LESSON 119

ACTIVITY

How Dynamic Dynamic Equilibrium

Name _____

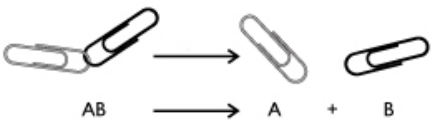
Date _____ Period _____

Purpose

To explore the concept of chemical equilibrium.

Part I: Irreversible Process

The bag you were given contains 50 pairs of attached paperclips (A and B). Before you start, designate one color paper clip as an "A clip" and the other as a "B clip." When attached, they are called an AB pair. Use the same color designations for Parts 1 and 2. Check to make sure you do not have any AA pairs or BB pairs. This setup will act as a model for studying an irreversible process. The irreversible process is an AB pair converting to a single A clip and a single B clip.



Procedure

1. With the bag open, one student should reach in the bag without looking and remove one item from the bag. The selection could be a single clip of either color or a connected pair. Do this quickly so the choice is as random as possible.
2. If the item is an AB pair, separate the pair into single A + B clips and return separated clips to the bag. If it's a single clip (A or B), simply put it back in the bag.
3. Shake the bag to mix.
4. Repeat steps 1- 3 for a total of ten tries.
5. After every 10 tries, determine the number of AB pairs, single A clips, and single B clips in the bag. Record each value in the data table provided.
6. Repeat the entire process of steps 1-5 until you have reached a total of 100 tries.

Data

Tries	0	10	20	30	40	50	60	70	80	90	100
Number of **AB** pairs	50										
Number of single **A** clips	0										
Number of single **B** clips.	0										

Analysis

1. How does the number of AB pairs change over time?

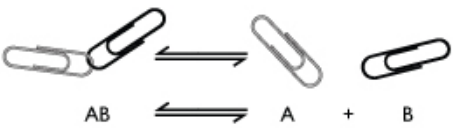
2. How does the number of single paperclips of each color (A and B) change over time?

3. You start with 50 AB pairs. How many AB pairs would you expect to see in the bag if you continued the process for a really long time?

4. Why does the number of AB pairs decrease rapidly at first, and then more slowly?

Part 2: Reversible Process

Return the bag of paperclips to the original condition of 50 AB pairs. You will now study a reversible process. The forward process is an AB pair converting to a single A clip and a single B clip. The reverse process is an A clip combining with a B clip to make an AB pair.



Procedure

1. With the bag open, one student should take a turn to reach in the bag without looking and make a single selection. If an AB pair is selected, separate the pair into single A + B clips and return the separated clips to the bag. If a single clip is selected, (A or B), simply put it back in the bag.
2. The second student should now take a turn to reach in the bag without looking and make two selections. If the result of the two selections is two paperclips of different colors, (A and B), connect them to create an AB pair and put the AB pair back into the bag. If any other combination is the result, (an A clip and an AB pair, a B clip and an AB pair, two AB pairs, two A clips, or two B clips) simply put both selections back in the bag.
3. Shake the bag to mix..
4. Repeat steps 1- 3 for a total of ten tries.
5. After every 10 tries, determine the number of AB pairs, single A clips, and single B clips in the bag. Record each value in the data table provided.
6. Repeat the entire process of steps 1-5 until you have reached a total of 100 tries.

Data

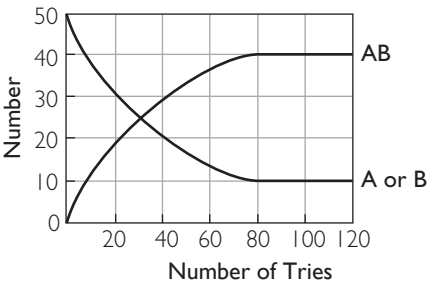
Tries	0	10	20	30	40	50	60	70	80	90	100
Number of **AB** pairs	50										
Number of single **A** clips	0										
Number of single **B** clips.	0										

1. How does the number of AB pairs change at first? How does the number of AB pairs change over time?

2. How do the numbers of single paperclips (A and B) change at first? How do the number of single clips change over time?

3. You start with 50 AB pairs. Do you ever get 50 A and 50 B in the bag? In other words, do all the paperclip pairs eventually convert to single paperclips in the process? Explain why or why not.

4. A pair of students collects the data plotted in the graph. The graph indicates that the rate of the forward reaction is equal to the rate of the reverse reaction after about 80 tries. Explain how the graph indicates this.



5. Making Sense Reversible processes reach equilibrium. What do you think this means?