Name: key
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Chemistry 11
How to Solve DILUTION PROBLEMS

THE DILUTION EQUATION: $M_1V_1 = M_FV_F$

where: M_1 = initial [ ]
V_1 = initial volume (in Litres)
M_F = final [ ]
V_F = final volume (total volume)
↳ add volumes together

Mixing a solute with water:
Example 1. If 200.0 mL of 0.500 M NaCl is added to 300.0 mL of water, what is the resulting [NaCl] in the mixture?

(1.) Re-arrange dilution eqtn to solve for M_F:

$$M_F = \frac{M_1V_1}{V_F}$$

(2.) Identify values + plug into eqtn.

$$M_F = \frac{0.500\,M \times 0.2000\,L}{(0.2000\,L + 0.3000\,L)} = 0.200\,M\ NaCl$$

Mixing different concentrations of the same substance:
Example 2. If 300.0 mL of 0.250 M NaCl is added to 500.0 mL of 0.100 M NaCl, what is the resulting [NaCl] in the mixture?

(1) Solve for M_F for the two situations.

$$NaCl_{F_1} = \frac{0.250\,M \times 0.3000\,L}{(0.800\,L)} = 0.09375\,M\ NaCl_{F_2} = \frac{0.100\,M \times 0.5000\,L}{(0.8000\,L)} = 0.0625\,M$$

(2) add the two together:

$NaCl_{F_1} = 0.09375\,M$
$+\ NaCl_{F_2} = 0.0625\,M$

$NaCl_{F_T} = 0.1563\,M\ NaCl$

Making dilute solutions from concentrated solutions:
Example 3. What volume of 6.00 M HCl is used in making 2.00 L of 0.125 M HCl?

① Re-arrange equation to solve for V_I

$$V_I = \frac{M_F V_F}{M_I}$$

② Solve for V_I

$$V_I = \frac{0.125\,M \times 2.00\,L}{6.000\,M} = \boxed{0.0417\ L \text{ of HCl}}$$

or 41.7 mL

SAMPLE PROBLEM. A student mixes 100.0 mL of water with 25.0 mL of a sodium chloride solution having an unknown concentration. IF the student finds the molarity of the sodium chloride in the diluted solution is 0.0876 M, what is the molarity of the original sodium chloride solution?

① Re-arrange eqtn for M_I

$$M_I = \frac{M_F V_F}{V_I}$$

② Solve for M_I

$$M_I = \frac{0.0876\,M \times 0.1250\,L}{0.0250\,L} = \boxed{0.438\ M\ NaCl}$$