Name: _____ Lab partners: _____

Homeostasis Simulation

Overview: In today's lab activity you will be simulating the maintenance of homeostasis by a living organism. You will have a beaker of water that will represent your organism. You will need to keep the beaker within a stable range of "body" temperature in order to keep it "alive." If you vary slightly outside of this range, your beaker will be considered hypothermic or hyperthermic. If you vary further outside of your stable range, your beaker will "die."

Objective: Keep your beaker of water "alive" for the length of the simulation.

Materials: Per lab group:

- 1- 250 mL Beaker containing 150 mL of water
- 1- Hot Plate
- 1- Bag of ice chips
- 1- Thermometer
- 1 pair- Heat resistant gloves

Per class:

- 1- Timer

Pre-lab: Answer the following questions, if you don't know an answer, look it up.

1) Define homeostasis. Give four examples of conditions that the body maintains as part of homeostasis. (its not just about temperature)!

2) Define stimulus and response. Based on the overview and set-up section of this lab, what will represent the stimulus, and what will represent responses in this lab?

3) What is generally considered "normal" body temperature for the human body in degrees Fahrenheit? What is it in degrees Celsius? We are in a science class, so which one should we be using? In general, why is this good scientific practice?

4) Define *hyperthermia* and *hypothermia*. We will come across the prefixes hypo- and hyper- several more times during this class. Based on the words you just defined, what do you think these prefixes mean?

Set-up:

Safety note: ONLY handle the beaker while wearing the heat resistant gloves. Goggles required.

1) Heat your beaker of water on the hot plate while monitoring the temperature. Hot plate should be set to 200℃ (or "5" if the hotplate shows temp as 1-10)
2) When your beaker reaches 37℃, take it off of the heat.
3) For 5 minutes, practice keeping your beaker as close to 37℃ as possible by putting the beaker back on the hot plate or by adding ice chips.

The Scenario:

Once you have had the opportunity to practice maintaining a homeostatic temperature condition in your beaker, you will be competing with the other groups in your class to keep your beaker "alive" as long as possible. Your beaker will be considered in homeostasis if it is between the temperatures of 36℃ and 38℃. If it is **between 35℃ and 36℃**, your beaker will be considered ***hypothermic***. If it is between **38℃ and 39℃**, your beaker will be considered ***hyperthermic***. If the beaker is **below 35℃** or **above 39℃**, your beaker is "**dead**."

You can monitor your temperature continuously **but you can only make a change to the beaker at the end of every minute**. At that point you may:

-Leave the beaker on the table (must stay the entire minute)
-Add ice (any amount you choose)
-Put the beaker on the hot plate (must stay for at least the entire minute)

The Competition:

1) Your teacher will start the class timer.
2) At the end of each minute, record the temperature in your data table, and decide what to do with the beaker for the next minute (ice, heat, table). Record your decision and the condition of the beaker (homeostatic, hypothermic, hyperthermic, dead-specify from heat or cold)
3) Leave the beaker alone for the duration of that minute.
4) At the end of the next minute, repeat steps 2 and 3.
5) Repeat step four until the end of the competition.

Note: Even if your beaker "dies," continue to collect data and try to prevent another "death."

Data Table: See next page

Graph:

-Graph (line graph) your temperature values vs. time or capture a screen grab of the graph on your screen.
-Label axes and give graph an appropriate title.
-Draw in the lines that denote hypothermia, hyperthermia, and death on the graph.
-Lightly shade the zones that you have created to differentiate them.
-Attach your graph to the back of this lab when you are finished.

Time (Min)	Temperature	Action (Response at end of minute)

Post-lab:

1) Did your beaker “survive” for the duration of the competition? If not, how many times did it “die?”

2) How many times did your beaker enter the hypothermic or hyperthermic range but not die?

3) What are some responses that your body has to maintain homeostasis that would be comparable to adding heat, ice, or placing on the counter? (List a total of at least 5 responses)

4) Is maintaining homeostasis in your body more or less complicated than the simulation that you conducted? Give three reasons to support your answer.

5) Communication was essential amongst your group to be successful in this simulation. What are some ways that parts of your body communicate to successfully maintain homeostasis?

6) Stirring the water with your probe was a good practice during this lab. Why?

7) What does your body do that is analogous to stirring?

8) You were only able to “react” at the end of each minute. Do you think your body calibrates its homeostasis more or less often than this? What makes you think this?