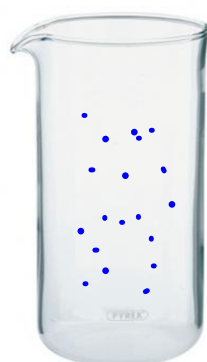


## DILUTION

Dilution is the process of decreasing the concentration of a solution.



CONCENTRATED

→



DILUTE

The initial concentration is always larger than the final concentration in a dilution problem.  $c_i > c_f$

The initial volume is always smaller than the final volume in a dilution problem.  $V_i < V_f$

When the volume is doubled the concentration is

\_\_\_\_\_  $\frac{1}{2}$  \_\_\_\_\_.

When the volume is ten times the original then the concentration is \_\_\_\_\_  $\frac{1}{10}$  \_\_\_\_\_.

To calculate the new concentration of a diluted solution we can use the following formula:

$$c_i V_i = c_f V_f$$

$V$  is the volume

Problems:

1. Water is added to 200. mL of a 2.40 M solution of ammonia until the final volume is 1.00L. What is the concentration of the diluted solution?

$$v_i c_i = v_f c_f$$

$$c_f = \frac{v_i c_i}{v_f} = \frac{0.200\text{L} \cdot 2.40\text{mol/L}}{1.00\text{L}} = 0.48\text{M}$$

2. Ms Fraser requires 1.50 L of 0.500 M hydrochloric acid solution. She has some **concentrated commercial reagent grade** hydrochloric acid in the storage area. How will she make this solution?

$$v_i c_i = v_f c_f$$

$$v_i = \frac{v_f c_f}{c_i} = \frac{1.50\text{L} \cdot 0.500\text{mol/L}}{11.6\text{mol/L}} = 0.0647\text{L} \rightarrow 64.7\text{mL}$$

3. Ms Fraser wants to make 500. mL of her own vinegar. Vinegar is 4.0 % by volume acetic acid. Some **concentrated commercial reagent** can be found in the chemical supply room of FHS. How should she proceed?

4. What volume of concentrated 17.8 M sulfuric acid would a lab technician need to make 2.00 L of 0.200 M solution by dilution of the original?

5. A 1.00 L bottle of concentrated acetic acid is diluted to prepare a 0.400M solution. Find the volume of diluted solution that is prepared.

6. Carbon dioxide levels in the atmosphere have increased by 20% over the last 100 years, to about 345 ppm. To what volume must 1.000 L of a carbon dioxide emission of 72 786 ppm be diluted to reach the atmospheric concentration of carbon dioxide?

7. A 10.00 mL sample of a test solution is diluted in an environmental lab to a final volume of 250.0 mL. The concentration of the diluted solution is found to be 0.274 g/L. What was the concentration of the original test solution?