

Molarity Worksheet

Show your work!

1. How many moles of potassium chloride are dissolved in 3.98 L of a 4.09 M KCl solution?

$$3.98 \text{ L} \times \frac{4.09 \text{ mol}}{\text{L}} = 16.3 \text{ mol}$$

2. How many moles of sodium chloride are dissolved in a 2.9 M NaCl solution that has a volume of 340 mL?

$$340 \text{ mL} \times \frac{\text{L}}{1000 \text{ mL}} \times \frac{2.9 \text{ mol}}{\text{L}} = 0.986$$

0.99 mol

3. How many moles of copper (II) sulfate must be used to make a 1.75 M CuSO_4 solution with a volume of 2300 mL?

$$2300 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{1.75 \text{ mol}}{\text{L}} = 4.025$$

4.0 mol

4. How many grams of NaCl are needed to make one liter of a 2.33 M NaCl solution?

$$1 \text{ L} \times \frac{2.33 \text{ mol}}{\text{L}} \times \frac{58.44 \text{ g}}{\text{mol}} = 136.165$$

100 g

$$\begin{array}{r} 22.99 \\ + 35.45 \\ \hline 58.44 \end{array}$$

5. What is the molarity of a nickel (II) sulfate solution where 47.32 grams of NiSO_4 is dissolved in enough solvent so that the final volume is 3.9 liters?

$$47.32 \text{ g} \times \frac{1 \text{ mol}}{154.76 \text{ g}} \times \frac{1}{3.9 \text{ L}} = 0.078 \text{ M}$$

$$\begin{array}{r} \text{Ni } 58.69 \\ \text{O } 64.00 \\ \text{S } 32.07 \\ \hline 154.76 \end{array}$$

6. What is the molarity of a sodium hydroxide solution where 48.9 grams of NaOH is dissolved in enough water so that the final volume is 679 mL?

$$48.9 \text{ g} \times \frac{1 \text{ mol}}{40.00 \text{ g}} = 1.2225 \text{ mol} = 1.80 \text{ M}$$

2

$$679 \text{ mL} = 0.679 \text{ L}$$

$$\begin{array}{r} 22.99 \\ + 16.00 \\ + 1.01 \\ \hline 40.00 \end{array}$$

7. Most acids are available commercially as concentrated solutions. Concentrated hydrochloric acid is 44 g of acid per 100 mL of solution. What is the molarity of concentrated HCl?

$$\begin{array}{r} 1.01 \\ 35.45 \\ \hline 36.46 \end{array}$$

$$44 \text{ g} \times \frac{1 \text{ mol}}{36.46 \text{ g}} \times \frac{100 \text{ mL}}{100 \text{ mL}} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 12.068$$

12 M

8. How many mLs of a 3.0 M HCl solution do you need to make 500 mL of a 0.10 M HCl solution?

$$M_1 V_1 = M_2 V_2$$

$$16.667 = (3.0 \text{ M}) V_1 = (0.10 \text{ M})(500 \text{ mL})$$

17 mL

9. How many grams of KCl are in 2.50 liters of a 0.50 M potassium chloride solution?

$$\begin{array}{r} 39.10 \\ 35.45 \\ \hline 74.55 \end{array}$$

$$2.50 \text{ L} \times \frac{0.50 \text{ mol}}{\text{L}} \times \frac{74.55 \text{ g}}{1 \text{ mol}} = 93.1875$$

93 g

10. How many milliliters of concentrated H₂SO₄ are needed to make 750.0 mL of a 2.00 M solution? Concentrated H₂SO₄ has a concentration of 173 g of acid/100 mL.

$$173 \text{ g acid} \times \frac{1 \text{ mol}}{98.09 \text{ g}} \times \frac{1}{100 \text{ mL}} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 17.6 \text{ M}$$

$$M_1 V_1 = M_2 V_2$$

$$17.6 \text{ M} (V_1) = (2.00 \text{ M})(750.0 \text{ mL})$$

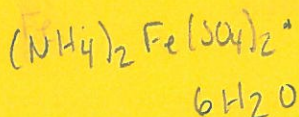
11. How many grams of NaF are needed to make 100 mL of a 0.5 M solution? $V_1 = 85.2 \text{ mL}$

$$\begin{array}{r} 22.99 \\ + 19.00 \\ \hline 41.99 \end{array}$$

$$100 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{0.5 \text{ mol}}{\text{L}} \times \frac{41.99 \text{ g}}{1 \text{ mol}} = 2.0995$$

2 g

12. You only have approximately 5 g of iron (II) ammonium sulfate and you want to make as much of a 0.20 M solution as possible with the amount of solute you have. What is volume of solution can you make?



$$5.00 \text{ g} \times \frac{1 \text{ mol}}{284.05 \text{ g}} \times \frac{0.1 \text{ L}}{0.20 \text{ mol}} = 0.088 \text{ L}$$

~90 mL

284.05 g/mol

(Thanks, google!)