Part I: Homeostasis

1. List three behaviors and three physiological mechanisms that occur in humans to cool the body when it is overheated. **(2 pts)**

(a) Behaviors:

(b) Physiological mechanisms:

2. Using a physiological example (hormone secretion, blood pressure regulation, etc.), draw a schematic that demonstrates a negative feed-back mechanism. Use your textbook and/or the internet to help you. **(1 pt)**

3. Can set points ever be changed? (Hint: What happens to set temperature during a fever? **(1 pt)**

4. Prostaglandin, a type of hormone, influences the temperature-control center in the hypothalamus. Interestingly, bacterial infections increase prostaglandin synthesis. **(1.5 pts)**

(a) What effect do you think prostaglandin has on set temperature? **(0.5 pt)**

(b) Which basic component of the feedback loop (as shown in Figure 1) for body temperature control does prostaglandin affect? **(0.5 pt)**

(c) What effect does acetaminophen (Tylenol, a fever-reducing or antipyretic drug) have on prostaglandin synthesis? **(0.5 pt)**

5. For each of the following feedback mechanisms, indicate whether it is an example of a negative or a positive feedback loop. Explain your reasoning. Although some of the examples are not physiological processes, the basic principles are the same. **(3 pts)**

(a) A snowball rolling down a hill becomes larger and larger, making it roll faster and become larger still. **(1 pt)**

(b) You are determined to earn an A in Biology. You decide to seek help from a tutor. The tutor is helpful, but very expensive. In order to pay the tutor, you must start working nights. Working reduces your study time, and your grades fall in the course. Thus, you spend more time with the tutor, meaning you have to earn more money. As a result of working more, your grades in the course fall even more. You

decide to spend even more time with the tutor. **(1 pt)**

(c) A decrease in the set-point concentration for thyroid hormones results in a greater inhibitory signal from the thyroid gland (effector). **(1 pt)**

Part II: Resting and Active Heart Rates

6. Create a whole class data table using Google Sheets. Insert the data table, make sure it's formatted properly, and include a descriptive table title. **(1 pt)**

7. What do you hypothesize regarding recovery times between the high and low activity groups? State the null and alternative hypotheses. **(0.5 pt)**

8. Use the appropriate statistical test to determine if there is a significant difference in recovery times between athletes and non-athletes. What test did you use? What are the results? Include the test statistic and p value. **(1 pt)**

9. Create a graph that shows a comparison between the heart rates of active students and non-active students for each of the time intervals measured. Represent the 95% confidence intervals around each of the mean heart rates and include a descriptive figure caption. **(1 pt)**

10. Why does heart rate return back to normal BPM quickly after exercise ends? **(1 pt)**

Part III: Meditation and Neuroscience

11. Based on Box 4, explain one way that mindfulness meditation may reduce stress? **(1 pt)**

12. Is there a connection between meditation and heart rate? **(1 pt)**

13. Now, take your resting heart rate and record your BPM:

As a class you will participate in Day 1 of Waking Up. When the audio ends, take your resting heart rate (BPM) again:

Was there a difference? **(1 pt)**

14. Create a whole class data table using Google Sheets. Create a graph that shows a comparison between the average heart rates before and after the guided meditation. Represent the 95% confidence intervals for each of the mean heart rates and include a descriptive figure caption. **(1 pt)**

15. Use the appropriate statistical test to determine if there is a significant difference in recovery times between athletes and non-athletes. What test did you use? What are the results? Include the test statistic and p value. **(1 pt)**