

$$\text{Molarity (Concentration)} = \frac{\text{Mol solute}}{V_{\text{soln}}}$$

Relationship

$$\frac{\text{mol}}{V} \uparrow \quad \frac{\text{mol}}{V} \downarrow = M \quad \downarrow \quad \downarrow \quad \downarrow$$

Direct Rel. (same) (constant conc.)

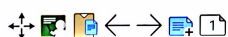
Dilutions

$$\underbrace{M_1 V_1}_{\text{Start}} = \underbrace{M_2 V_2}_{\text{Final (changed)}}$$

Relationship

$$\uparrow M \quad V \downarrow \quad \downarrow M \quad V \uparrow$$

Indirect Relationship (opposite)



Standard

$$\underbrace{M_1 V_1}_{\text{Start}} = \underbrace{M_2 V_2}_{\text{final (changed)}}$$

$$M = \frac{\text{mol}}{L} \quad | \quad V = L$$

Solved

Volume Change

$$M_1 = \frac{M_2 V_2}{V_1}$$

$$M_2 = \frac{M_1 V_1}{V_2}$$

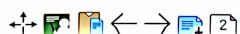
Solve for Concentration

Concentration Change

$$V_1 = \frac{M_2 V_2}{M_1}$$

$$V_2 = \frac{M_1 V_1}{M_2}$$

Solve for Volume



3. Initial: $M_1 = 3.00 \text{ mol/L}$ $V_1 = 1.5 \text{ L}$

Final: $M_2 = \text{---} \text{ mol/L}$ $V_2 = 2.0 \text{ L}$

$$M_2 = \frac{M_1 V_1}{V_2} = \frac{3.00 \text{ mol/L} \cdot 1.5 \text{ L}}{2.0 \text{ L}}$$

$$M_2 = 2.25 \text{ mol/L}$$

$V \uparrow$ dilution $M \downarrow$

ft. 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

5. Initial $M_1 = 1.30 \text{ mol/L}$ $V_1 = 0.50 \text{ L}$

Final $M_2 = 1.60 \text{ mol/L}$ $V_2 = \text{---} \text{ L}$

$$V_2 = \frac{M_1 V_1}{M_2} = \frac{1.30 \text{ mol/L} \cdot 0.50 \text{ L}}{1.60 \text{ mol/L}}$$

$$V_2 = 0.41 \text{ L}$$

$V \downarrow$ Concentration $M \uparrow$

ft. 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100