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# Molarity Practice Problems

100 ✓ KHDB

1) How many grams of potassium carbonate are needed to make 200 mL of a 2.5 M solution?  
 $K_2CO_3$   
 $2.5 M = \frac{x}{.2 L}$   $x = .5 \text{ mol}$   $.5 \text{ mol} \frac{138.21}{1 \text{ mol } K_2CO_3} = 69.105 \text{ g } K_2CO_3$

2) How many liters of 4 M solution can be made using 100 grams of lithium bromide?  
 $4 M = \frac{100 \text{ g LiBr}}{x}$   $100 \text{ g LiBr} \frac{1 \text{ mol}}{86.84} = 1.15 \text{ mol LiBr}$   
 $4 M = \frac{1.15 \text{ mol}}{x}$   $4x = 1.15 \text{ mol}$  = **0.2875 L**

3) What is the concentration of a 450 mL solution that contains 200 grams of iron (II) chloride?  
 $200 \text{ g } FeCl_2 \frac{1 \text{ mol}}{126.75 \text{ g}} = 1.58 \text{ mol}$   
 $M = \frac{1.58 \text{ mol}}{.45 L}$  = **3.51**

4) How many grams of ammonium sulfate are needed to make a 0.25 M solution with 2.5 L  
 $.625 \text{ mol } (NH_4)_2SO_4$   $0.25 M = \frac{x}{2.5 L}$   $x = .625 \text{ mol}$   
 $.625 \text{ mol} \frac{132.17 \text{ g}}{1 \text{ mol}} = 82.60625 \text{ g } (NH_4)_2SO_4$

5) What is the concentration of a solution that has a volume of 2.5 L and contains 660 grams of calcium phosphate?  
 $m = \frac{660 \text{ g } Ca_3(PO_4)_2}{2.5 L}$   $660 \text{ g} \frac{1 \text{ mol}}{310.18 \text{ g}} = 2.13 \text{ mol}$   $m = \frac{2.13}{2.5 L} = .852$

6) How many grams of copper (II) fluoride are needed to make 6.7 liters of a 1.2 M solution?  
 $1.2 M = \frac{x}{6.7 L}$   $x = 8.04 \text{ mol}$   $8.04 \text{ mol} \frac{101.55 \text{ g}}{1 \text{ mol}} = 816.462 \text{ g } CuF_2$

7) How many liters of 0.88 M solution can be made with 25.5 grams of lithium fluoride?  
 $.88 M = \frac{25.5 \text{ g LiF}}{x}$   $25.5 \text{ g} \frac{1 \text{ mol}}{25.94} = .98 \text{ mol}$   $.88 = \frac{.98 \text{ mol}}{x}$   $x = 1.11 L$

8) What is the concentration of a solution that with a volume of 660 ml that contains 33.4 grams of aluminum acetate?  
 $Al(C_2H_3O_2)_3$   $m = \frac{33.4}{.66 L}$   $33.4 \text{ g} \frac{1 \text{ mol}}{204.13 \text{ g}} = .16 \text{ mol}$   $m = \frac{.16 \text{ mol}}{.66 L} = .24$

9) How many liters of 0.75 M solution can be made using 75 grams of lead (II) oxide?  
 $.75 M = \frac{75 \text{ g PbO}}{x}$   $75 \text{ g} \frac{1 \text{ mol}}{223.2} = .336 \text{ mol}$   $.75 = \frac{.336 \text{ mol}}{x}$   $x = .448 L$

10) How many grams of manganese (IV) oxide are needed to make a 5.6 liters of a 2.1 M solution?  
 $2.1 M = \frac{x}{5.6 L}$   $x = 11.76 \text{ mol}$   $11.76 \text{ mol} \frac{86.94 \text{ g}}{1 \text{ mol}} = 1022.4144 \text{ g } MnO_2$

11) What is the concentration of a solution with a volume of 9 mL that contains 2 grams of iron (III) hydroxide?  
 $m = \frac{2 \text{ g } Fe(OH)_3}{.009 L}$   $2 \text{ g } Fe(OH)_3 \frac{1 \text{ mol}}{106.88} = .0187 \text{ mol}$   $m = \frac{.0187}{.009} = 2.078$

12) How many liters of 3.4 M solution can be made using 78 grams of isopropanol (C<sub>3</sub>H<sub>8</sub>O)?  
 $3.4 M = \frac{78 \text{ g } C_3H_8O}{x}$   $78 \text{ g} \frac{1 \text{ mol}}{60.11 \text{ g}} = 1.298 \text{ mol}$   $3.4 = \frac{1.298}{x}$   $x = .382 L$

13) What is the concentration of a solution with a volume of 3.3 mL that contains 12 grams of ammonium sulfite?  
 $m = \frac{12 \text{ g } (NH_4)_2SO_3}{.0033 L}$   $12 \text{ g } (NH_4)_2SO_3 \frac{1 \text{ mol}}{116.17 \text{ g}} = .1033 \text{ mol}$   $m = \frac{.1033}{.0033} = 31.3$

# Dilutions Worksheet

Key

1) If I add 25 mL of water to 125 mL of a 0.15 M NaOH solution, what will the molarity of the diluted solution be?  $M_2 = ?$

$$\frac{(0.15M)(125mL)}{150mL} = \frac{(x)(150mL)}{150mL} \quad \boxed{M_2 = .125m}$$

2) If I add water to 100 mL of a 0.15 M NaOH solution until the final volume is 150 mL, what will the molarity of the diluted solution be?  $M_2 = ?$

$$\frac{(0.15M)(100)}{150mL} = \frac{(x)(150mL)}{150mL} \quad \boxed{M_2 = .1m}$$

$M_1 = 10m$   
 $V_1 = 250mL$   
 $M_2 = 0.05m$

3) How much 0.05 M HCl solution can be made by diluting 250 mL of 10 M HCl?

$$\frac{(10m)(250mL)}{0.05m} = \frac{(x)(x)}{0.05m} \quad \boxed{V_2 = 50000mL}$$

$V_2 = ?$

4) I have 345 mL of a 1.5 M NaCl solution. If I boil the water until the volume of the solution is 250 mL, what will the molarity of the solution be?

$$\frac{(1.5m)(345mL)}{250mL} = \frac{(x)(250mL)}{250mL} \quad \boxed{2.07m}$$

$M_1 = 1.5m$   
 $V_1 = 345mL$   
 $M_2 = ?$   
 $V_2 = 250mL$

$V_1 = 500mL$   
 $M_1 = 2.4m$   
 $V_2 = ?$   
 $M_2 = 1.0m$

5) How much water would I need to add to 500 mL of a 2.4 M KCl solution to make a 1.0 M solution?

$$\frac{(500mL)(2.4m)}{1.0m} = \frac{(x)(1.0m)}{1m} \quad \boxed{200mL - 500mL = 700mL}$$

6) If I have 340 mL of a 0.5 M NaBr solution, what will the concentration be if I add 560 mL more water to it?

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$$\frac{(0.5m)(340mL)}{900mL} = \frac{(x)(900mL)}{900mL} \quad \boxed{.188m}$$

$M_1 = .5m$   
 $V_1 = 340mL$   
 $M_2 = ?$   
 $V_2 = 900mL$

$M_1 = .10m$   
 $V_1 = 250mL$   
 $M_2 = ?$   
 $V_2 = 750mL$

7) If I dilute 250 mL of 0.10 M lithium acetate solution to a volume of 750 mL, what will the concentration of this solution be?

$$\frac{(0.10m)(250mL)}{750mL} = \frac{(x)(750mL)}{750} \quad \boxed{.033m}$$

$M_1 = 3.5m$   
 $V_1 = 50mL$   
 $M_2 = 2.00m$   
 $V_2 = ?$

8) If I leave 750 mL of 0.50 M sodium chloride solution uncovered on a windowsill and 150 mL of the solvent evaporates, what will the new concentration of the sodium chloride solution be?

$$\frac{(750mL)(.5m)}{600mL} = \frac{(x)(600mL)}{600mL} \quad \boxed{.625m}$$

$M_1 = 750mL$   
 $V_1 = .5m$   
 $M_2 = ?$   
 $V_2 = 600mL$

$M_1 = 3.5m$   
 $V_1 = 50mL$   
 $M_2 = 2.00m$   
 $V_2 = ?$

9) A chemist wants to dilute 50.0 ml of 3.50 M Sulfuric acid to 2.00 M Sulfuric acid. To what volume must it be diluted?

$$\frac{(3.5m)(50mL)}{2m} = \frac{(2m)(x)}{2m} \quad \boxed{87.5mL}$$

10) What is the concentration when 50.0ml of 1.0M Na<sub>2</sub>SO<sub>4</sub> is diluted to 500mL?

$$\frac{(50mL)(1m)}{500mL} = \frac{(x)(500mL)}{500mL} \quad \boxed{.1m}$$

$M_1 = 50mL$   
 $V_1 = 1m$   
 $M_2 = ?$   
 $V_2 = 500mL$