Concentrating on Equilibrium Worksheet

Procedure

1. Place all 30 "molecules" (bingo chips) around the outside of the "cell" (Petri dish).

2. In each transfer round, *one-third* of the molecules will move from the area of higher concentration to the area of lower concentration. *One-third* of the molecules in the area of lower concentration will move to the area of higher concentration. *Note:* In deciding how many molecules to move, round all calculations ***down*** to the nearest whole number.

3. For the first round, count 10 molecules (1/3 of 30) from outside the cell and set them aside. No molecules (1/3 of 0) are set aside from inside the cell.

4. Move the 10 molecules from the area of higher concentration (outside the cell) to the area of lower concentration (inside the cell). Record results in the data table (Columns B and G). Move no molecules out of the cell (Columns C and F). Fill in the data for Transfer Round #1.

5. Fill in Columns A and E for Transfer Round 2 with the new totals after Transfer Round 1 is complete.

6. Once molecules are found both inside and outside the cell, one-third of the molecules are counted from the remaining molecules in the area of higher concentration and set aside, then one-third of the molecules in the area of lower concentration are counted and set aside. Record these values in the data table.

7. Transfer the counted molecules simultaneously. If the molecules were outside the cell, they are transferred to inside the cell, and vice versa.

8. Fill in the data for Transfer Round #2 and record the new totals found inside and outside the cell.

9. Repeat steps 5–7 for each transfer round.

10. Continue moving molecules back and forth until no further changes are observed in the number of molecules found inside and outside the cell.

Data Table

Transfer Round	A Molecules Outside Cell	B Molecules Moving into Cell	C Molecules Moving out of Cell (F)	D Total Molecules Outside (A – B + C)	E Molecules Inside Cell	F Molecules Moving out of Cell	G Molecules Moving into Cell (B)	H Total Molecules Inside (E – F + G)
1	30				0			
2								
3								
4								
5								

Post-Lab Questions

1. Based on the results of this activity, describe the changes observed in the number of molecules inside and outside the cell over time.

2. Write a definition of cellular equilibrium based on the answer to Question #1.

3. Why do molecules move across the cell membrane in both directions?

4. Since the chips representing molecules move in both directions across the Petri dish "membrane," explain why a net movement of molecules occurs in one direction for the first four transfers.

5. The state of cellular equilibrium is best described as a dynamic condition, not static. What does this mean?

6. Which figure below most accurately represents the movement of molecules in the state of equilibrium?