Honors Key

Honors Mass %, Molarity, & Dilutions

Molarity (1.) What is the molarity of 2.00 L of a solution containing 17.5 grams of barium chloride?

$M = \frac{mol}{L}$

$\frac{17.5\,g}{} \cdot \frac{mol}{208.3\,g} \cdot \frac{}{2.00\,L}$

.0420 M

$BaCl_2$

Molarity $137.3 + 71.0 = 208.3\,g/mol$

(2.) How many grams of KNO_3 should be used to prepare 2.00 L of a 0.500 M solution?

$M = \frac{mol}{L}$

$\frac{.500\,mol}{} \cdot \frac{2.00\,L}{} \cdot \frac{101.1\,g}{mol}$

101 g

KNO_3

Dilution $101.1\,g/mol$

(3.) To what volume should 100. mL of 18.0 M sulfuric acid be diluted with water to prepare a 1.50 M solution?

$V_2 = \frac{M_1 V_1}{M_2}$

$\frac{18.0\,M}{1.50\,M} \cdot \frac{100.\,mL}{}$

1.20 L

$1.20 \times 10^3\,mL$

mass % (4.) 24.3 g of NaCl must be placed in what mass of water to yield a 12.5% salt water solution?

$\text{mass \%} = \frac{\text{mass solute}}{\text{mass total}} \times 100$

$\text{mass total} = \text{mass}_{H_2O} + \text{mass}_{NaCl}$

170.1 g

H_2O

$12.5\% = \frac{24.3}{24.3 + x} \cdot 100$

Dilution (5.) How much concentrated 18.0 M sulfuric acid is needed to prepare 250. mL of a 6.00 M solution?

$V_1 = \frac{M_2 V_2}{M_1}$

$\frac{6.00\,M}{18.0\,M} \cdot \frac{250.\,mL}{}$

83.3 mL

Molarity

(6.) How many grams of $CuSO_4 \cdot 5H_2O$ are needed to prepare 100. mL of a 0.100 M solution?

$M = \frac{mol}{L}$ $\quad mol = M \cdot L$ $\quad .100 mol/L \;/\; 100. mL/1L \;/\; 1000 mL/L \;/\; 249.7 g/mol$

2.50 g $CuSO_4 \cdot 5H_2O$

249.7 ← used 1/10 for PT

Dilution (7.) How much concentrated 12.0 M hydrochloric acid is needed to prepare 100. mL of a 2.00 M solution?

16.7 mL 12.0 M HCl $\quad V_1 = \frac{V_2 M_2}{M_1}$ $\quad 2.00 M / 100. mL / 12.0 M$

Molarity (8.) To what volume should 5.00 g of KCl be diluted in order to prepare a 0.250 M solution?

.268 L OR 268 mL $\quad M = \frac{mol}{L}$ $\quad L = \frac{mol}{M}$ $\quad 5.00 g / mol / L / 74.6 g / .250 mol$

↑ to 1/10

Molarity (9.) What is the molarity of a solution in which 10.0 g of $AgNO_3$ is dissolved in 500. mL of solution?

.118 M $AgNO_3$ $\quad M = \frac{mol}{L}$ $\quad 10.0 g / mol / 169.9 g / .500 L = .118 M$

↑ to 1/10

Dilution (10.) To what volume should 25.0 mL of 15.0 M nitric acid be diluted to prepare a 3.00 M solution?

125 mL $\quad V_2 = \frac{M_1 V_1}{M_2}$ $\quad 15.0 M / 25.0 mL / 3.00 M$

Dilution (11.) To what volume should 50.0 mL of 12.0 M hydrochloric acid be diluted with water to produce a 4.00 M solution?

150. mL $\quad V_2 = \frac{M_1 V_1}{M_2}$ $\quad 12.0 M / 50.0 mL / 4.0 M = 150. mL$

Mass % (12.) What is the mass percent of 4.35 g of KCl dissolved in 125 g of water?

3.37% $\quad \text{mass \%} = \frac{g\ solute}{g\ total} \cdot 100$

$3.37\% = \frac{4.35}{4.35 + 125} \cdot 100$