

# Solutions: worked example

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Calculate the volume of a solution of sulfuric ( $\text{H}_2\text{SO}_4$ ) acid 4 M needed to get a solution that has a volume of 400 mL and a concentration of 50 g/L.

(Atomic weights: S=32; O=16; H=1)

# Solutions: worked example

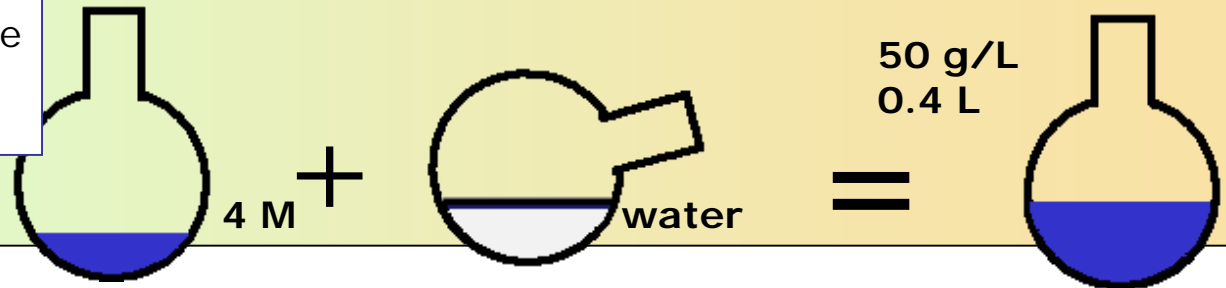
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(Atomic weights: S=32; O=16; H=1)

The process is a DILUTION;  
from a concentrated solution  
we get a diluted solution by  
adding water.

To start, we will calculate the  
molar mass of the solute  
(sulfuric acid).

$$M(\text{H}_2\text{SO}_4) = 2 + 32 + 4 * 16 = 98 \text{ g/mol}$$



## additive magnitudes

mass of the solute	
# of moles of the solute	
volume of the solution	$V_1$

+

0
0
$V_2$

=

0,4 L

concentration	
	4 mol/L

0 g/L
0 mol/L
0 %

50 g/L

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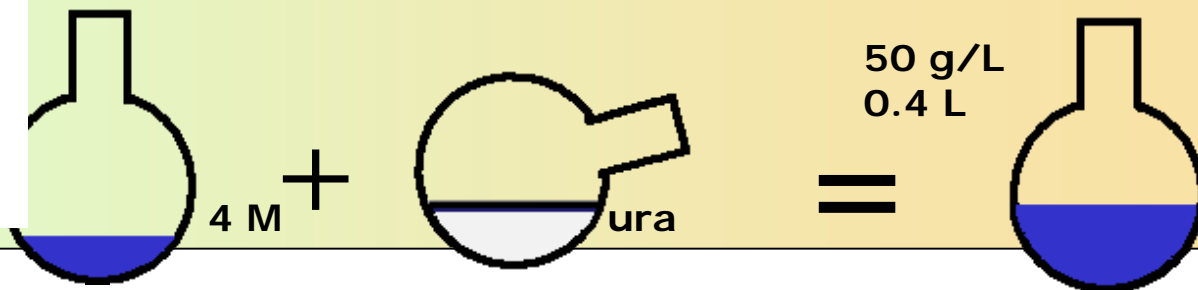
Calculate the volume of a solution of sulfuric ( $\text{H}_2\text{SO}_4$ ) acid 4 M needed to get a solution that has a volume of 400 mL and a concentration of 50 g/L.

We know the volume and the concentration of the final solution; from those pieces of data we can get the amount of solute we have in this final solution.

$$m = 50 \frac{\text{g H}_2\text{SO}_4}{\text{L solution}} * 0.4 \text{ L solution} = 20 \text{ g H}_2\text{SO}_4$$

$$n = 20 \text{ g H}_2\text{SO}_4 \frac{1 \text{ mol H}_2\text{SO}_4}{98 \text{ g H}_2\text{SO}_4} = 0.204 \text{ mol H}_2\text{SO}_4$$

If we take into account that only water is added along the dilution, it means that the solute we have comes from the initial solution.



## additive magnitudes

mass of the solute	20 g
# of moles of the solute	0.204 mol
volume of the solution	$V_1$

+

0
0
$V_2$

=

20 g
0.204 mol
0.4 L

concentration	
	4 mol/L

0 g/L
0 mol/L
0 %

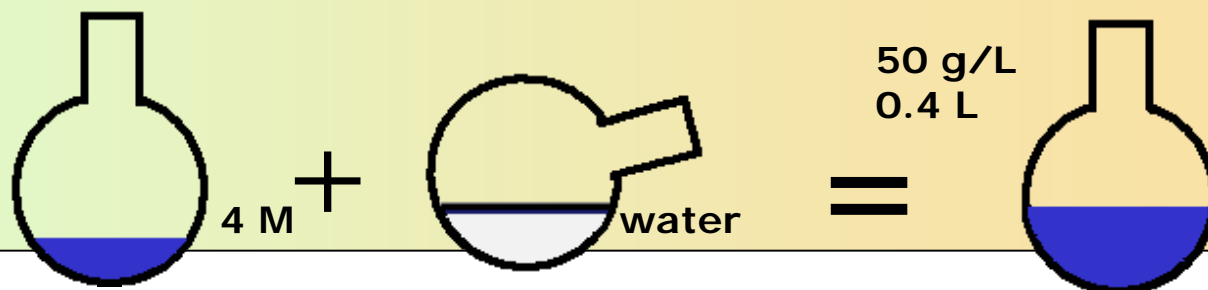
50 g/L

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Calculate the volume of a solution of sulfuric ( $\text{H}_2\text{SO}_4$ ) acid 4 M needed to get a solution that has a volume of 400 mL and a concentration of 50 g/L.

Now, we can calculate the volume of the initial solution:  $V_1$

$$V_1 = 0.204 \text{ mol H}_2\text{SO}_4 \frac{1 \text{ L dis}}{4 \text{ mol H}_2\text{SO}_4} = 0.051 \text{ L} = 51 \text{ mL}$$



## additive magnitudes

mass of the solute	20 g
# of moles of the solute	0.204 mol
volume of the solution	0.051 L

+

0
0
$V_2$

=

20 g
0.204 mol
0.4 L

concentration	
	4 M

0 g/L
0 mol/L
0 %

50 g/L