

ESCI 1010 Lab 2 Energy and Temperature

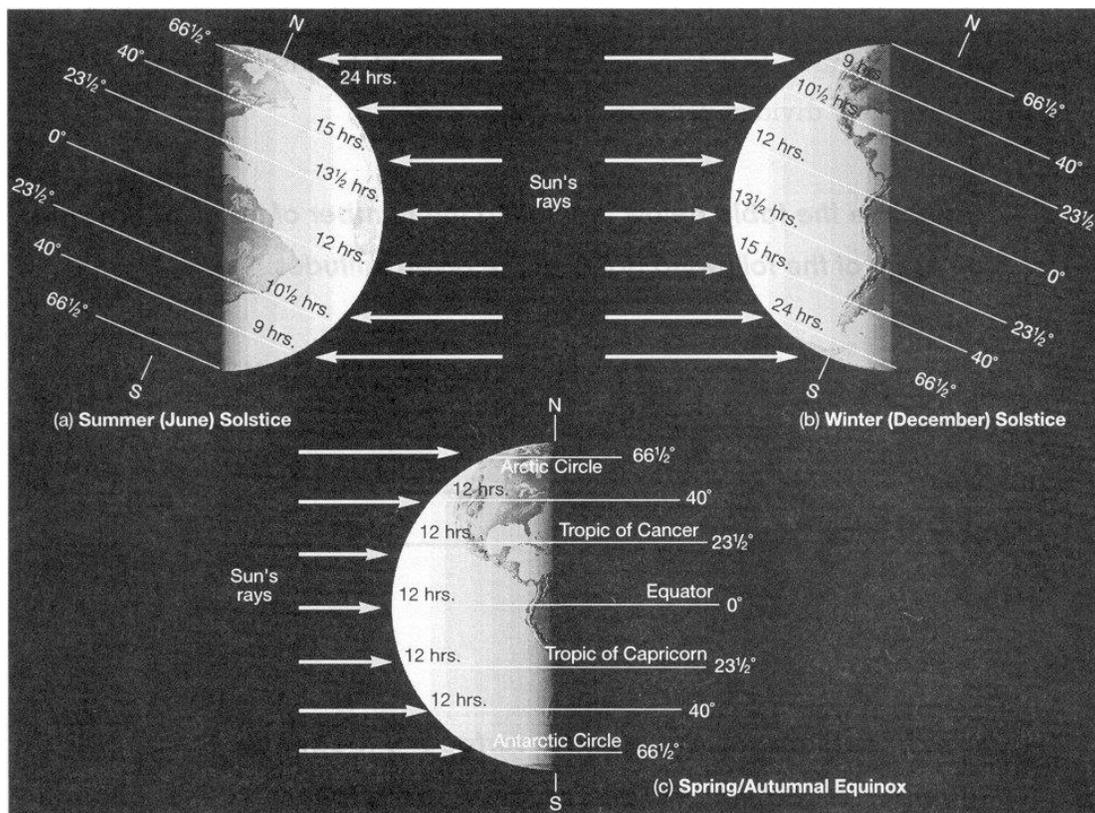
Before Lab: Review pages 62-105 in your Weather and Climate textbook. Pay special attention to the sections entitled “Effects of Earth’s Changing Orientation”, “Global Temperature Distributions”, “Daily and Annual Temperature Patterns”, and “Some Useful Temperature Indices”.

Summary: The temperature of the planet at any given time is dependent upon the amount of sunlight that is received. This lab will stress key topics on energy and temperature from chapters 3 and 4 in the textbook, but you will also need to refer back to temperature scales in chapter 2 (page 46).

LAB EXERCISE

1. Using the figure below, complete the following table indicating the number of hours of daylight on each of the following dates at the given latitudes:

	0°	40°S	66 ½°S	40°N	66 ½°N
June Solstice					
Equinoxes					
December Solstice					



2. Given your answers to question 1, why is the Northern Hemisphere warmer in June and colder in December?

3. Given your answers to question 1, if the tilt of Earth's axis was completely removed, what would happen to the seasons?

4. Why is the North Pole not warmer than areas closer to the equator during the June Solstice (hint: remember the number of sunlight hours is not the only variable that impacts temperature; see textbook page 74)?

5. Draw a typical daily temperature curve during a sunny day (see pages 98 and 99 of the textbook if needed).

6. When does the low temperature for the day typically occur? When does the high temperature for the day typically occur?

7. Why do the low and high temperatures typically occur during those times?

8. How would the curve you drew in question 5 change if the sky was cloudy all day?

9. There are three temperature scales used in meteorology (°C, °F, and K). Use the formulas on page 46 of the textbook to fill in the table below.

°C	°F	K
		303
20		
	75	
		270
	0	
39		

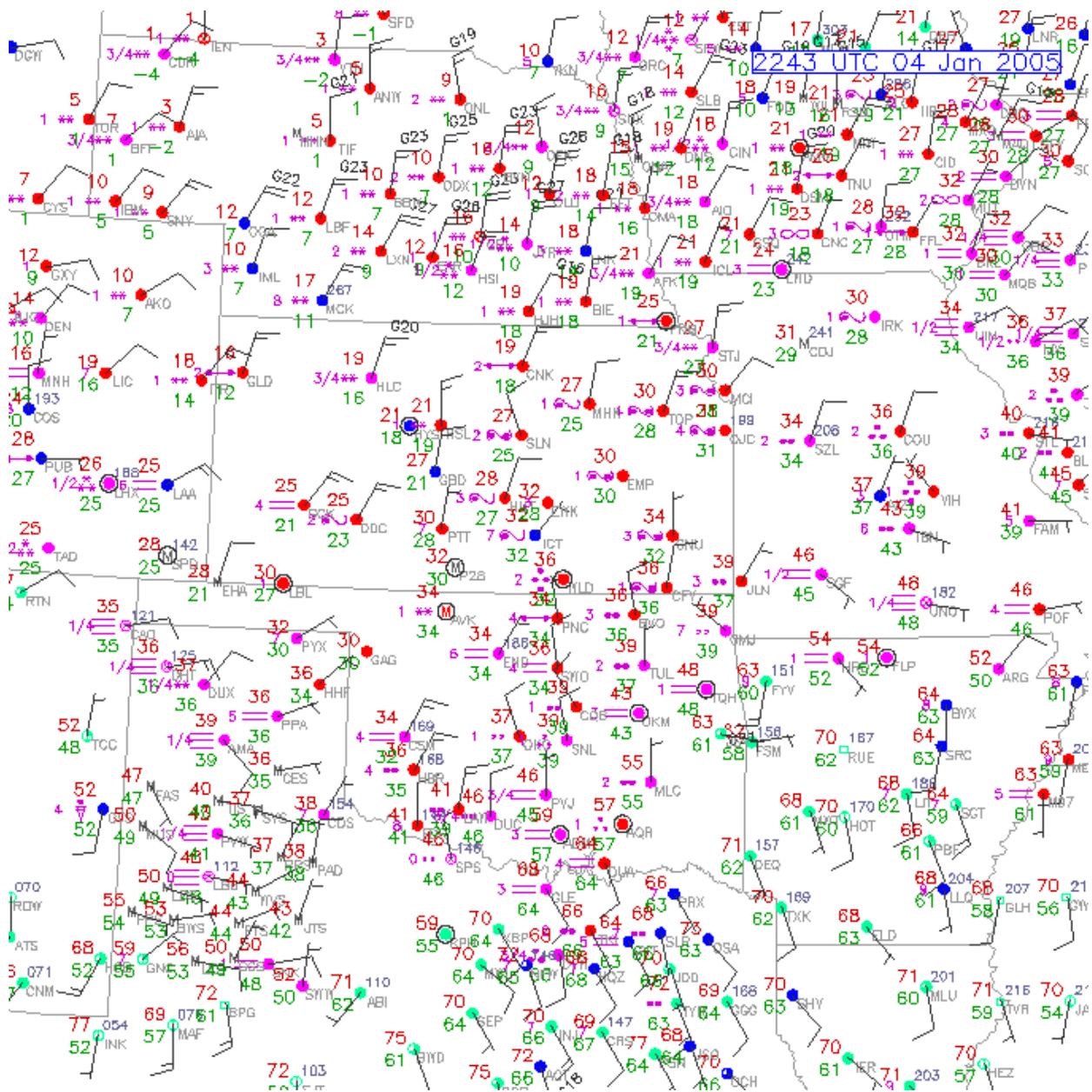
10. Using Table 1 on page 5, find heat index values for the following temperature and relative humidity conditions:

Temperature (°F)	Relative Humidity (%)	Heat Index
90	60	
102	40	
86	75	

11. Using Table 2 on page 5, find wind chill index values for the following temperature and wind speed conditions:

Temperature (°F)	Wind Speed (mph)	Wind Chill Index
30	30	
10	20	
0	15	

12. Draw isotherms (lines of equal temperature) at 10°F intervals starting at 70°F on the map below (i.e., draw 70°F, 60°F, 50°F, 40°F, etc. lines). Remember the temperature is the value in the upper-left of the station model plot, and that a 50°F isotherm will separate temperatures above 50°F from those below 50°F (40°F separates temperatures above 40°F from those below 40°F and so on).



13. On the map above, circle the highest temperature gradient.

		Relative Humidity (%)												
		40	45	50	55	60	65	70	75	80	85	90	95	100
Temperature (°F)	110	136												
	108	130	137											
	106	124	130	137										
	104	119	124	131	137									
	102	114	119	124	130	137								
	100	109	114	118	124	129	136							
	98	105	109	113	117	123	128	134						
	96	101	104	108	112	116	121	126	132					
	94	97	100	102	106	110	114	119	124	129	135			
	92	94	96	99	101	105	108	112	116	121	126	131		
	90	91	93	95	97	100	103	106	109	113	117	122	127	132
	88	88	89	91	93	95	98	100	103	106	110	113	117	121
	86	85	87	88	89	91	93	95	97	100	102	105	108	112
	84	83	84	85	86	88	89	90	92	94	96	98	100	103
	82	81	82	83	84	84	85	86	88	89	90	91	93	95
	80	80	80	81	81	82	82	83	84	84	85	86	86	87

Table 1. Table of heat index values with associated temperature and relative humidity values.

		Wind (mph)											
		Calm	5	10	15	20	25	30	35	40	45	50	55
Temperature (°F)	40	36	34	32	30	29	28	28	27	26	26	25	25
	35	31	27	25	24	23	22	21	20	19	19	18	17
	30	25	21	19	17	16	15	14	13	12	12	11	10
	25	19	15	13	11	9	8	7	6	5	4	4	3
	20	13	9	6	4	3	1	0	-1	-2	-3	-3	-4
	15	7	3	0	-2	-4	-5	-7	-8	-9	-10	-11	-11
	10	1	-4	-7	-9	-11	-12	-14	-15	-16	-17	-18	-19
	5	-5	-10	-13	-15	-17	-19	-21	-22	-23	-24	-25	-26
	0	-11	-16	-19	-22	-24	-26	-27	-29	-30	-31	-32	-33
	-5	-16	-22	-26	-29	-31	-33	-34	-36	-37	-38	-39	-40
	-10	-22	-28	-32	-35	-37	-39	-41	-43	-44	-45	-46	-48
	-15	-28	-35	-39	-42	-44	-46	-48	-50	-51	-52	-54	-55
	-20	-34	-41	-45	-48	-51	-53	-55	-57	-58	-60	-61	-62
	-25	-40	-47	-51	-55	-58	-60	-62	-64	-65	-67	-68	-69
	-30	-46	-53	-58	-61	-64	-67	-69	-71	-72	-74	-75	-76
	-35	-52	-59	-64	-68	-71	-73	-76	-78	-79	-81	-82	-84
-40	-57	-66	-71	-74	-78	-80	-82	-84	-86	-88	-89	-91	
-45	-63	-72	-77	-81	-84	-87	-89	-91	-93	-95	-97	-98	

Table 2. Table of wind chill index values with associated temperature and wind speed values.