

Dilute 10 mL of a 6.0 M NaCl solution to 100 mL. Then take 25 mL of that and dilute it to 250 mL. What is the final concentration?

Start with 5 mL of a 10.0 M solution. Dilute it to 50 mL, then take 10 mL and dilute to 100 mL. Find the final molarity.

A 2.0 M solution is diluted 1/10, and then again 1/4. What is the final concentration?

You dilute 20 mL of a 5.0 M glucose solution to 100 mL. Then take 10 mL and dilute to 200 mL. What is the result?

From a 1.0 M solution, perform two 1/5 dilutions. What is the final concentration?

A 12.0 M HCl solution is serially diluted: first 1/3, then 1/2, then 1/4. What is the resulting molarity?

You take 2.0 mL of a 4.0 M HCl solution and dilute it to 100 mL. Then take 5.0 mL of that and dilute to 250 mL. What is the final concentration?

A 0.50 M solution undergoes two consecutive 1/10 dilutions. What is the final concentration?

Dilute 1.0 mL of 10.0 M NaOH to 100 mL. Then dilute 10 mL of that to 1.0 L. What is the final molarity?

Starting with 8.0 M glucose, dilute 4.0 mL to 40 mL. Then take 8.0 mL and dilute it to 400 mL. Find the final concentration.

A 6.0 M stock undergoes 1/5 dilution, then 1/2, then 1/10. What is the final concentration?

Begin with 3.0 M CaCl_2 . Take 5 mL and dilute to 50 mL. Then take 20 mL of that and dilute to 200 mL. What is the concentration now?

Dilute 10 mL of a 6.0 M NaCl solution to 100 mL. Then take 25 mL of that and dilute it to 250 mL. What is the final concentration?

assume $10 \text{ mL} = 1.0 \times 10^1 \text{ mL}$ & $100 \text{ mL} = 1.00 \times 10^2 \text{ mL}$

dilution 1:

$$C_1 V_1 = C_2 V_2$$

$$[6.0 \text{ M}][10 \text{ mL}] = C_2 [100 \text{ mL}]$$

$$C_2 = \frac{(6.0 \text{ M})(10 \text{ mL})}{100 \text{ mL}} = 0.6 \text{ M}$$

dilution 2:

$$C_2 V_2 = C_3 V_3$$

$$[0.6 \text{ M}][25 \text{ mL}] = C_3 [250 \text{ mL}]$$

$$C_3 = \frac{(0.6 \text{ M})(25 \text{ mL})}{250 \text{ mL}} = 0.06 \text{ M}$$

$$C_3 = 0.06 \text{ M}$$

Start with 5 mL of a 10.0 M solution. Dilute it to 50 mL, then take 10 mL and dilute to 100 mL. Find the final molarity.

dilution 1:

$$C_1 V_1 = C_2 V_2$$

$$[10\text{M}][5\text{mL}] = C_2 [50\text{mL}]$$

$$C_2 = \frac{(10\text{M})(\cancel{5\text{mL}})}{\cancel{50\text{mL}}} = 1\text{M}$$

dilution 2:

$$C_2 V_2 = C_3 V_3$$

$$[1\text{M}][10\text{mL}] = C_3 [100\text{mL}]$$

$$C_3 = \frac{(1\text{M})(\cancel{10\text{mL}})}{\cancel{100\text{mL}}} = 0.1\text{M}$$

$$\boxed{C_3 = 0.1\text{M}}$$

A 2.0 M solution is diluted 1/10, and then again 1/4. What is the final concentration?

dilution 1:

$$C_1 V_1 = C_2 V_2$$

$$C_2 = C_1 \left(\frac{V_1}{V_2} \right)$$

$$C_2 = [2.0 \text{ M}] \left[\frac{1}{10} \right] = 0.2 \text{ M}$$

dilution 2:

$$C_2 V_2 = C_3 V_3$$

$$C_3 = C_2 \left(\frac{V_2}{V_3} \right)$$

$$C_3 = [0.2] \left[\frac{1}{4} \right] = 0.05 \text{ M}$$

$$C_3 = 0.05 \text{ M}$$

You dilute 20 mL of a 5.0 M glucose solution to 100 mL. Then take 10 mL and dilute to 200 mL. What is the result?

assume $20\text{ mL} = 2.0 \times 10^1\text{ mL}$ & $100\text{ mL} = 1.00 \times 10^2\text{ mL}$

dilution 1:

$$C_1 V_1 = C_2 V_2$$

$$[5.0\text{ M}][20\text{ mL}] = C_2 [100\text{ mL}]$$

$$C_2 = \frac{(5.0\text{ M})(20\text{ mL})}{100\text{ mL}} = 1\text{ M}$$

dilution 2:

$$C_2 V_2 = C_3 V_3$$

$$[1\text{ M}][10\text{ mL}] = C_3 [200\text{ mL}]$$

$$C_3 = \frac{(1\text{ M})(10\text{ mL})}{200\text{ mL}} = 0.05\text{ M}$$

$$C_3 = 0.050\text{ M}$$

From a 1.0 M solution, perform two $1/5$ dilutions. What is the final concentration?

dilution 1:

$$C_1 V_1 = C_2 V_2$$

$$C_2 = C_1 \left(\frac{V_1}{V_2} \right)$$

$$C_2 = [1.0 \text{ M}] \left[\frac{1}{5} \right] = 0.2 \text{ M}$$

dilution 2:

$$C_2 V_2 = C_3 V_3$$

$$C_3 = C_2 \left(\frac{V_2}{V_3} \right)$$

$$C_3 = [0.2 \text{ M}] \left[\frac{1}{5} \right] = 0.04 \text{ M}$$

$$C_3 = 0.040 \text{ M}$$

A 12.0 M HCl solution is serially diluted: first 1/3, then 1/2, then 1/4. What is the resulting molarity?

dilution 1:

$$C_1 V_1 = C_2 V_2$$

$$C_2 = C_1 \left(\frac{V_1}{V_2} \right)$$

$$= [12.0\text{M}] \left[\frac{1}{3} \right] = 4\text{M}$$

dilution 2:

$$C_2 V_2 = C_3 V_3$$

$$C_3 = C_2 \left(\frac{V_2}{V_3} \right)$$

$$= [4\text{M}] \left[\frac{1}{2} \right] = 2\text{M}$$

dilution 3:

$$C_3 V_3 = C_4 V_4$$

$$C_4 = C_3 \left(\frac{V_3}{V_4} \right)$$

$$= [2\text{M}] \left[\frac{1}{4} \right] = 0.5\text{M}$$

$$C_4 = 0.500\text{M}$$

You take 2.0 mL of a 4.0 M HCl solution and dilute it to 100 mL. Then take 5.0 mL of that and dilute to 250 mL. What is the final concentration?

assume 100 mL = 1.00 mL

dilution 1:

$$C_1 V_1 = C_2 V_2$$

$$[4.0\text{M}][2.0\text{mL}] = C_2 [100\text{mL}]$$

$$C_2 = \frac{(4\text{M})(2\text{mL})}{100\text{mL}} = 0.08\text{M}$$

dilution 2:

$$C_2 V_2 = C_3 V_3$$

$$[0.08\text{M}][5.0\text{mL}] = C_3 [250\text{mL}]$$

$$C_3 = \frac{(0.08\text{M})(5\text{mL})}{250\text{mL}} = 0.0016\text{M}$$

$$C_3 = 0.0016\text{M}$$

A 0.50 M solution undergoes two consecutive 1/10 dilutions. What is the final concentration?

dilution 1:

$$C_1 V_1 = C_2 V_2$$

$$C_2 = C_1 \left(\frac{V_1}{V_2} \right)$$

$$= [0.50 \text{ M}] \left[\frac{1}{10} \right] = 0.05 \text{ M}$$

dilution 2:

$$C_2 V_2 = C_3 V_3$$

$$C_3 = C_2 \left(\frac{V_2}{V_3} \right)$$

$$= [0.05 \text{ M}] \left[\frac{1}{10} \right] = 0.005 \text{ M}$$

$$C_3 = 0.0050 \text{ M}$$

Dilute 1.0 mL of 10.0 M NaOH to 100 mL. Then dilute 10 mL of that to 1.0 L. What is the final molarity?

assume $100 \text{ mL} = 1.00 \times 10^2 \text{ mL}$ & $10 \text{ mL} = 1.0 \times 10^1 \text{ mL}$

dilution 1:

$$C_1 V_1 = C_2 V_2$$

$$[10.0 \text{ M}][1.0 \text{ mL}] = C_2 [100 \text{ mL}]$$

$$C_2 = \frac{(10 \text{ M})(1 \text{ mL})}{100 \text{ mL}} = 0.1 \text{ M}$$

dilution 2:

$$C_2 V_2 = C_3 V_3$$

$$[0.1 \text{ M}][10 \text{ mL}] = C_3 [1.0 \text{ L}]$$

$$C_3 = \frac{(0.1 \text{ M})(10 \text{ mL})}{1 \text{ L}} \left(\frac{1 \text{ L}}{1000 \text{ mL}} \right) = 0.001 \text{ M}$$

$$C_3 = 0.0010 \text{ M}$$

Starting with 8.0 M glucose, dilute 4.0 mL to 40 mL. Then take 8.0 mL and dilute it to 400 mL. Find the final concentration.

assume: $40 \text{ mL} = 4.0 \times 10^1 \text{ mL}$ & $400 \text{ mL} = 4.00 \times 10^2 \text{ mL}$

dilution 1:

$$C_1 V_1 = C_2 V_2$$

$$[8.0 \text{ M}][4.0 \text{ mL}] = C_2 [40 \text{ mL}]$$

$$C_2 = \frac{(8 \text{ M})(\cancel{4 \text{ mL}})}{\cancel{40 \text{ mL}}} = 0.8 \text{ M}$$

dilution 2:

$$C_2 V_2 = C_3 V_3$$

$$[0.8 \text{ M}][8.0 \text{ mL}] = C_3 [400 \text{ mL}]$$

$$C_3 = \frac{(0.8 \text{ M})(\cancel{8 \text{ mL}})}{\cancel{400 \text{ mL}}} = 0.016 \text{ M}$$

$$C_3 = 0.016 \text{ M}$$

A 6.0 M stock undergoes $1/5$ dilution, then $1/2$, then $1/10$. What is the final concentration?

dilution 1:

$$C_1 V_1 = C_2 V_2$$

$$C_2 = C_1 \left(\frac{V_1}{V_2} \right)$$

$$= [6.0 \text{ M}] \left[\frac{1}{5} \right] = 1.2 \text{ M}$$

dilution 2:

$$C_2 V_2 = C_3 V_3$$

$$C_3 = C_2 \left(\frac{V_2}{V_3} \right)$$

$$= [1.2 \text{ M}] \left[\frac{1}{2} \right] = 0.6 \text{ M}$$

dilution 3:

$$C_3 V_3 = C_4 V_4$$

$$C_4 = C_3 \left(\frac{V_3}{V_4} \right)$$

$$= [0.6 \text{ M}] \left[\frac{1}{10} \right] = 0.06 \text{ M}$$

$$C_4 = 0.060 \text{ M}$$

Begin with 3.0 M CaCl_2 . Take 5 mL and dilute to 50 mL. Then take 20 mL of that and dilute to 200 mL. What is the concentration now?

assume: $50 \text{ mL} = 5.0 \times 10^1 \text{ mL}$, $20 \text{ mL} = 2.0 \times 10^1 \text{ mL}$ & $200 \text{ mL} = 2.00 \times 10^2 \text{ mL}$

dilution 1:

$$C_1 V_1 = C_2 V_2$$

$$[3.0 \text{ M}][5 \text{ mL}] = C_2 [50 \text{ mL}]$$

$$C_2 = \frac{(3 \text{ M})(\cancel{5 \text{ mL}})}{\cancel{50 \text{ mL}}} = 0.3 \text{ M}$$

dilution 2:

$$C_2 V_2 = C_3 V_3$$

$$[0.3 \text{ M}][20 \text{ mL}] = C_3 [200 \text{ mL}]$$

$$C_3 = \frac{(0.3 \text{ M})(\cancel{20 \text{ mL}})}{\cancel{200 \text{ mL}}} = 0.03 \text{ M}$$

$$C_3 = 0.030 \text{ M}$$