KEY

More Dilution Calculations

Name - _____

$$Molarity = \frac{moles\ of\ solute}{litre\ of\ solution}$$

$$[final] = \frac{[initial] \times (initial\ volume)}{(final\ volume)}$$

1.) How many litres of a $0.250\ M$ K_2CrO_4 solution contain $26.3\ grams$ of K_2CrO_4?

Answer - $Molarity = \frac{moles\ of\ solute}{litre\ of\ solution}$ $\quad 0.250\ M = \frac{26.3\ g \times 1\frac{mol}{194.2g}}{litre\ of\ solution}$ $\quad = 0.542\ L\ K_2CrO_4$

2.) How many grams of sodium sulphate are there in $0.27\ L$ of a $1.13\ M$ solution?

Answer - $Molarity = \frac{moles\ of\ solute}{litre\ of\ solution}$ $\quad 1.13\ M = \frac{moles\ of\ solute}{0.27\ L}$ $\quad 0.3051\ mol \times \frac{142.04\ g}{1\ mol}$

$= 43.3364\ mol$ $\quad = 43\ g\ Na_2SO_4$

3.) $1.00\ L$ of solution contains $0.200\ moles$ of NaF $_{(s)}$ and $0.300\ moles$ of $MgF_{2\,(s)}$. Find;

$MgF_{2\,(s)} \rightarrow Mg^{+2}_{(aq)} + 2\ F^-_{(aq)}$ $\quad$ $NaF_{(s)} \rightarrow Na^+_{(aq)} + F^-_{(aq)}$

$[Mg^{2+}]$ = 0.300 M $\quad$ $0.300\ mol \rightarrow 0.300\ mol + 2 \times 0.300\ mol$ $\quad$ $0.200\ mol \rightarrow 0.200\ mol + 0.200\ mol$

$[Na^+]$ = 0.200 M

$[F^-]$ = 0.800 M $\quad 2\ F^- \times 0.300\ mol = 0.600\ mol\ F^-$ $\quad + \quad 0.200\ F^- = 0.800\ M\ F^-$

4.) What would be the molarity of a solution in which $50.0\ litres$ of HCl $_{(aq)}$ measured at STP, is dissolved in $2.00\ L$ of water? (assume no change in volume of the water when the gas is added).

Answer - $Molarity = \frac{moles\ of\ solute}{litre\ of\ solution}$ $\quad Molarity = \frac{50.0\ L \times \frac{1\ mol}{22.4\ L}}{2.00\ L}$ $\quad = 1.11607\ M$

$= 1.12\ M\ HCl$

5.) To what volume must $100.mL\ of\ 6.00\ M$ HCl $_{(aq)}$ be diluted in order that the resulting solution be $1.00\ M$?

Answer - $[final] = \frac{[initial] \times (initial\ volume)}{(final\ volume)}$ $\quad 1.00\ M = \frac{6.00\ M \times 0.100\ L}{(final\ volume)}$ $\quad = 0.600\ L$

$= 0.600\ L\ HCl$

KEY

6.) How many molecules of sucrose, $C_{12}H_{22}O_{11}$, would there be in $1.00\ mL$ of a $1.00\ M$ solution?

Answer - $0.001\ L \times \frac{1.00\ mol}{1\ L} \times \frac{6.022 \times 10^{23}\ molec}{1\ mol} =$ $= 6.022 \times 10^{20} molec$

$= 6.022 \times 10^{20} molec\ C_{12}H_{22}O_{11}$

7.) How many grams of $CuSO_4 \cdot 5H_2O_{(s)}$ would be required to prepare $1.00\ L$ of $2.00\ M$ $CuSO_4$?

Answer - $1.00\ L \times \frac{2.00\ mol\ CuSO_4}{1\ L} \times \frac{249.71\ g}{1\ mol} =$ $= 499.42\ g\ CuSO_4$

$= 499\ g\ CuSO_4$

8.) $2.00\ L$ of $12.0\ M$ $HCl_{(aq)}$ is diluted to $20.0\ L$. What is the molarity of the diluted solution?

Answer - $\boldsymbol{C_{conc} \times V_{conc} = C_{dil} \times V_{dil}}$ $\boldsymbol{12.0 \times 2.00 = C_{dil} \times 20.0}$ $\boldsymbol{C_{dil} = 1.20\ M\ HCl}$