

GENERAL CHEMISTRY

STANDARD 10.6

10.6: Dilute a given solution from one concentration to a weaker concentration

SOLUTION DILUTION EQUATION

- Solutions can be diluted to a weaker concentration by mixing the solution with pure, distilled water
 - As more water is added to a solution, the concentration will decrease

$$C_1V_1 = C_2V_2$$

C_1 = Concentration before dilution

V_1 = Volume before dilution

C_2 = Concentration after dilution

V_2 = Volume after dilution

Units need not be converted, as any volume units are allowed as long as it remains consistent (mL on both sides, or L on both sides, etc.)

EXAMPLE

- 53.4 mL of a 1.50 M solution of NaCl is on hand, but you need some 0.800 M solution. How many mL of 0.800 M can you make?
 - Use the five step problem solving method to solve these problems

Step 1

$$\begin{aligned}C_1 &= 1.50 \text{ M} \\V_1 &= 53.4 \text{ mL} \\C_2 &= 0.800 \text{ M} \\V_2 &= ?\end{aligned}$$

Step 2

$$C_1V_1 = C_2V_2$$

Step 3

$$\frac{C_1V_1}{C_2} = V_2$$

Step 4

$$\frac{1.50 \text{ M} \times 53.4 \text{ mL}}{0.800 \text{ M}} = V_2$$

Step 5

$$V_2 = 100. \text{ mL}$$

ANOTHER EXAMPLE

- A stock solution of 1.00 M HCl is available. How many milliliters are needed to make 100.0 mL of a 0.750 M solution?

Step 1

$$\begin{aligned}C_1 &= 1.00 \text{ M} \\V_1 &= ? \\C_2 &= 0.750 \text{ M} \\V_2 &= 100.0 \text{ mL}\end{aligned}$$

Step 2

$$C_1V_1 = C_2V_2$$

Step 3

$$V_1 = \frac{C_2V_2}{C_1}$$

Step 4

$$V_1 = \frac{0.750 \text{ M} \times 100.0 \text{ mL}}{1.00 \text{ M}}$$

Step 5

$$V_1 = 75.0 \text{ mL}$$

TRY IT YOURSELF

- 2.00 L of a 0.800 M NaNO_3 solution must be prepared from a solution known to be 1.50 M in concentration. How many mL of the stock solution are required?
- 100.0 mL of a 2.500 M KBr solution is on hand. You need 0.5500 M and will dilute all of the stock solution. What is the final volume of the solution that results?

TRY IT YOURSELF SOLUTIONS

- 2.00 L of a 0.800 M NaNO_3 solution must be prepared from a solution known to be 1.50 M in concentration. How many mL of the stock solution are required?

1.07 L

- 100.0 mL of a 2.500 M KBr solution is on hand. You need 0.5500 M and will dilute all of the stock solution. What is the final volume of the solution that results?

454.5 mL