Activity 1 Worksheet
Modeling a Dynamic Equilibrium

Materials:

- 2-3 Sheets of Graphing Paper
- 1 Marker
- 2 Cups
- 40-50 Coins or Candies
- 1 Pencil

Instructions:

1. Label one of your cups “liquid” and the other cup “gas” using your marker.
2. Place 24 coin or candy “water molecules” in the “liquid” cup.
3. Make three columns on one sheet of graphing paper.
4. Label the columns “Time Step”, “Liquid”, and “Gas”.
5. Following example 1 below, move your “water molecules” between the “Liquid” and “Gas” cups, recording the number of “molecules” in each cup at each time step.
6. Continue moving “molecules” until the system reaches equilibrium.
7. Make a line graph of your equilibrium data using the step # as the x-axis and the number of “molecules” in each cup as the y-axis.
8. Leave all “molecules” in their respective cups for the next activity.

Example 1:

If we have the reaction:

$$\text{Liquid} \underset{1/4\ \text{period}^{-1}}{\overset{1/3\ \text{period}^{-1}}{\rightleftharpoons}} \text{Gas}$$

For the first time point, 24/3 = 8 “Liquid” molecules will move to the “Gas” cup, 0/4 = 0 “Gas” molecules will move to the “Liquid” cup. At time point one you will thus have 16 “Liquid” molecules and 8 “Gas” Molecules. At time point two 16/3 = 5 (always round down) “Liquid” molecules will to the “Gas” cup, and 8/4 = 2 “Gas” molecules will move to the “Liquid” cup. At time point two you will have (16 - 5 + 2) = 13 “Liquid” molecules and (8 + 5 - 2) = 11 “Gas” molecules. The data in your chart should look like this:

Step	Liquid	Gas
0	24	0
1	16	8
2	13	11
3		
4		

Questions:

1. How many steps did it take for your system to reach equilibrium?

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2. If you started with twice as many “water molecules”, how many steps would it take to reach equilibrium? Why?

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3. What does your graph look like when equilibrium is reached?

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4. What is the relationship between the number of “molecules” in each cup at equilibrium and the number that move during each time point?

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