

Name: \_\_\_\_\_ Laboratory Section: \_\_\_\_\_  
Date: \_\_\_\_\_ Score/Grade: \_\_\_\_\_

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Exercise 7  
Pre-Lab Video



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## LAB EXERCISE

# Temperature Concepts

## Lab Exercise and Activities

### SECTION 1

#### Temperature Concepts, Terms, and Measurements

1. Using the given conversion formulas, complete the following temperature conversions. The first answer is provided for you in bracketed italics.

25°C 77°F\*      30°F -1.1°C      -18°C -0.4°C      -9°F -12.7°C  
4°C 39.2°F      92°F 33.4°C      57°C 134.6°F      57°F 13.8°C  
134°F 56.6°C      59°F 15°C      0°C 32°F      15°C 59°F

\* {°F = [(25° × 1.8) + 32°] = (45° + 32°) = 77° F}

2. Using the given conversion formulas, complete the following degree conversions.

5 F° 9 C°      25 C° 13.8 F°      15 F° 27 C°      18 C° 10 F°  
6 C° 3.3 F°      90 F° 162 C°      27 C° 15 F°      32 F° 57.6 C°

3. What temperature is it as you work on this lab exercise? *personal answers*

- a) Outdoor temperature? \_\_\_\_\_°C      \_\_\_\_\_°F  
b) Indoor temperature? \_\_\_\_\_°C      \_\_\_\_\_°F

4. Using a physical geography text, an atlas, an encyclopedia, or the Internet, answer the following. Be sure to list temperature record, date, and place.

- a) Highest natural temperature recorded on Earth (where and value)?

*Highest natural temperature recorded in North America, July 10, 1913, Death Valley, California, 57°C (134°F). Causative factors are interior Basin and Range continentality, high pressure system, continental air mass, and descending air heated by compression in below sea-level valley.*

- b) Lowest natural temperature recorded on Earth (where and value)?

*Lowest natural temperature recorded on Earth, July 21, 1983, Vostok, Antarctica, -89°C (-129°F). Causative factors are polar high pressure, dry, cold, stable Antarctic air mass (AA) and continentality.*

- c) Lowest natural temperature recorded for the Northern Hemisphere?

*Lowest natural temperature recorded for the Northern Hemisphere, February 7, 1892, Verkhoyansk, Russia,  $-68^{\circ}\text{C}$  ( $-90^{\circ}\text{F}$ ). Causative factors are Siberian high pressure system (modified polar high), cold, dry air and extreme continentality.*

- d) Highest natural temperature recorded for the Southern Hemisphere?

*Highest natural temperature recorded in the Southern Hemisphere, January 2, 1960, Oodnadatta, Australia,  $50.7^{\circ}\text{C}$  ( $123^{\circ}\text{F}$ ).*

## SECTION 2

### The Temperatures We Feel

1. Use the wind chill chart in Figure 7.1 to determine the wind chill temperature for each of the following examples:

- |   | $^{\circ}\text{C}$                      | $(^{\circ}\text{F})$                      |
|---|---|---|
| a) Wind speed: 24 kmph, air temperature: $-34^{\circ}\text{C}$ = wind-chill temp: | <u><math>-50^{\circ}\text{C}</math></u> | <u><math>(-58^{\circ}\text{F})</math></u> |
| b) Wind speed: 48 kmph, air temperature: $-7^{\circ}\text{C}$ = wind-chill temp:  | <u><math>-17^{\circ}\text{C}</math></u> | <u><math>(1^{\circ}\text{F})</math></u>   |
| c) Wind speed: 8 kmph, air temperature: $+4^{\circ}\text{C}$ = wind-chill temp:   | <u><math>2^{\circ}\text{C}</math></u>   | <u><math>(36^{\circ}\text{F})</math></u>  |
| d) Wind speed: 56 kmph, air temperature: $-23^{\circ}\text{C}$ = wind-chill temp: | <u><math>-41^{\circ}\text{C}</math></u> | <u><math>(-41^{\circ}\text{F})</math></u> |

2. Competitive downhill ski racers are subjected to severe wind chill, and so are average skiers and snowboarders, to a lesser degree. Assuming a downhill racer is going 80 kmph (50 mph), which is coasting on some runs, and the air temperature is  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ), what is the wind chill the skier is feeling on any exposed skin?

**$-35^{\circ}\text{C}$  ( $-31^{\circ}\text{F}$ )**

What is the skier's time to experience frostbite, given these conditions?

**10 minutes**

3. Use the heat index chart in Figure 7.2 to determine the heat index temperature for each of the following examples:

- |   | $^{\circ}\text{C}$                       | $(^{\circ}\text{F})$                      |
|---|--|---|
| a) Air temperature: $37.8^{\circ}\text{C}$ , relative humidity 5% = heat index temp:  | <u><math>33.3^{\circ}\text{C}</math></u> | <u><math>(92^{\circ}\text{F})</math></u>  |
| b) Air temperature: $32.2^{\circ}\text{C}$ , relative humidity 80% = heat index temp: | <u><math>43.3^{\circ}\text{C}</math></u> | <u><math>(110^{\circ}\text{F})</math></u> |
| c) Air temperature: $32.2^{\circ}\text{C}$ , relative humidity 90% = heat index temp: | <u><math>54.4^{\circ}\text{C}</math></u> | <u><math>(130^{\circ}\text{F})</math></u> |
| d) Air temperature: $43.3^{\circ}\text{C}$ , relative humidity 10% = heat index temp: | <u><math>40.5^{\circ}\text{C}</math></u> | <u><math>(105^{\circ}\text{F})</math></u> |

4. List the temperatures and heat index categories you would experience if the temperature stayed a constant 35°C (95°F) but the relative humidity dropped from 90% down to 10%. List the temperatures and heat index categories at each drop of 10% relative humidity (90%, 80%, 70%...).

*90% 130°+ Category I,  
80% 130° Category I,  
70% 125° Category II,  
60% 110° Category II,  
50% 105° Category II,  
40% 100° Category III,  
30% 97° Category III,  
20% 93° Category III,  
10% 90° Category IV,  
0% 86° Category IV*

## SECTION 3

**Temperature Readings** *Personal answers for Section 3.*