

Name: _____

Grade/Class: _____

Diluting Aqueous Solutions

Dilutions

We know how to prepare an aqueous solution by mixing a solute with water and how to calculate the concentration of that solution, but what if you want to make a solution of a specific molarity starting from a stock solution? A **stock solution** is a large volume of a solution at a standardized concentration. So what if you have a 6.0 M solution of HCl (6 mol/liter) and you want to produce a 3.0 M solution of HCl? You can use the following formula:

$$M_1 \times V_1 = M_2 \times V_2 \quad \text{Where: } M_1 = \text{initial molarity} \quad V_1 = \text{initial volume} \\ M_2 = \text{final molarity} \quad V_2 = \text{final volume} \quad \boxed{\text{(in liters)}}$$

Consider this problem: If you begin with 6.0 M HCl and want to produce 150 ml of 3.0 M HCl, then how much of the stock solution will you need to dissolve in water? All you have to do is plug the numbers in.

$$M_1 \times V_1 = M_2 \times V_2 \\ 6M \times V_1 = 3M \times 0.150 \text{ L} \\ V_1 = (3M \times 0.150 \text{ L}) / 6M \\ V_1 = 0.075 \text{ L}$$

Now you take the Initial Volume of Stock Solution and add enough water to reach the final volume that you want. Therefore, you would need to mix 75 ml (0.075 L) of 6M HCl with 75 ml of H₂O in order to produce 150 ml of a 3 M HCl solution.

- 1) If I dilute 250 mL of 0.10 M lithium acetate solution to a volume of 750 mL, what will the concentration of this solution be?

- 2) If I dilute 125 mL of a 0.15 M NaOH solution to a volume of 150. mL, what will the molarity of the diluted solution be?

- 3) If I have 340. mL of a 0.5 M NaBr solution, what will the concentration be if I add 560. mL more water to it?
- 4) To what volume would I need to add water to the evaporated solution in problem 3 to get a solution with a concentration of 0.25 M?
- 5) If I leave 750 mL of 0.50 M sodium chloride solution uncovered on a windowsill and 150 mL of the solvent evaporates, what will the new concentration of the sodium chloride solution be?
- 6) If I add water to 100. mL of a 0.15 M NaOH solution until the final volume is 150. mL, what will the molarity of the diluted solution be?
- 7) What volume of 0.050 M HCl solution can be made by diluting 250. mL of 10.0 M HCl?