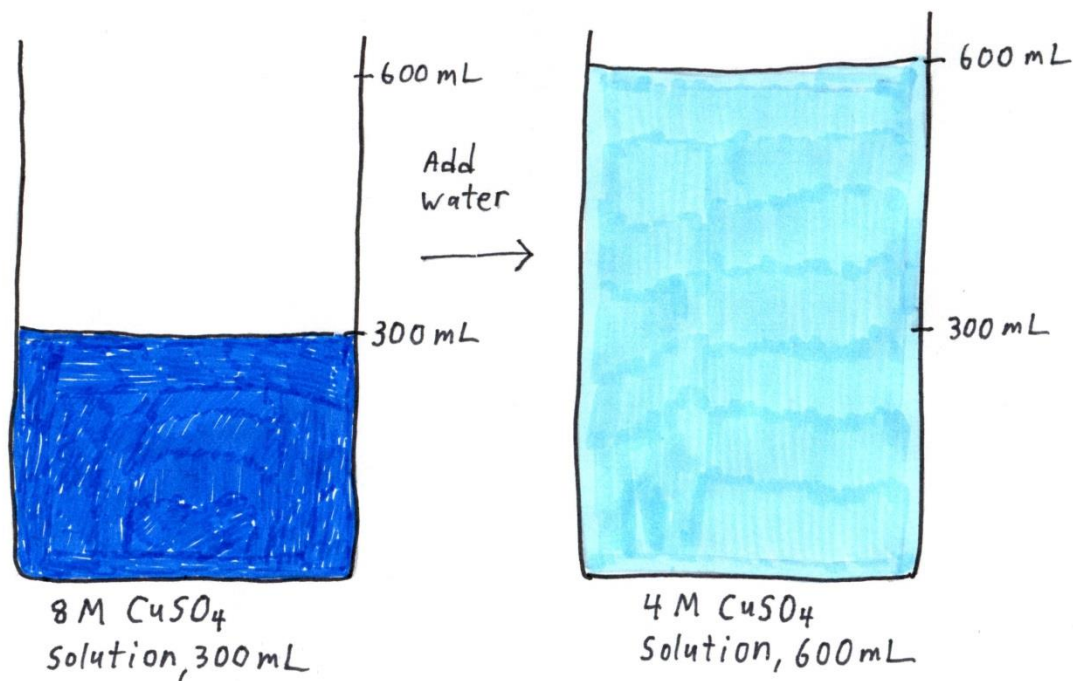


Chemistry Lecture #78: Molarity - Preparations from Stock Solutions

A stock solution is a concentrated solution used to make other solutions of lower concentration. For example, suppose I have an 8 M CuSO_4 stock solution and I want 600 mL of 4 M CuSO_4 . If I take 300 mL of the 8 M solution and add water until the volume is 600 mL, I'll have diluted the concentration to 4 M.



By adding water until the volume has doubled, I reduce the concentration by half.

We can use a formula to help us calculate the amount of stock solution we need to prepare a more dilute solution.

$$M_1V_1 = M_2V_2$$

M_1 = molarity of the stock solution

V_1 = volume of the stock solution

M_2 = molarity of the dilute solution

V_2 = volume of the dilute solution

The units of volume can be anything: mL, L, gallons, quarts, etc.

As long as V_1 and V_2 both use the same type of volume unit, you can use any volume unit you want.

How much 2.00 M MgSO_4 is needed to prepare 1.00×10^2 mL of 0.400 M MgSO_4 ?

$$M_1 = 2.00 \text{ M}$$

$$M_2 = 0.400 \text{ M}$$

$$V_1 = ?$$

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

$$M_1V_1 = M_2V_2$$

$$(2.00 \text{ M}) V_1 = (0.400 \text{ M}) (100 \text{ mL})$$

$$2.00 V_1 = (0.400) (100)$$

$$V_1 = \frac{(0.400) (100)}{2.00} = 20.0 \text{ mL}$$

To prepare 100 mL of 0.400 M solution, take 20.0 mL of 2.00 M stock solution and add water until the volume is 100 mL.

If 15.0 mL of 10.0 M HCl solution is diluted to 3.00×10^2 mL, what is the molarity of the diluted solution?

$$M_1 = 10.0 \text{ M}$$

$$M_2 = ?$$

$$V_1 = 15.0 \text{ mL}$$

$$V_2 = 300 \text{ mL}$$

$$M_1 V_1 = M_2 V_2$$

$$(10.0 \text{ M})(15.0 \text{ mL}) = M_2 (300 \text{ mL})$$

$$(10.0)(15.0) = M_2 (300)$$

$$M_2 = \frac{(10.0)(15.0)}{300}$$

$$M_2 = 0.500 \text{ M HCl}$$