PROBLEM SET 0

1) **Text, Problem 1.1**

2) Derive the formula for converting from ℃ to K temperature scales

3) Calculate the temperature at which the Fahrenheit and Kelvin numerical values are the same.
Hint: use the result from **Text, Problem 1.1** and 2)

4) **Text, Problem 1.8** — Only do part (a).
Assume cold winter night is T = -30 ℃ and hot summer day is T= 40 ℃.

5) How many milliliters of water at 23 °C with a density of 1.00 g/mL must be mixed with 180 mL (about 6 oz) of coffee at 95 °C so that the resulting combination will have a temperature of 60 °C? Assume that coffee and water have the same density and the same specific heat (4.184 J/g °C).

6) **Text, Problem 1.41**

7) **Text, Problem 1.47**

8) **Text, Problem 1.48** – note that 1000 W/m2 means that 1000 Joules of radiant energy are supplied by the sun per second over an area of 1 square meter.

9) A 500-mL bottle of water at room temperature and a 2-L bottle of water at the same temperature were placed in a refrigerator. After 30 minutes, the 500-mL bottle of water had cooled to the temperature of the refrigerator. An hour later, the 2-L of water had cooled to the same temperature. When asked which sample of water lost the most heat, Student A replied that both bottles lost the same amount of heat because they started at the same temperature and finished at the same temperature. Student B thought that the 2-L bottle of water lost more heat because there was more water. A third student believed that the 500-mL bottle of water lost more heat because it cooled more quickly. A fourth

student thought that it was not possible to tell because we do not know the initial temperature and the final temperature of the water. Indicate which of these answers is correct and describe the error in each of the other answers.

10) A 45-g aluminum spoon (specific heat 0.88 J/g °C) at 24 °C is placed in 180 mL (180 g) of coffee at 85 °C and the temperature of the two become equal.

a) What is the final temperature when the two become equal? Assume that coffee has the same specific heat as water.

b) The first time a student solved this problem she got an answer of 88 °C. Explain why this is clearly an incorrect answer.