Name:

**Materials needed (per group):**

STEMinAR Cube

STEMinAR Augmented Reality app (downloaded)

Writing utensil

***Observations – Recalling experiences***

1. Imagine that you have a glass of water with ice and you are sitting outside on a hot summer day. What happens to the outside of the glass of the ice water?
2. Where did this water on the outside of the glass come from?
3. What do you observe happening to a pot of water as you put it on the stove before it starts to boil?
4. What happens to the water when it starts to boil?
5. What, if anything, do you think is inside the bubbles? Try to be as specific as possible.
6. If you were to forget about the water and it boils away, where did that water go?

***Observations – Recalling experiences***

1. Open up the STEMinAR app on your device. Click on Thermodynamics. What are the initial values you see when the simulation turns on?
2. What do these values mean?
3. Run the Simulation until the temperature goes up to 100 degrees Celsius (keep running it for a while at this temperature). What do you observe?
4. What do the flat horizontal lines represent?
5. What do you observe in terms of the molecule portion of the simulation?
6. What do you observe in terms of the ice cube / water portion of the simulation?
7. Why is the second horizontal line so much longer than the first?

***Developing a Model***

1. Copy the graph that was created in the simulation. What do you think is happening at each part?
2. What do the flat lines represent?
3. What does the x and y axis represent?
4. Do not run a new simulation yet to answer this question. What affect would increasing each of the initial three variables have on the graph?
   1. Mass
   2. Temperature
   3. Heat Flow
5. Now run the simulation and alter each of the variables one at a time. Describe what happens now both with the image of the beaker itself and the graphs.
   1. Mass
   2. Temperature
   3. Heat Flow
6. Why did the graph change the way it did with each of the above changes?
   1. Mass
   2. Temperature
   3. Heat Flow
7. Play with the variables. Describe what variable you are changing and what was the outcome?
8. Share this result with a neighbor, what did they do and what did they see?
9. Set the temperature to – 200 degrees Celsius, compare the molecules and ice blocks when the temperature starts at – 20 degrees Celsius.
10. Do the molecules ever stop moving? If so, what temperature would that be?
11. On a molecular scale, what is temperature related to?