Answer on Question #77088, Chemistry / General Chemistry

I Have a solution mixed of 10uM A and 100uM B. How can I dilute it to a solution containing 0.3uM A and 3uM B with final volume of 100ml?

Solution

$c_1(A)$ = 10 uM = $10 \cdot 10^{-6}$ mol/L = $1 \cdot 10^{-5}$ mol/L

$c_1(B)$ =100 uM = $100 \cdot 10^{-6}$ mol/L = $1 \cdot 10^{-4}$ mol/L

$c_2(A)$ =0.3 uM = $0.3 \cdot 10^{-6}$ mol/L= $3 \cdot 10^{-7}$ mol/L

$c_2(B)$ = 3 uM = $3 \cdot 10^{-6}$ mol/L

V_2 = 100 mL = 0.1 L

V_1 -?

Find amount of chemical substances of n_2(A) and n_2 (B) in final solution of volume V_2= 0.1 L:

$$c = \frac{n}{V} \Rightarrow n = c \times V$$

Where c – concentration of a substance (mol/L)

n- amount of chemical substance

V – volume of a solution

$n_2(A) = c_2(A) \cdot V_2$

$n_2(A)$ = $3 \cdot 10^{-7}$ mol/L $\cdot 0.1$ L = $3 \cdot 10^{-8}$ mol

$n_2(B) = c_2(B) \cdot V_2$

$n_2(B)$ = $3 \cdot 10^{-6}$ mol/L $\cdot 0.1$ L = $3 \cdot 10^{-7}$ mol

When the first solution was diluted the concentrations of substances changed but their amounts of chemical substances remained the same, i.e. $n_1(A) = n_2(A) = 3 \cdot 10^{-8}$ mol and $n_1(B) = n_2(B)$= $3 \cdot 10^{-7}$ mol

Find the volume of the first solution (the one that was diluted):

$$c = \frac{n}{V} \Rightarrow V = \frac{n}{c}$$

$$V_1 = \frac{n_1(A)}{c_1(A)} \ or \ V_1 = \frac{n_1(B)}{c_1(B)}$$

$$V_1 = \frac{3 \times 10^{-8} \ mol}{1 \times 10^{-5} \frac{mol}{L}} = 0.003 \ L \ \ or \ \ V_1 = \frac{3 \times 10^{-7} \ mol}{1 \times 10^{-4} \frac{mol}{L}} = 0.003 \ L$$

To get a solution containing 0.3uM A and 3uM B with final volume of 100ml one should pour 3 mL of a solution containing 10uM A and 100uM into 100 mL vessel and add necessary volume of water to reach 100 mL line on the vessel.

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