

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?

.0420 M

BaCl₂

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

$$\frac{17.5g / \text{mol}}{208.3g / 2.00L}$$

Molarity

$$137.3 + 71.0 = 208.3g / \text{mol}$$

- (2.) How many grams of KNO₃ should be used to prepare 2.00 L of a 0.500 M solution?

101g

KNO₃

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

$$\frac{.500 \text{ mol} / 2.00L}{101.1g / \text{mol}}$$

Dilution

$$101.1g / \text{mol}$$

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

1.20 L

$1.20 \times 10^3 \text{ mL}$

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

$$\frac{18.0M}{1.50M} / 100. \text{ mL}$$

mass %

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

170.1g

H₂O

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

$$\underbrace{\text{mass}_{\text{H}_2\text{O}} + \text{mass}_{\text{NaCl}}}$$

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

Dilution

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

83.3 mL

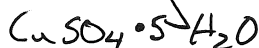
$$V_1 = \frac{M_2 V_2}{M_1}$$

$$\frac{6.00M}{18.0M} / 250. \text{ mL}$$

Molarity

- (6.) How many grams of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ are needed to prepare 100. mL of a 0.100 M solution?

$$M = \frac{\text{mol}}{L} \quad \text{mol} = M \cdot L \quad \frac{0.100 \text{ mol/L} \cdot 100. \text{ mL} \cdot \cancel{1 \text{ L}}}{1000 \text{ mL} / \cancel{\text{mol}}} = 249.7 \text{ g}$$



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?

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

12.0 M HCl

Molarity

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

$$M = \frac{\text{mol}}{L} \quad L = \frac{\text{mol}}{M} \quad \frac{5.00 \text{ g/mol}}{74.6 \text{ g/mol}} \cdot \frac{1}{0.250 \text{ mol/L}} = 268 \text{ mL}$$

0.268 L

OR 268 mL

Molarity

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

$$M = \frac{\text{mol}}{L} \quad \frac{10.0 \text{ g/mol}}{169.9 \text{ g/mol}} \cdot \frac{1}{0.500 \text{ L}} = 0.118 \text{ M}$$

0.118 M

AgNO_3

Dilution

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

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

125 mL

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?

$$V_2 = \frac{M_1 V_1}{M_2} \quad \frac{12.0 \text{ M} \cdot 50.0 \text{ mL}}{4.00 \text{ M}} = 150. \text{ mL}$$

150. mL

Mass %

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

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

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