through.

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You can use a Cloud Chart to get more information about Cirrus clouds.

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They write the information on the Record Sheet.

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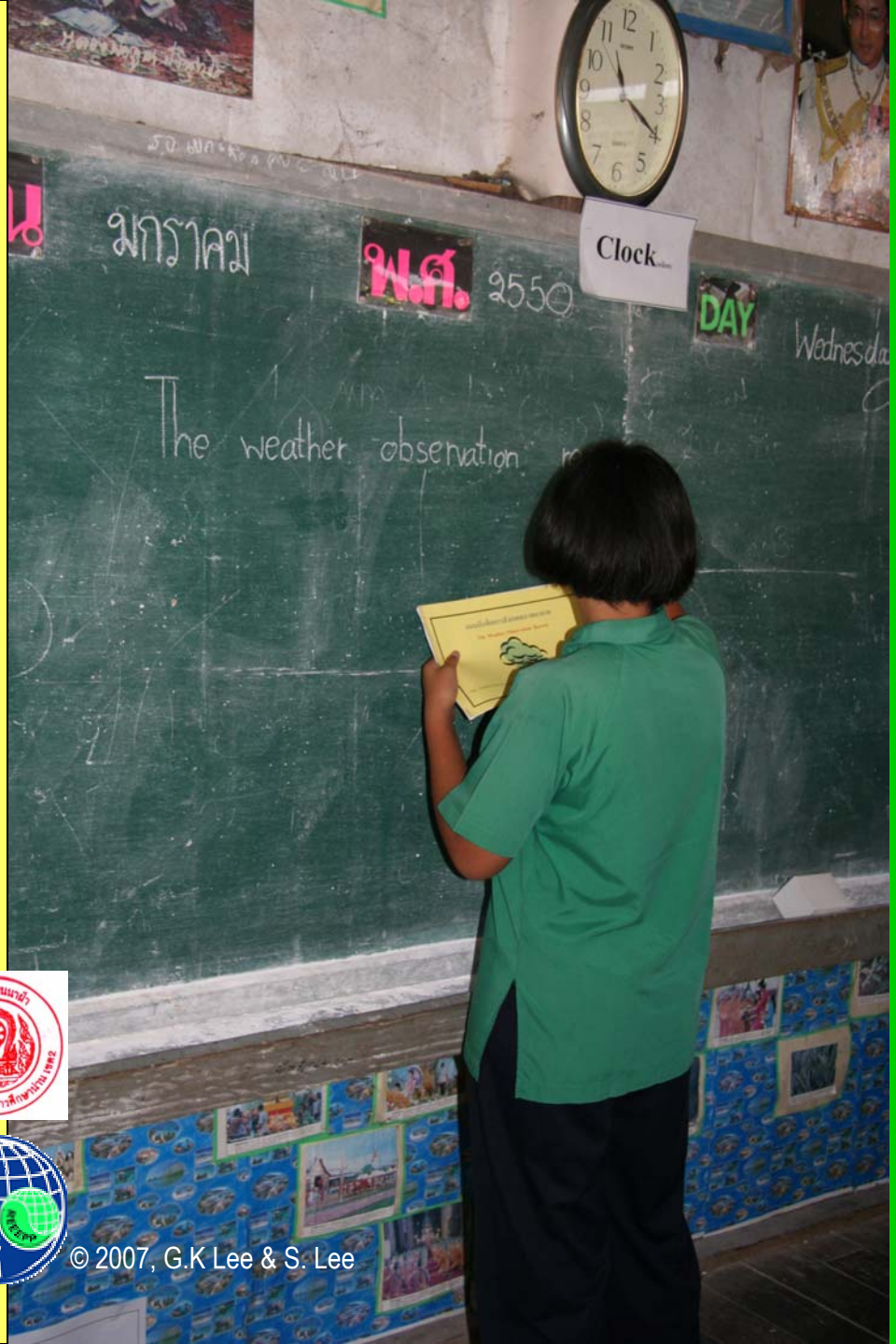

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They prepare to give a report to the class.

They practice writing English on the board.

They can be a teacher for this lesson.

They must read the report aloud in English to their classmates.

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Their classmates get to practice listening to English and learn about the weather at the same time.

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This is the cover for the Weather Observation Records

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This is a Weather Observation Record Sheet.

The weather today

Date Monday / 29 / 2006

Time 10:30

Location Nafa school

	Cloud types ชนิดของเมฆ	Symbol สัญลักษณ์	Altitude ระดับความสูง	Forecast พยากรณ์อากาศ
North	Cumlonimbus		3-12 mile 5-19 km	
South	cirrostratus	2	4-a mile 6-13 km	
East	cirrostratus	2	4-a mile 6-13 km	
West	cirrostratus	2	4-a mile 6-13 km	

Recorded by 1. AEkavat 2. kitti

3. Waranyoo 4. [illegible]

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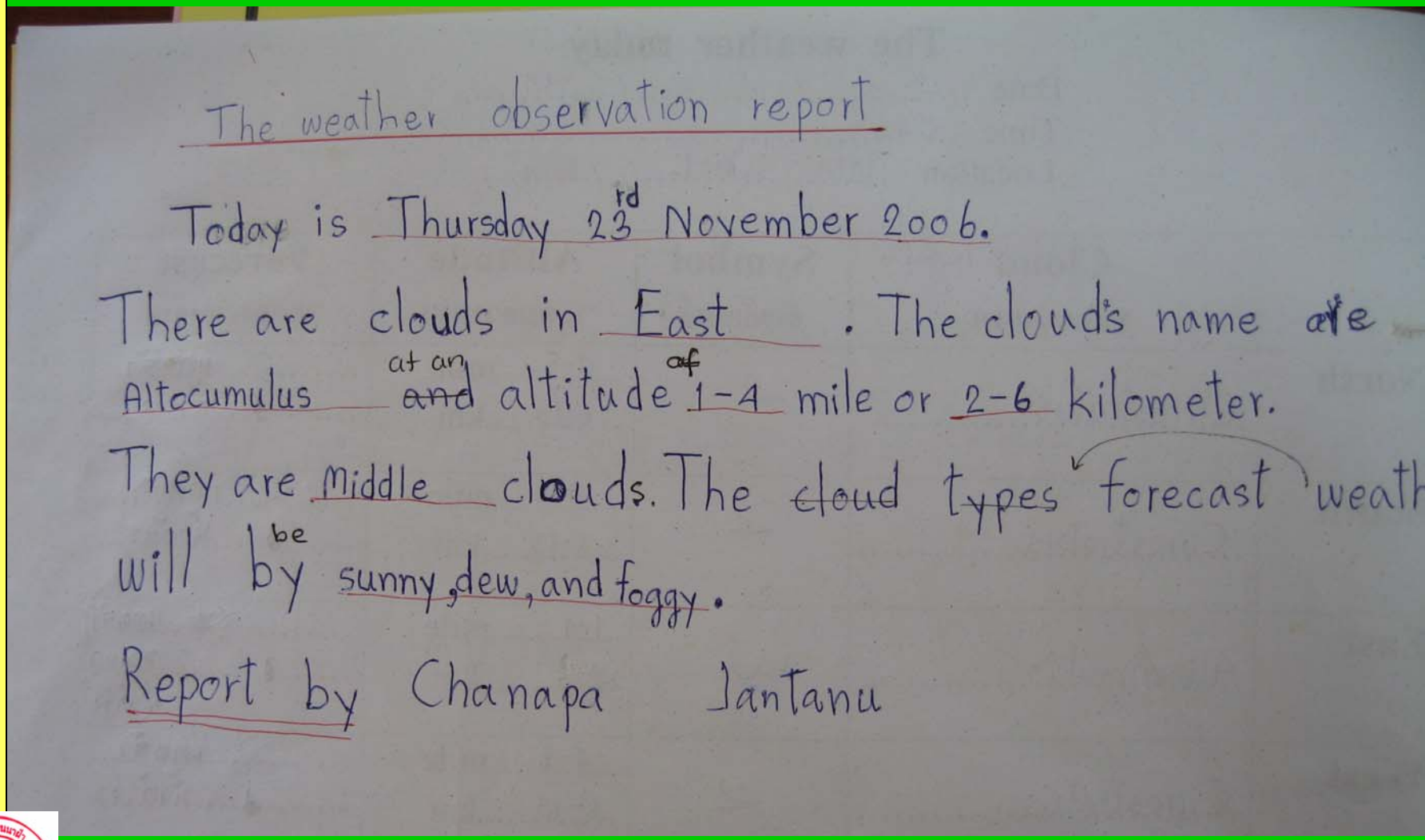

The weather observation report

Today is Thursday 23rd November 2006.

There are clouds in East . The clouds name are Altocumulus ~~and~~ at an altitude of 1-4 mile or 2-6 kilometer.

They are Middle clouds. The ~~cloud~~ types forecast weath will be by sunny, dew, and foggy.

Report by Chanapa Jantanu

This is an English practice weather observation report .

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Another class is measuring the temperature and relative humidity.

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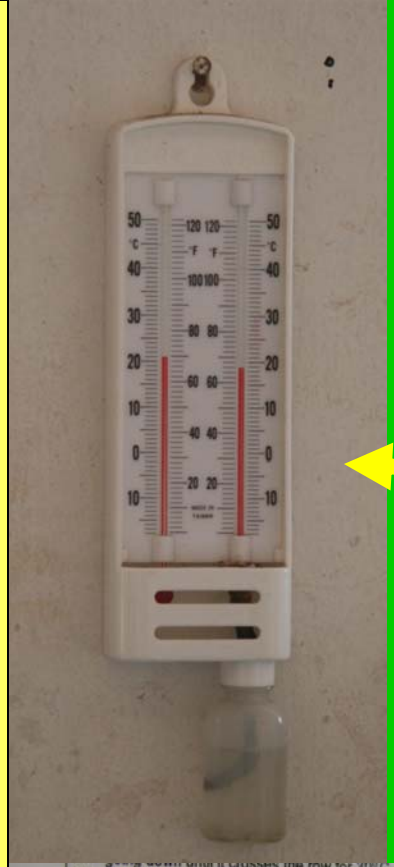
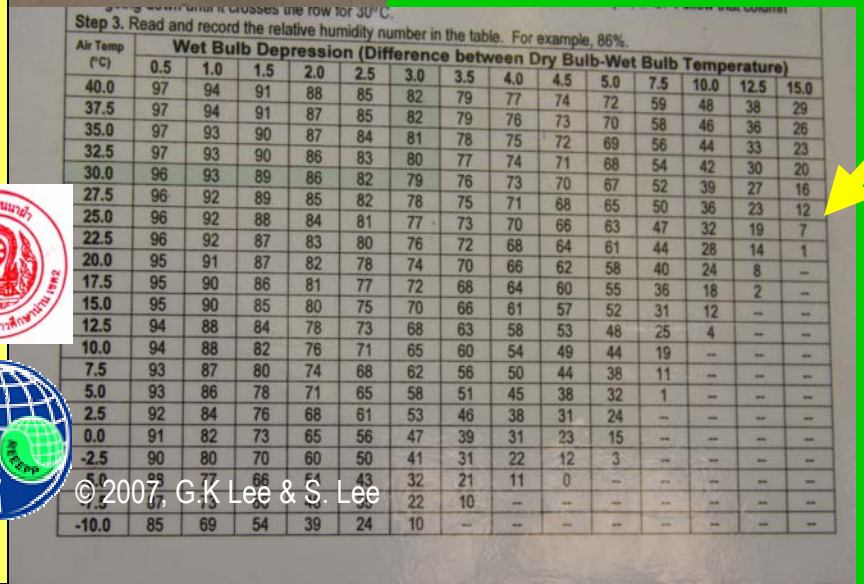


You need two things to measure the temperature and calculate the relative humidity.

The first thing you need is the hygrometer.



Step 3. Read and record the relative humidity number in the table. For example, 86%.

Air Temp (°C)	Wet Bulb Depression (Difference between Dry Bulb-Wet Bulb Temperature)													
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	7.5	10.0	12.5	15.0
40.0	97	94	91	88	85	82	79	77	74	72	59	48	38	29
37.5	97	94	91	87	85	82	79	76	73	70	58	46	36	26
35.0	97	93	90	87	84	81	78	75	72	69	56	44	33	23
32.5	97	93	90	86	83	80	77	74	71	68	54	42	30	20
30.0	96	93	89	86	82	79	76	73	70	67	52	39	27	16
27.5	96	92	89	85	82	78	75	71	68	65	50	36	23	12
25.0	96	92	88	84	81	77	73	70	66	63	47	32	19	7
22.5	96	92	87	83	80	76	72	68	64	61	44	28	14	1
20.0	95	91	87	82	78	74	70	66	62	58	40	24	8	--
17.5	95	90	86	81	77	72	68	64	60	55	36	18	2	--
15.0	95	90	85	80	75	70	66	61	57	52	31	12	--	--
12.5	94	88	84	78	73	68	63	58	53	48	25	4	--	--
10.0	94	88	82	76	71	65	60	54	49	44	19	--	--	--
7.5	93	87	80	74	68	62	56	50	44	38	11	--	--	--
5.0	93	86	78	71	65	58	51	45	38	32	1	--	--	--
2.5	92	84	76	68	61	53	46	38	31	24	--	--	--	--
0.0	91	82	73	65	56	47	39	31	23	15	--	--	--	--
-2.5	90	80	70	60	50	41	31	22	12	3	--	--	--	--
[illegible]	[illegible]	[illegible]	66	[illegible]	43	32	21	11	0	--	--	--	--	--
[illegible]	[illegible]	75	[illegible]	[illegible]	[illegible]	22	10	--	--	--	--	--	--	--
-10.0	85	69	54	39	24	10	--	--	--	--	--	--	--	--

The second thing you need is the Relative Humidity Reference Chart.

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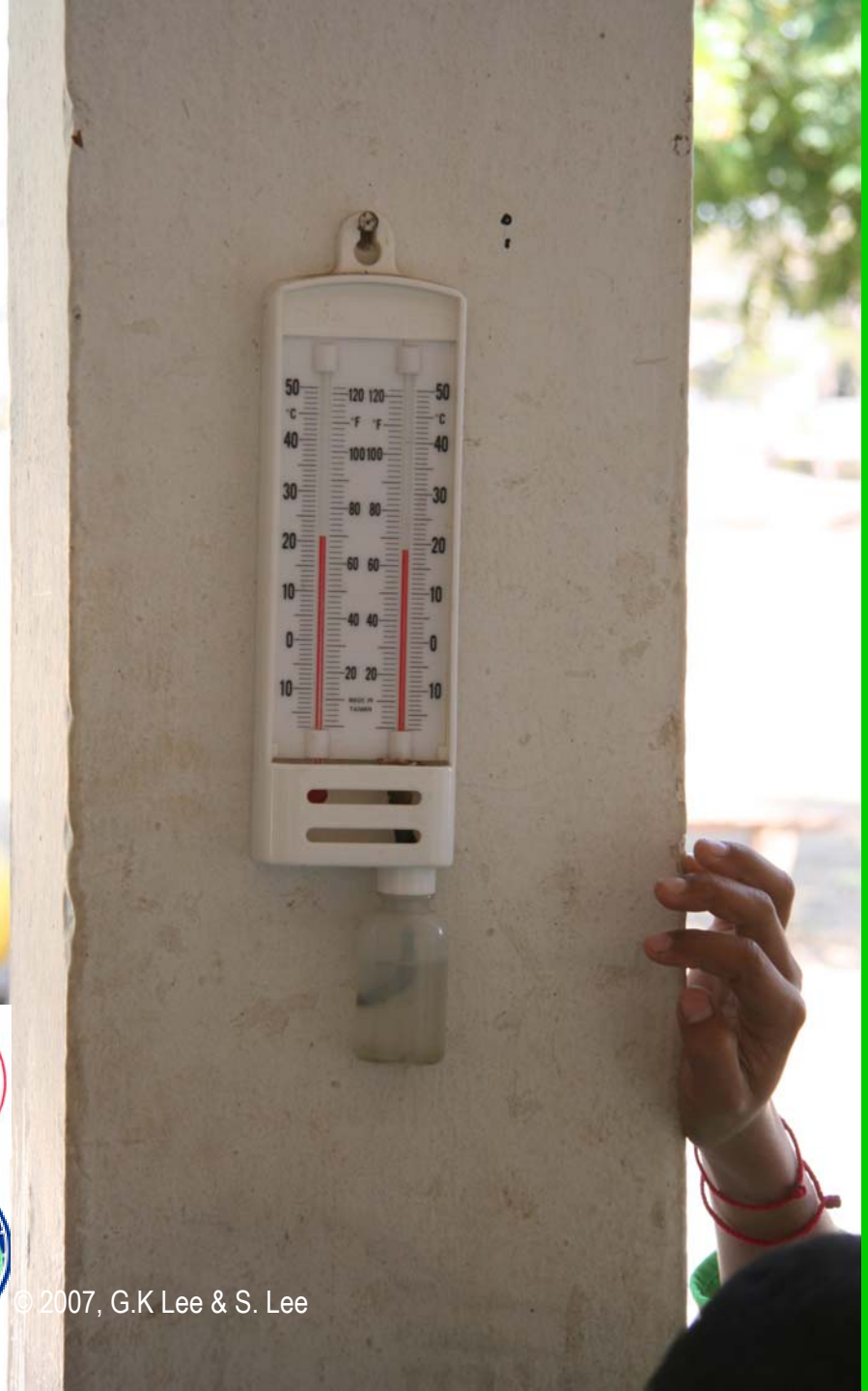

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The hygrometer is outside the Science classroom.

It must be located in the shade and be 1.5 meters above the ground.

This is the international weather science standard.

The Relative Humidity Reference Chart is on the wall outside the Science classroom.

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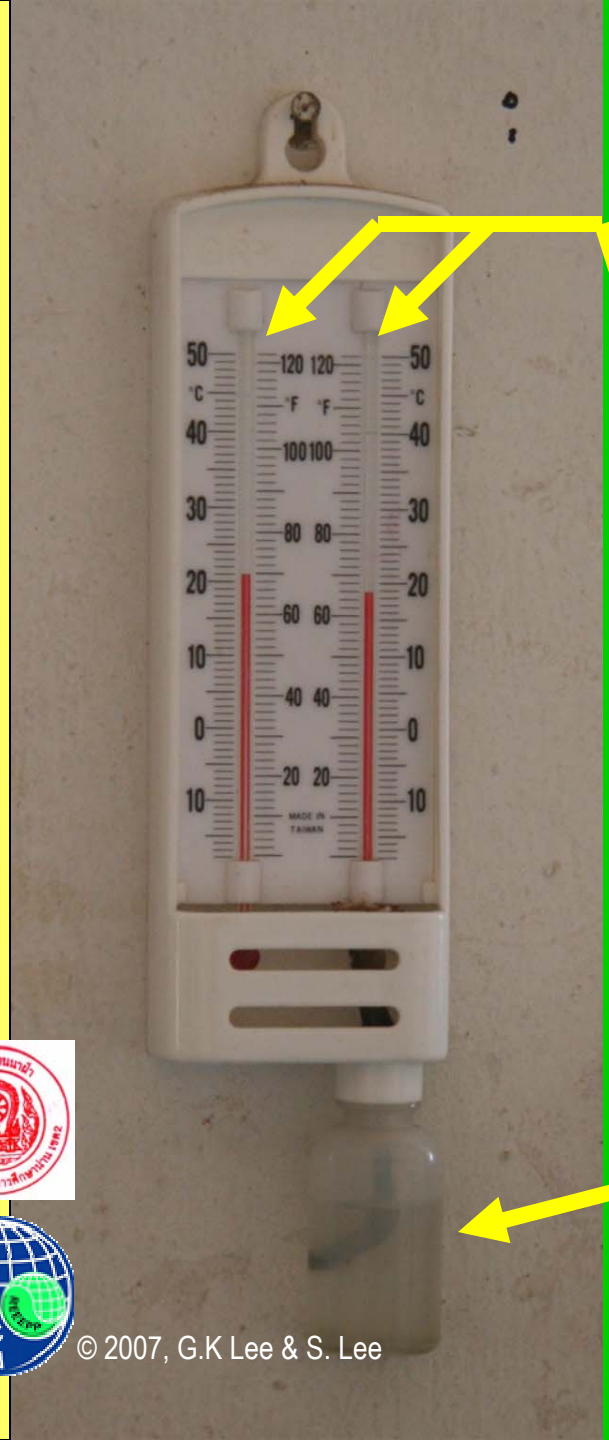

The students will use an instrument called a hygrometer.

It has two thermometers and a bottle of water.

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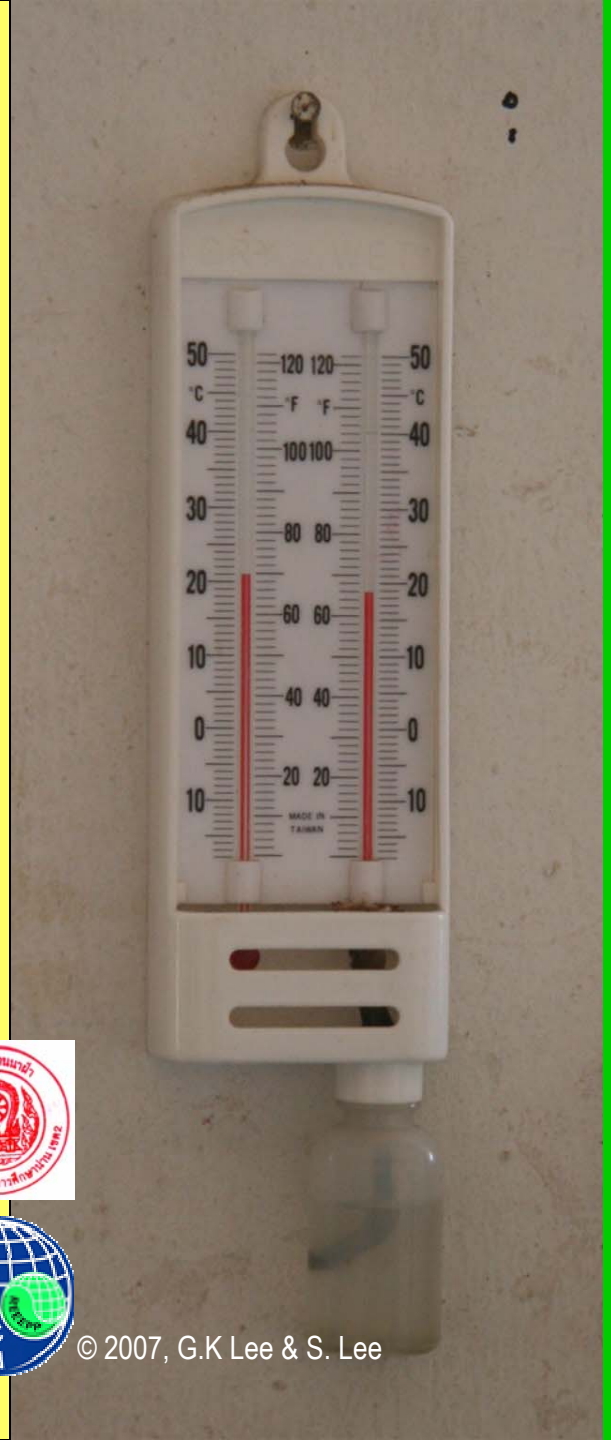

One thermometer is called the Dry Bulb Thermometer.

The other thermometer is called the Wet Bulb Thermometer.

Can you tell which thermometer is which?

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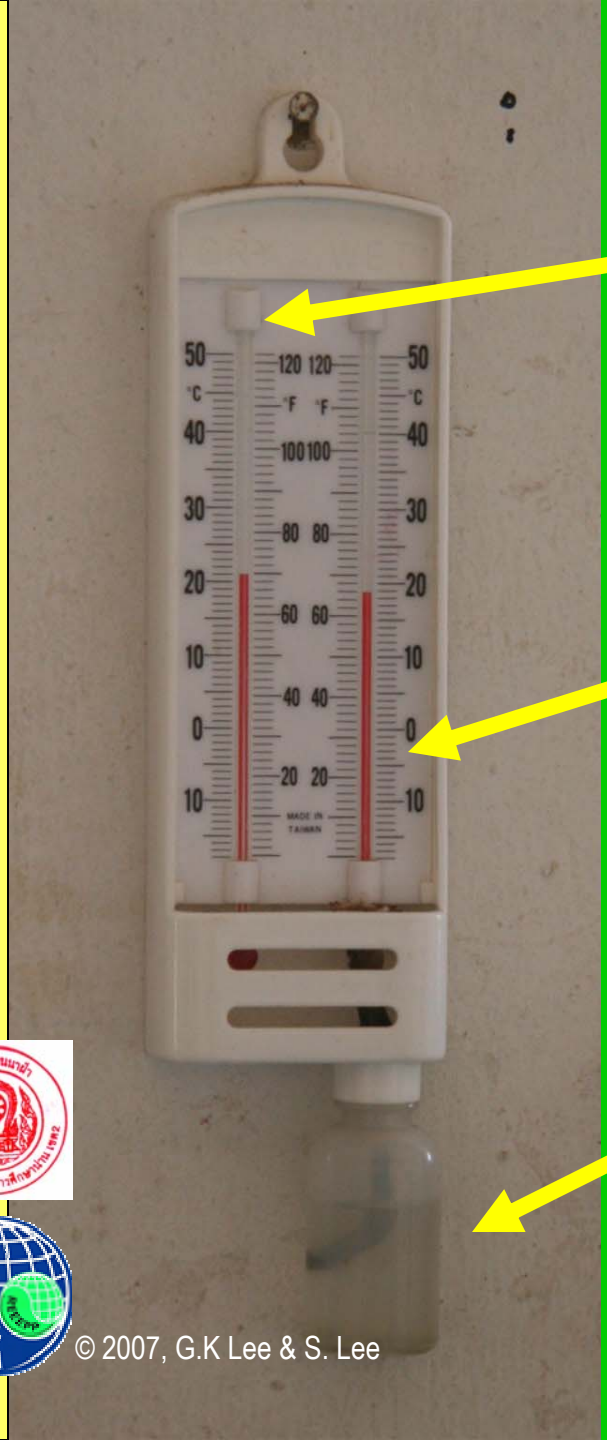

This is the Dry Bulb Thermometer.

This is the Wet Bulb Thermometer. It has the water bottle at the bottom.

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Before making any measurements, check the Wet Bulb Thermometer.

Look at the back of the hygrometer.

The cloth wick around the Wet Bulb Thermometer must be all wet.

There must be water in the bottle.

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You read the Dry Bulb Temperature first.

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Then you read the Wet Bulb Temperature.

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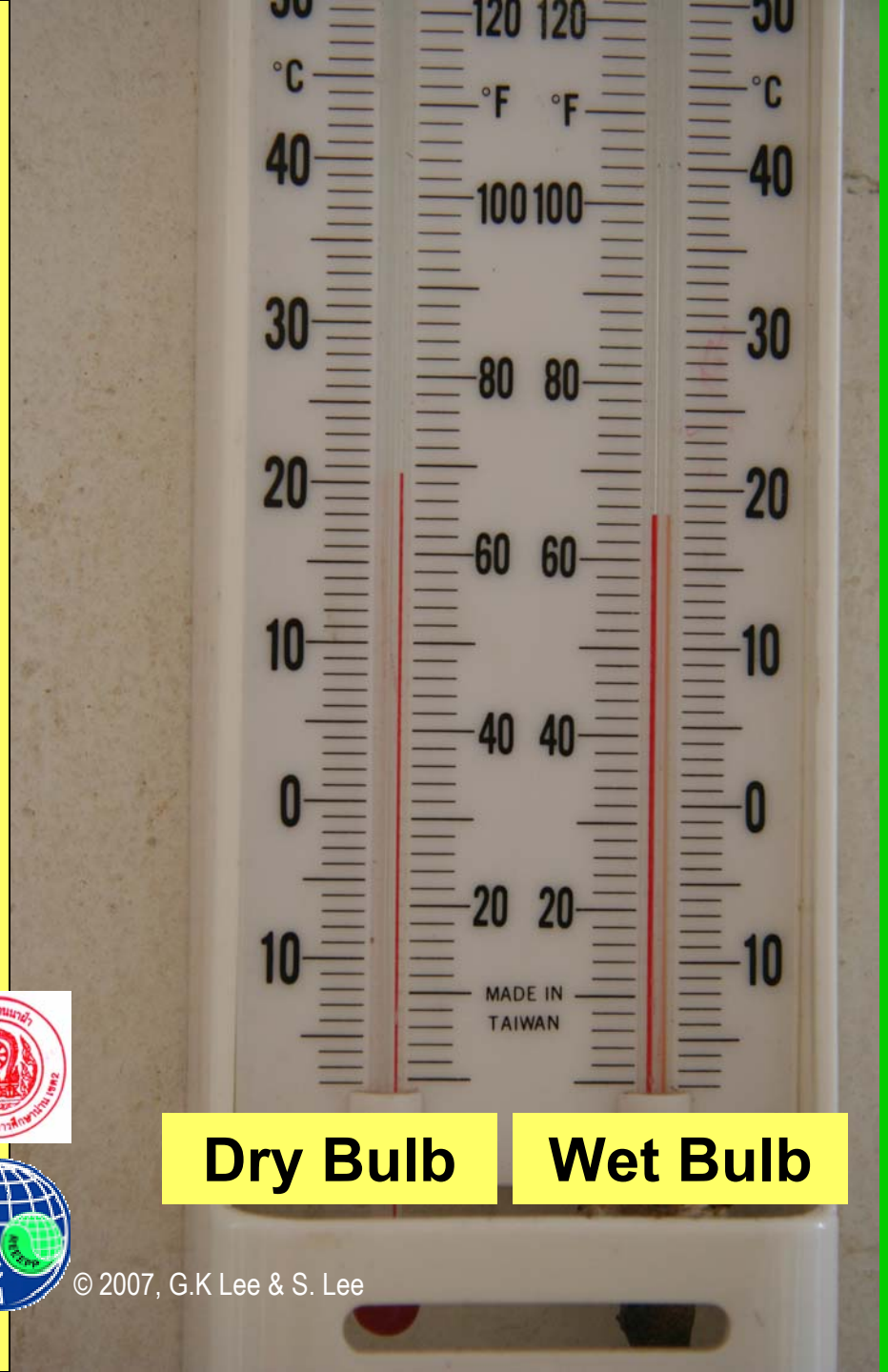

Here is an easy way you can remember the proper order to read the thermometers.

Read them in alphabetical order.

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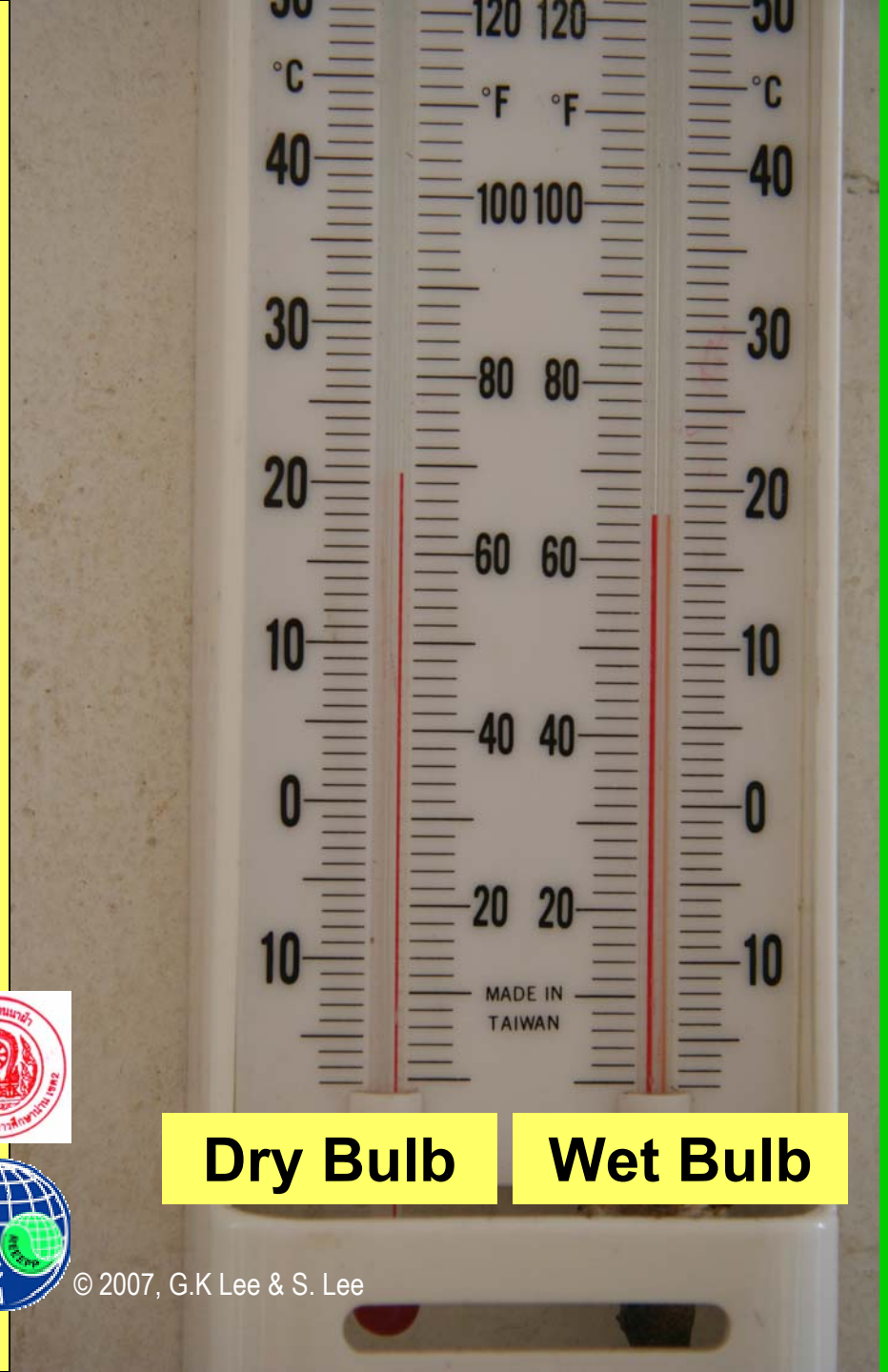

Dry begins with the letter “D.”

Wet begins with the letter “W.”

“D” is before “W” in the alphabet.

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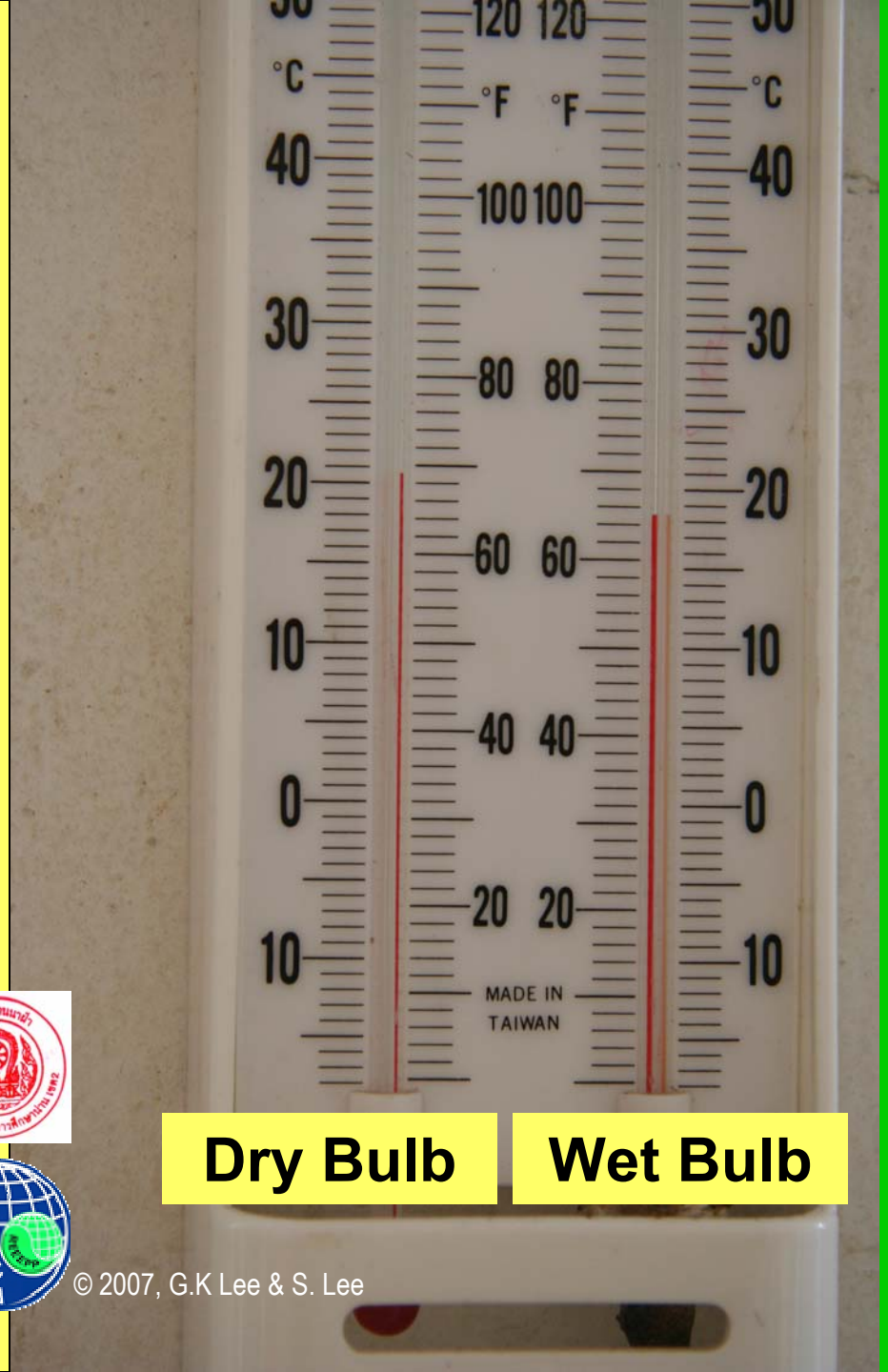

Here is another easy way to remember the proper order.

You read English from left to right.

The Dry Bulb is on the left and the Wet Bulb is on the right.

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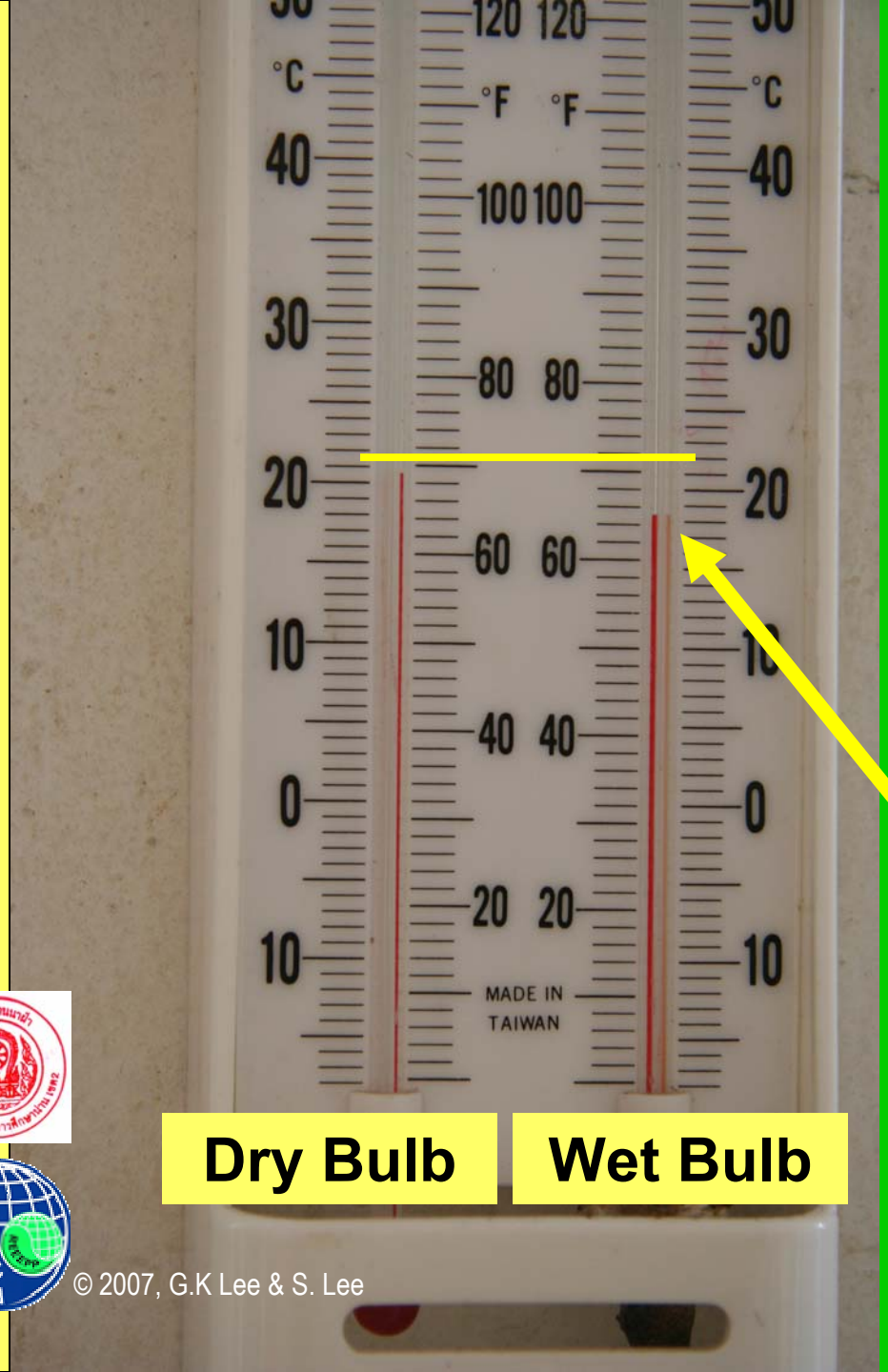

Most of the time, the Wet Bulb temperature will be lower than the Dry Bulb temperature.

That's because the water from the bottle cools the Wet Bulb Thermometer.

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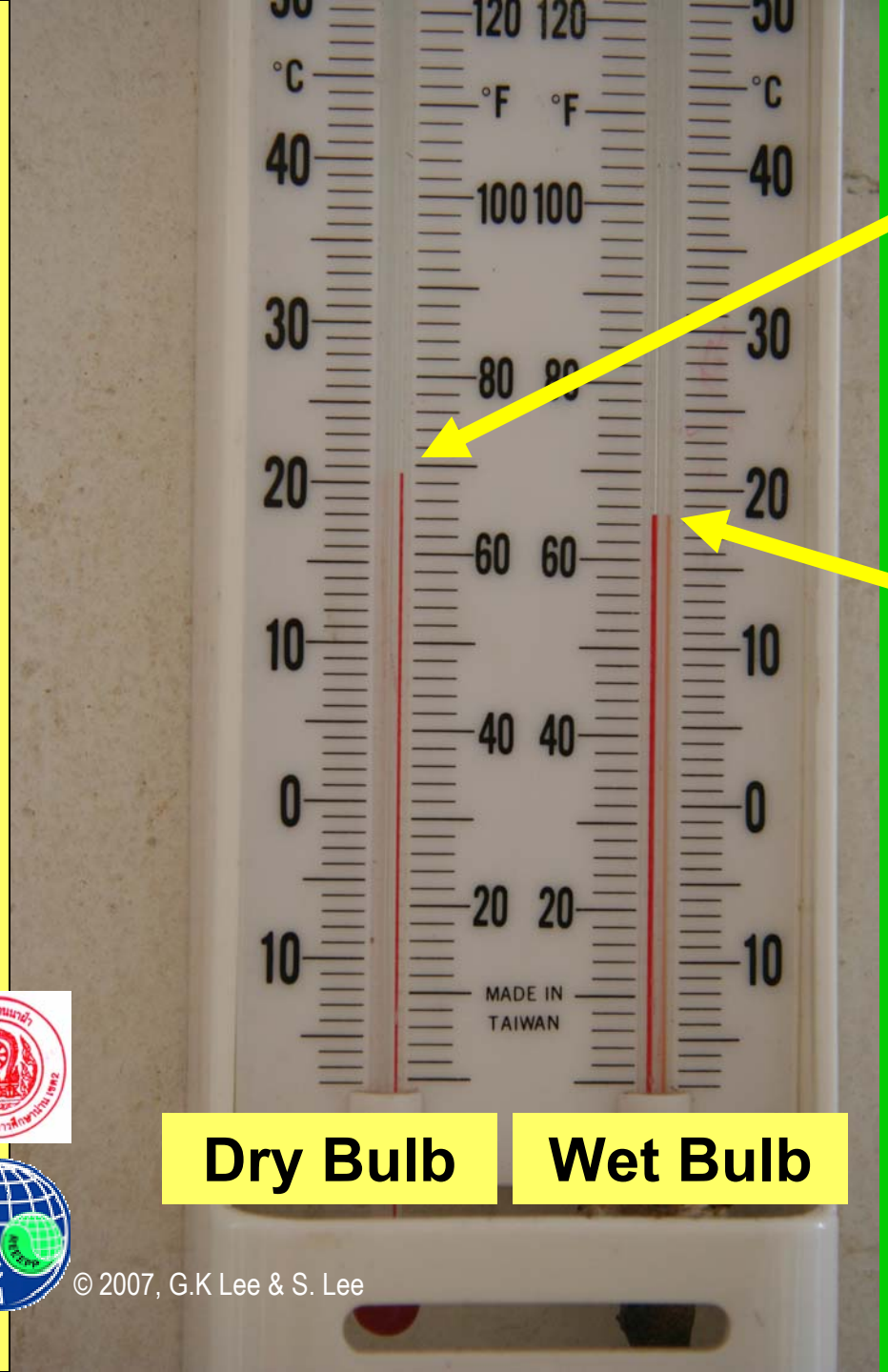

The Dry Bulb temperature is 21 degrees Celsius.

The Wet Bulb Temperature is 19 degrees Celsius.

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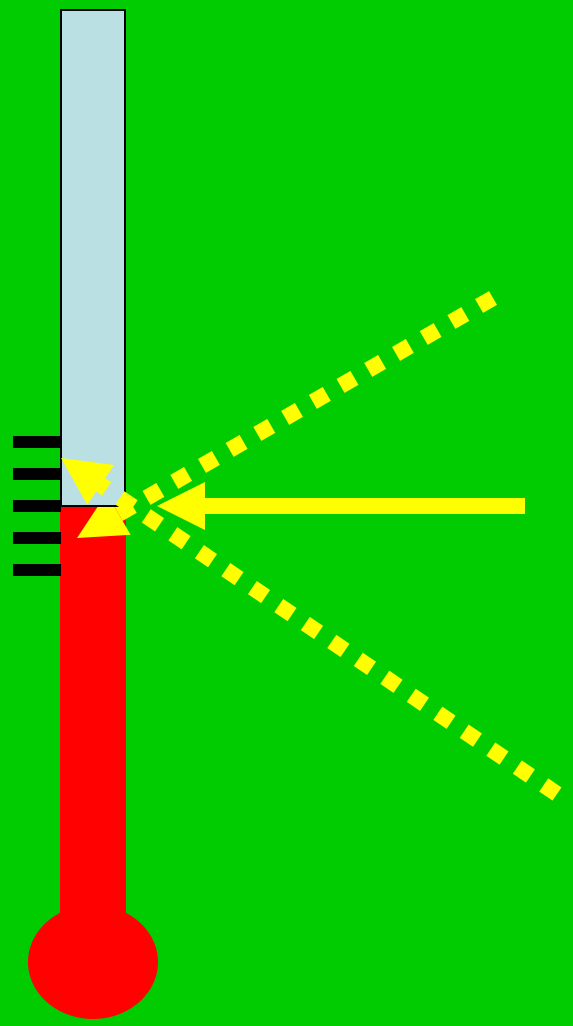

Be sure to read the thermometer accurately.

Your eyes must be level with the red liquid in the thermometer.

If you eyes are above or below the level of the red liquid, the temperature reading will be wrong.

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The students write the measurements on the Record Sheet.

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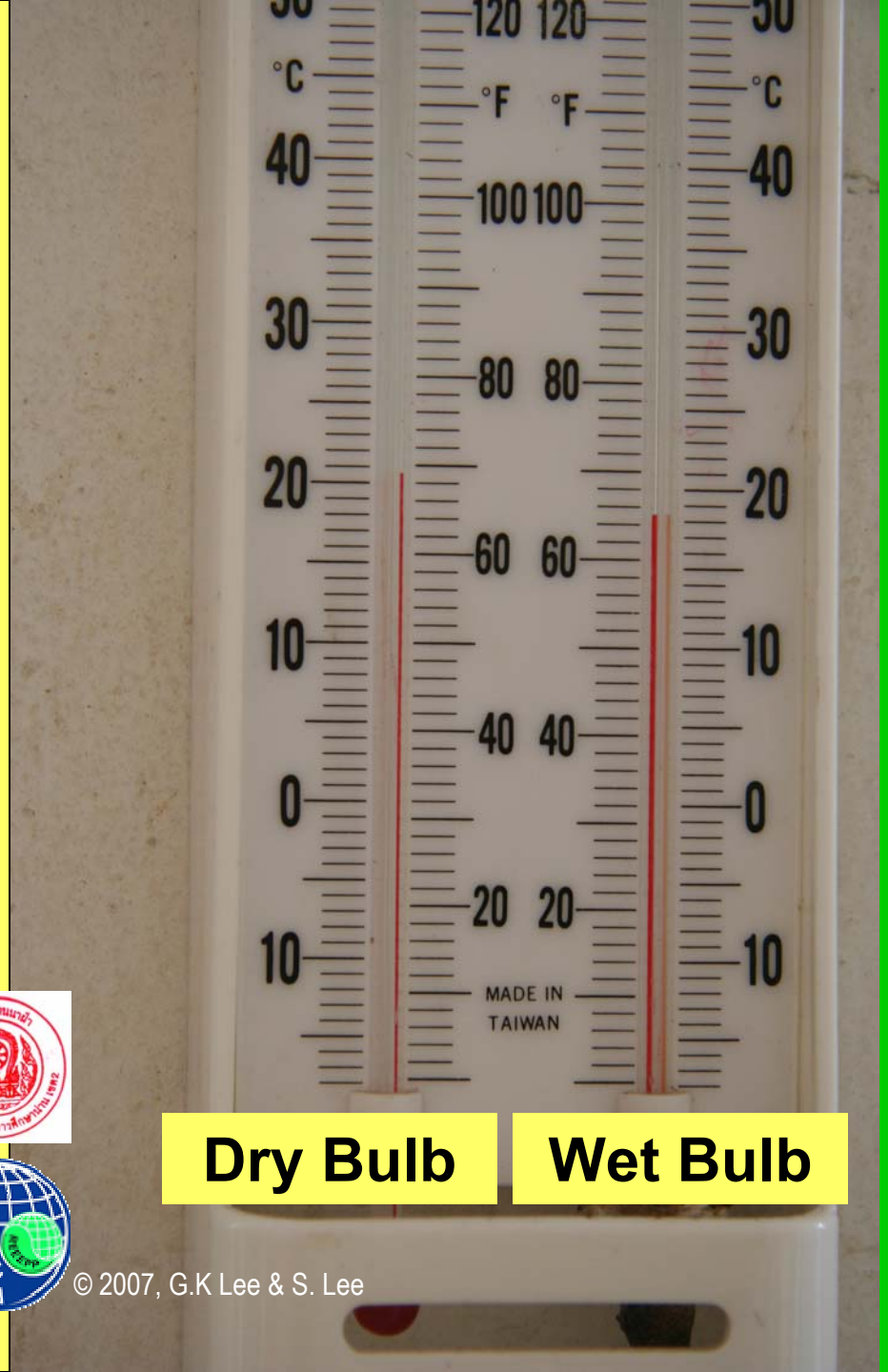

Here is how you can calculate the relative humidity.

First, subtract the Wet Bulb temperature from the Dry Bulb Temperature.

Dry – Wet = Difference

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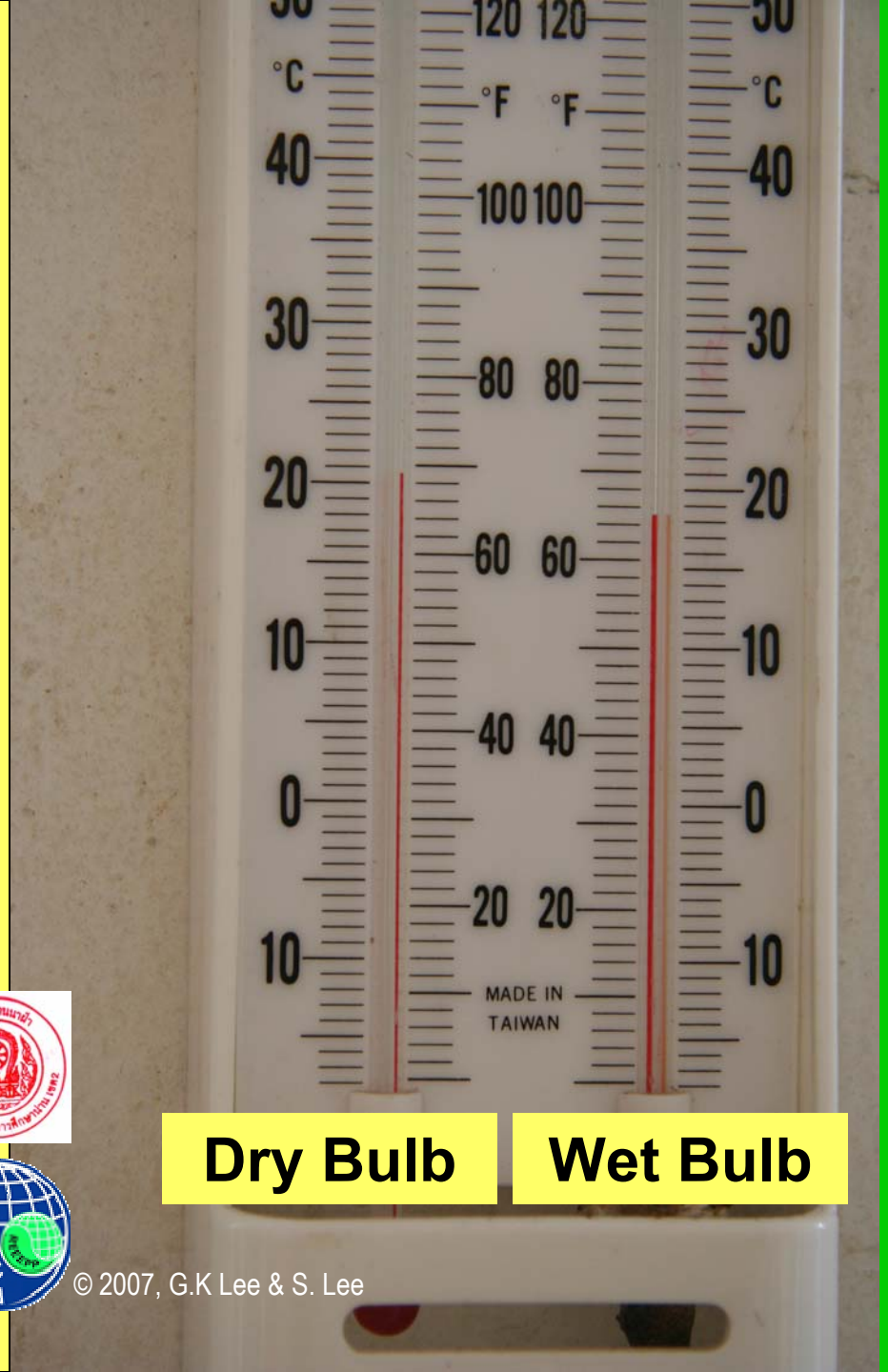

21 – 19 = 2

In this problem, the Difference, “2”, is called the “Wet Bulb Depression.”

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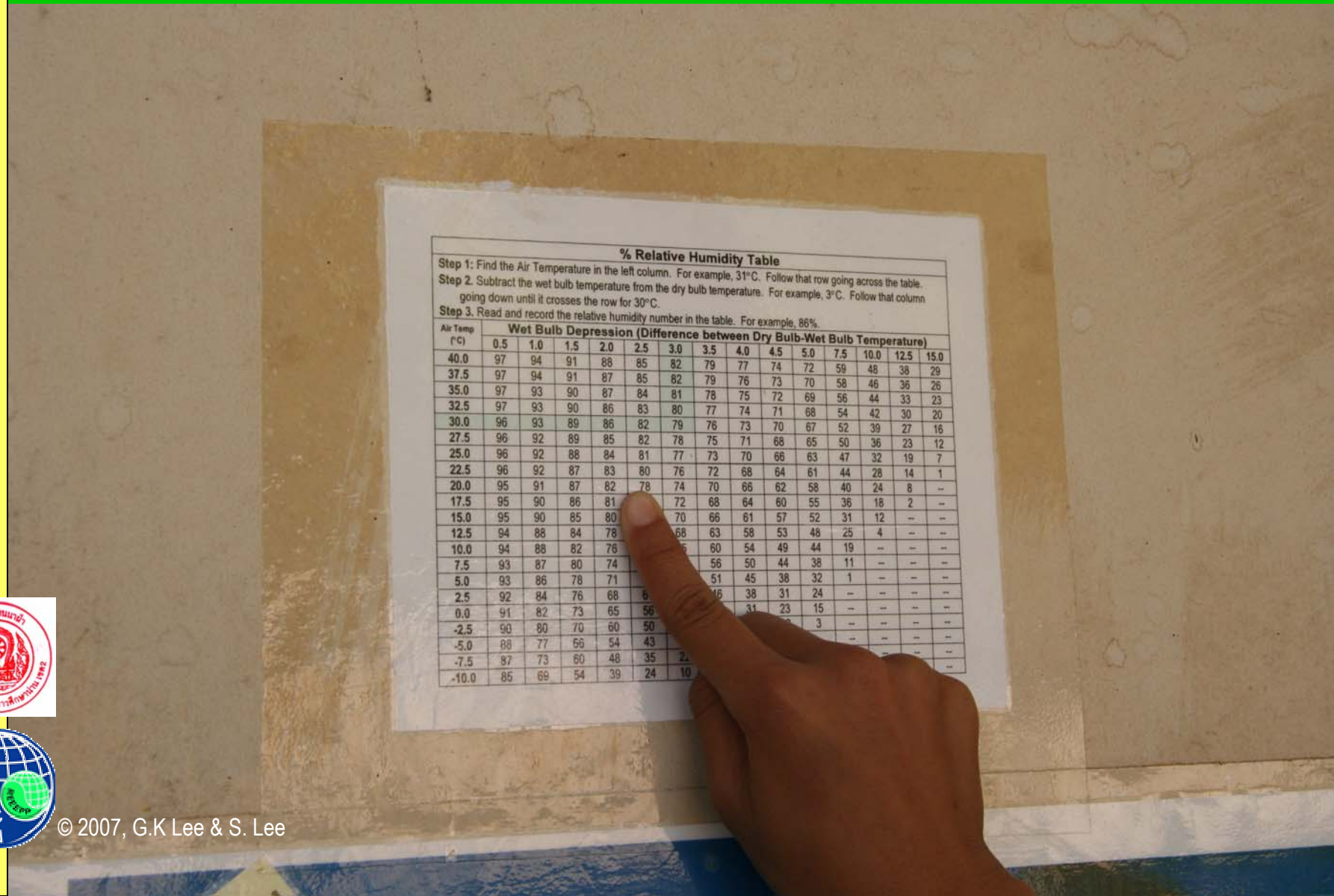
For the second part, you need to use the Relative Humidity Reference Chart.



% Relative Humidity Table

Step 1: Find the Air Temperature in the left column. For example, 31°C. Follow that row going across the table.

Step 2. Subtract the wet bulb temperature from the dry bulb temperature. For example, 3°C. Follow that column going down until it crosses the row for 30°C.

Step 3. Read and record the relative humidity number in the table. For example, 86%.

Air Temp (°C)	Wet Bulb Depression (Difference between Dry Bulb-Wet Bulb Temperature)													
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	7.5	10.0	12.5	15.0
40.0	97	94	91	88	85	82	79	77	74	72	59	48	38	29
37.5	97	94	91	87	85	82	79	76	73	70	58	46	36	26
35.0	97	93	90	87	84	81	78	75	72	69	56	44	33	23
32.5	97	93	90	86	83	80	77	74	71	68	54	42	30	20
30.0	96	93	89	86	82	79	76	73	70	67	52	39	27	16
27.5	96	92	89	85	82	78	75	71	68	65	50	36	23	12
25.0	96	92	88	84	81	77	73	70	66	63	47	32	19	7
22.5	96	92	87	83	80	76	72	68	64	61	44	28	14	1
20.0	95	91	87	82	78	74	70	66	62	58	40	24	8	--
17.5	95	90	86	81	[illegible]	72	68	64	60	55	36	18	2	--
15.0	95	90	85	80	[illegible]	70	66	61	57	52	31	12	--	--
12.5	94	88	84	78	[illegible]	68	63	58	53	48	25	4	--	--
10.0	94	88	82	76	[illegible]	[illegible]	60	54	49	44	19	--	--	--
7.5	93	87	80	74	[illegible]	[illegible]	56	50	44	38	11	--	--	--
5.0	93	86	78	71	[illegible]	[illegible]	51	45	38	32	1	--	--	--
2.5	92	84	76	68	[illegible]	[illegible]	[illegible]	38	31	24	--	--	--	--
0.0	91	82	73	65	[illegible]	[illegible]	[illegible]	[illegible]	23	15	--	--	--	--
-2.5	90	80	70	60	50	[illegible]	[illegible]	[illegible]	[illegible]	3	--	--	--	--
-5.0	88	77	66	54	43	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--	--	--	--
-7.5	87	73	60	48	35	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--	--	--
-10.0	85	69	54	39	24	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--

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Start at the left column and find the Dry Bulb Temperature.

Step 3. Read and record the relative humidity number in the table. For example, 86%.

Air Temp (°C)	Wet Bulb Depression (Difference between Dry Bulb-Wet Bulb Temperature)													
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	7.5	10.0	12.5	15.0
40.0	97	94	91	88	85	82	79	77	74	72	59	48	38	29
37.5	97	94	91	87	85	82	79	76	73	70	58	46	36	26
35.0	97	93	90	87	84	81	78	75	72	69	56	44	33	23
32.5	9	93	90	86	83	80	77	74	71	68	54	42	[illegible]	[illegible]
30.0	96	93	89	86	82	79	76	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27.5	96	92	89	85	82	78	75	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25.0	96	92	88	84	81	77	73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22.5	96	92	87	83	80	76	72	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20.0	95	91	87	82	78	74	70	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17.5	95	90	86	81	77	72	68	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15.0	95	90	85	80	75	70	66	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12.5	94	88	84	78	73	68	63	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10.0	94	88	82	76	71	65	60	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7.5	93	87	80	74	68	62	56	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5.0	93	86	78	71	65	58	51	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2.5	92	84	76	68	61	53	46	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.0	91	82	73	65	56	47	39	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-2.5	90	80	70	60	50	41	31	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
-5.0	88	77	66	54	43	32	21	11	0	--	--	--	--	--
-7.5	87	73	60	48	35	22	10	--	--	--	--	--	--	--
-10.0	85	69	54	39	24	10	--	--	--	--	--	--	--	--

The Dry Bulb Temperature was 21 degrees Celsius. On the chart, use 20.0 because it is the closest number to the measurement.

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Then use the top row and find the Wet Bulb Depression.

Step 3. Read and record the relative humidity number in the table. For example, 86%.

Air Temp (°C)	Wet Bulb Depression (Difference between Dry Bulb-Wet Bulb Temperature)													
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	7.5	10.0	12.5	15.0
40.0	97	94	91	88	85	82	79	77	74	72	59	48	38	29
37.5	97	94	91	87	85	82	79	76	73	70	58	46	36	26
35.0	97	93	90	87	84	81	78	75	72	69	56	44	33	23
32.5	97	93	90	86	83	80	77	74	71	68	54	42	[illegible]	[illegible]
30.0	96	93	89	86	82	79	76	73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27.5	96	92	89	85	82	78	75	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25.0	96	92	88	84	81	77	73	70	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22.5	96	92	87	83	80	76	72	68	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20.0	95	91	87	82	78	74	70	66	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17.5	95	90	86	81	77	72	68	64	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15.0	95	90	85	80	75	70	66	61	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12.5	94	88	84	78	73	68	63	58	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10.0	94	88	82	76	71	65	60	54	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7.5	93	87	80	74	68	62	56	50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5.0	93	86	78	71	65	58	51	45	38	32	[illegible]	--	--	--
2.5	92	84	76	68	61	53	46	38	31	24	--	--	--	--
0.0	91	82	73	65	56	47	39	31	23	15	--	--	--	--
-2.5	90	80	70	60	50	41	31	22	12	3	--	--	--	--
-5.0	88	77	66	54	43	32	21	11	0	--	--	--	--	--
-7.5	87	73	60	48	35	22	10	--	--	--	--	--	--	--
-10.0	85	69	54	39	24	10	--	--	--	--	--	--	--	--

The Wet Bulb Depression was 2 degrees Celsius. On the chart, find 2.0 Celsius.

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Here is how you read the chart.

Step 3. Read and record the relative humidity number in the tab

Air Temp (°C)	Wet Bulb Depression (Difference betw						
	0.5	1.0	1.5	2.0	2.5	3.0	3.5
40.0	97	94	91	88	85	82	79
37.5	97	94	91	87	85	82	79
35.0	97	93	90	87	84	81	78
32.5	97	93	90	86	83	80	77
30.0	96	93	89	86	82	79	76
27.5	96	92	89	85	82	78	75
25.0	96	92	88	84	81	77	73
22.5	96	92	87	83	80	76	72
20.0	95	91	87	82	78	74	70
17.5	95	90	86	81	77	72	68
15.0	95	90	85	80	75	70	66
12.5	94	88	84	78	73	68	63
10.0	94	88	82	76	71	65	60
7.5	93	87	80	74	68	62	56
5.0	93	86	78	71	65	58	51
2.5	92	84	76	68	61	53	46
0.0	91	82	73	65	56	47	39
-2.5	90	80	70	60	50	41	31
-5.0	88	77	66	54	43	32	21
-7.5	87	73	60	48	35	22	10
-10.0	85	69	54	39	24	10	--

- Read down the Wet Bulb Depression column for 2 degrees Celsius.
- Read across the row for the Dry Bulb temperature of 20 degrees Celsius.
- Where the column and the row meet is the relative humidity.

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The relative humidity is 82%.

Step 3. Read and record the relative humidity number in the table. For example, 86%.

Air Temp (°C)	Wet Bulb Depression (Difference between Dry Bulb-Wet Bulb Temperature)													
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	7.5	10.0	12.5	15.0
40.0	97	94	91	88	85	82	79	77	74	72	59	48	38	29
37.5	97	94	91	87	85	82	79	76	73	70	58	46	36	26
35.0	97	93	90	87	84	81	78	75	72	69	56	44	33	23
32.5	97	93	90	86	83	80	77	74	71	68	54	42	30	20
30.0	96	93	89	86	82	79	76	73	70	67	52	39	27	16
27.5	96	92	89	85	82	78	75	71	68	65	50	36	23	12
25.0	96	92	88	84	81	77	73	70	66	63	47	32	19	7
22.5	96	92	87	[illegible]	80	76	72	68	64	61	44	28	14	1
20.0	95	91	87	82	78	74	70	66	62	58	40	24	8	--
17.5	95	90	86	[illegible]	77	72	68	64	60	55	36	18	2	--
15.0	95	90	85	80	75	70	66	61	57	52	31	12	--	--
12.5	94	88	84	78	73	68	63	58	53	48	25	4	--	--
10.0	94	88	82	76	71	65	60	54	49	44	19	--	--	--
7.5	93	87	80	74	68	62	56	50	44	38	11	--	--	--
5.0	93	86	78	71	65	58	51	45	38	32	1	--	--	--
2.5	92	84	76	68	61	53	46	38	31	24	--	--	--	--
0.0	91	82	73	65	56	47	39	31	23	15	--	--	--	--
-2.5	90	80	70	60	50	41	31	22	12	3	--	--	--	--
-5.0	88	77	66	54	43	32	21	11	0	--	--	--	--	--
-7.5	87	73	60	48	35	22	10	--	--	--	--	--	--	--
-10.0	85	69	54	39	24	10	--	--	--	--	--	--	--	--

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The students write down the results.

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The students prepare to report the temperature and humidity to the class.

They are also practicing their English writing.

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The students must give their report in English to the class.

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Their teacher can help them improve their English pronunciation.

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Then they must write their report in English.

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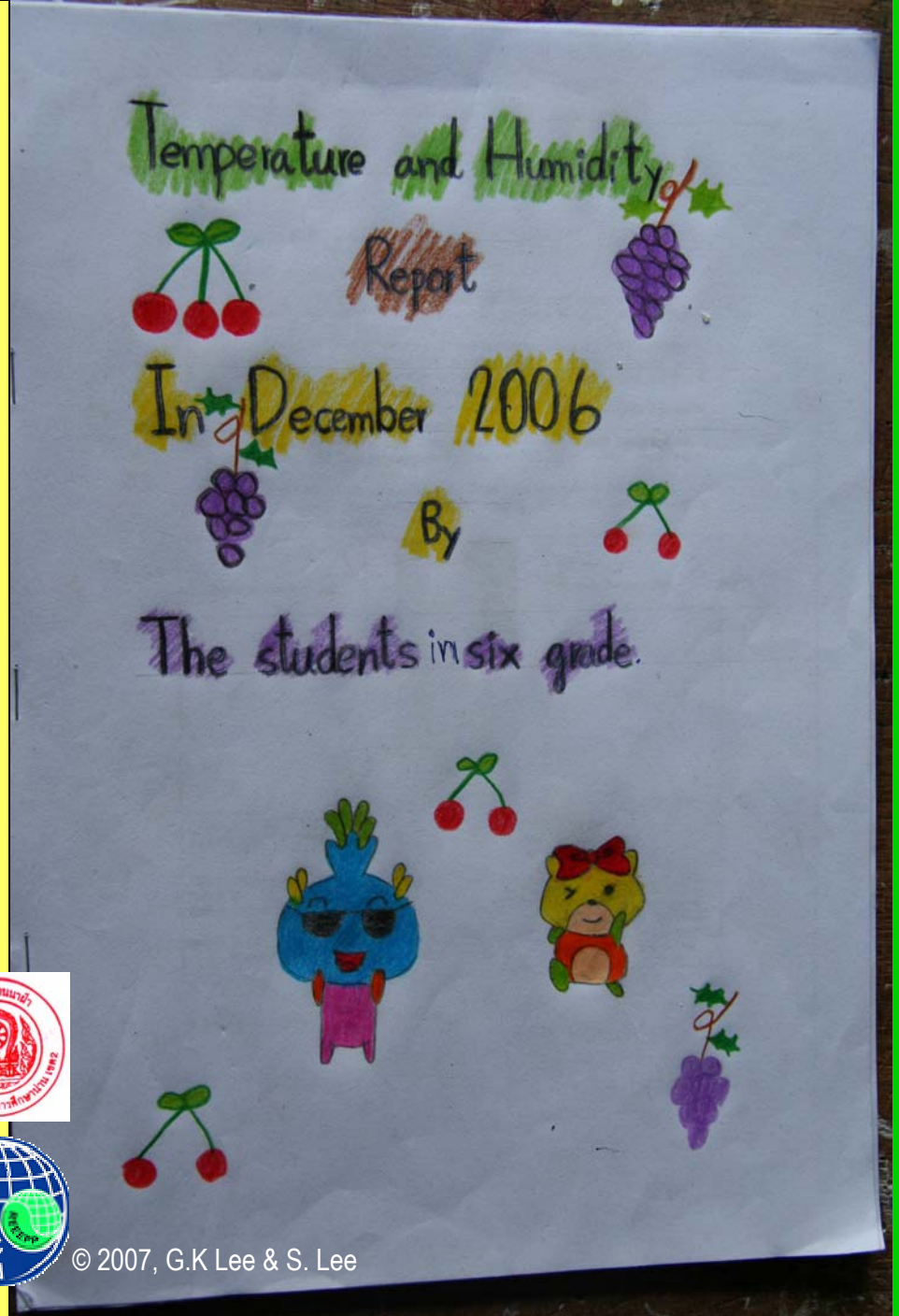

This is the cover for the Temperature and Humidity Report for December 2006.

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RELATIVE HUMIDITY

การวัดความชื้นสัมพัทธ์

Relative humidity is the measurement of how much water vapor is in the air compared to how much water vapor could be in the air, were saturated (Full of water vapor) It is reported as a percentage.

A hygrometer is used to measure relative humidity. It has two thermometers. One thermometer looks like a normal thermometer.

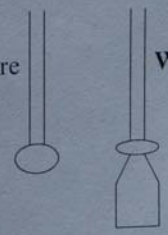
* **Check** the appropriate box for the temperature units you are using for this set of measurements (Celsius or Fahrenheit)

* **Read** and **record** the Dry Bulb Temperature and d the Wet Bulb Temperature.

* Subtract the Wet Bulb temperature from the Dry Bulb temperature. Record the result in the " Differnce "box

* Use the Dry Bulb temperature and the Differnce and refer to the Relative Humidity Table to deermine the reative humidity. Record the relative humidity in the appropriate box.

Dry Bulb temperature



Wet Bulb temperature

Location Nafa School		Date 4th / 1 / 07	
Recorded by Sutida Panide Chenepa		Time 10.30	
		Measurement	Hygrometer
Step1.Read and record Wet Bulb temperature in row B	A	21°	Dry Bulb TEMPERATURE
Step2.Read and record Dry Bulb temperature in row A	B	19°	Wet bulb TEMPERATURE
Step3.Subtract the wet bulb temperature in row (B) from the dry bulb temperature in row (A write the result in C.	C	2	Dry - Wet Bulb TEMPERATURE
Step4.Use the reference table to find the relative humidity record the result in row D.	D	62%	% Relative Humidity

Nafa village Elementary School NASA S'COOL Project.

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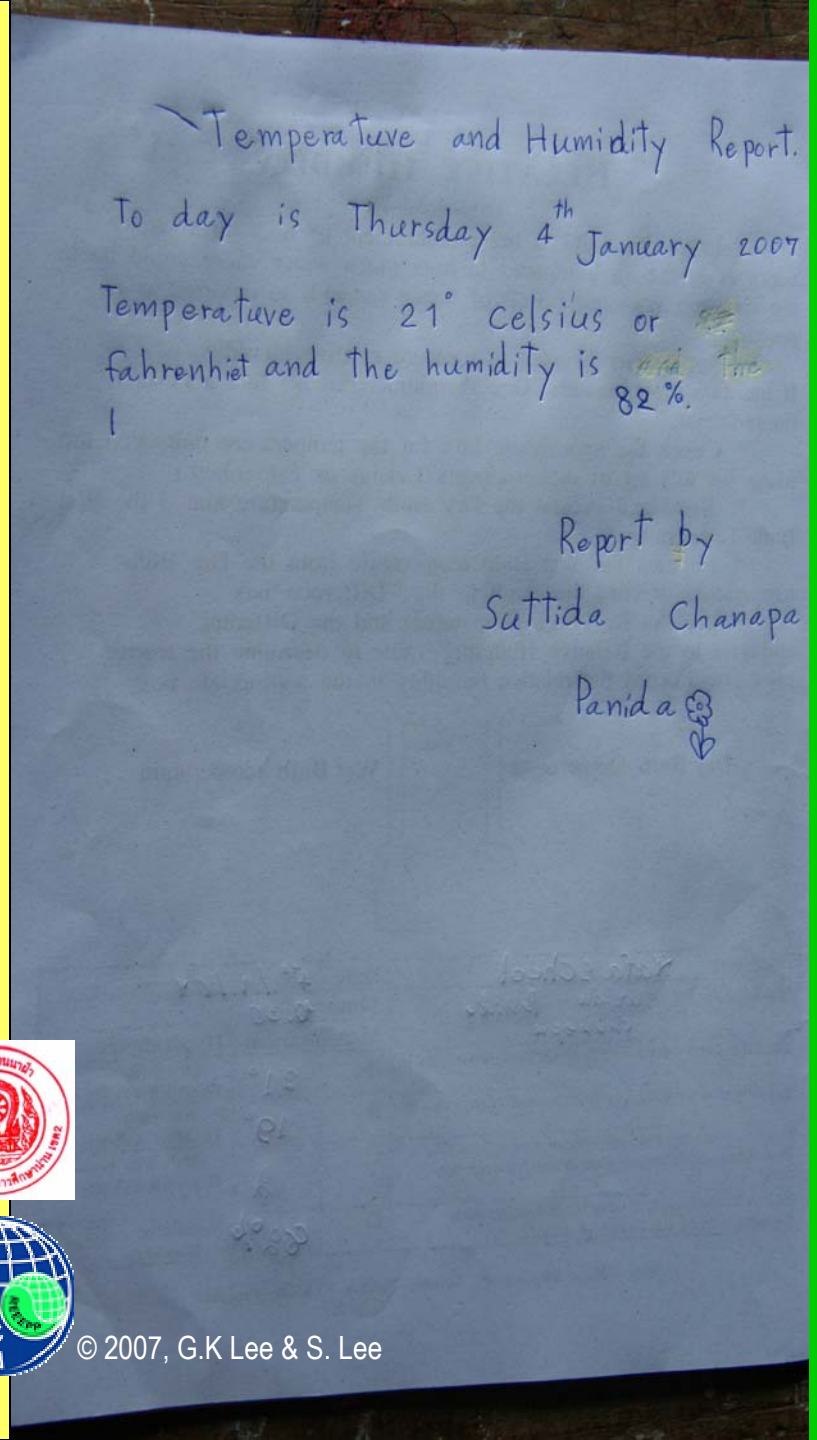
This is the Relative Humidity Record Sheet.

All the instructions are in English.



Temperature and Humidity Report.

To day is Thursday 4th January 2007

Temperature is 21° celsius or
fahrenhiet and the humidity is
82 %.

Report by
Suttida Chanapa
Panida

This is an example of a student report on temperature and relative humidity measurements written in English.

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Thanks to Mr. Wittaya and the Na Fa Elementary School students who helped make this show about the weather observation lessons at their school.

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RTC-TH

Rural Training Center-Thailand is dedicated to providing community-based environmental education for the self-sufficiency and sustainability of small rural family farms.

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The RTC-TH was created to honor the memory of Mr. Tang Suttisan, a father, a farmer, and a man who valued education and used it in starting his family farm.

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REEEPP

Rural Environmental Education Enhancement Pilot Program

An innovative, non-traditional community-based environmental education program integrating math, science, geography, English language, and technology lessons for environmental stewardship using interactive experiential learning in outdoor settings at Ban Na Fa Elementary School, Nan Province, Thailand.

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The End

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