

Molarity Problems

$$\text{Molarity} = \text{mol/L}$$

$$\text{Molarity} = \text{moles of solute} / \text{Liters of solution}$$

Equation

- $[A] = \frac{n}{V}$
- $[A]$ = square brackets mean concentration in molarity of A
- n = number of particles, moles
- V = volume, liters

Molarity problems

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- $[HCl] = \frac{n}{V}$
- $2.5 \text{ M} = \frac{n}{0.125 \text{ L}}$
- $n = .31 \text{ mol HCl}$
- Or---

$$\frac{2.5 \text{ mol HCl}}{1 \text{ L of soln.}} \times \frac{.125 \text{ L of soln.}}{1} = .31 \text{ mol HCl}$$

Here we go

What concentration solution would be prepared if 39 g of $\text{Ba}(\text{OH})_2$ were mixed in a 450 mL solution?

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$$\frac{39 \text{ g Ba}(\text{OH})_2}{171.316 \text{ g Ba}(\text{OH})_2} \times \frac{1 \text{ mol Ba}(\text{OH})_2}{171.316 \text{ g Ba}(\text{OH})_2} = .2276 \text{ mol Ba}(\text{OH})_2$$

$$M = \frac{\text{mol/L}}{.45 \text{ L of solution}} \frac{.2276 \text{ mol Ba}(\text{OH})_2}{.45 \text{ L of solution}} = .51 \text{ M Ba}(\text{OH})_2$$

More

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- $.6 \text{ L} \times 3.0 \text{ M NaOH} = 1.8 \text{ mol NaOH}$
- $1.8 \text{ mol NaOH} \times 39.998 \text{ g/mol}$
- $= 72 \text{ g NaOH}$

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$$\frac{0.36 \text{ mol Na}_2\text{SO}_4}{0.24 \text{ mol}^{-1}} = 1.5 \text{ L Na}_2\text{SO}_4$$

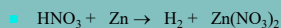
Getting tougher

- $\text{AgNO}_3 + \text{BaCl}_2 \rightarrow \text{AgCl} + \text{Ba(NO}_3)_2$
- Balance the equation. If 1.2 L of .50 M AgNO_3 is reacted completely, what molarity solution of $\text{Ba(NO}_3)_2$ will be created if the volume increased to 1.5 L?

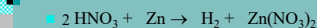
Getting tougher

- $2\text{AgNO}_3 + \text{BaCl}_2 \rightarrow 2\text{AgCl} + \text{Ba(NO}_3)_2$
- Balance the equation. If 1.2 L of .50 M AgNO_3 is reacted completely, what molarity solution of $\text{Ba(NO}_3)_2$ will be created if the volume increased to 1.5 L?

$$\frac{1.2 \text{ L} \times .5 \text{ M AgNO}_3 = .6 \text{ mol AgNO}_3}{.6 \text{ mol AgNO}_3 \left| \frac{1 \text{ mol Ba(NO}_3)_2}{2 \text{ mol AgNO}_3} \right. = \frac{.3 \text{ mol Ba(NO}_3)_2}{1.5 \text{ L}} = .20 \text{ M Ba(NO}_3)_2$$



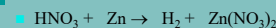
- If you have .65 L of 1.2 M HNO_3 and you react it completely what volume of H_2 gas will you produce at STP?



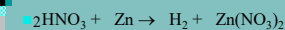
- If you have .65 L of 1.2 M HNO_3 and you react it completely what volume of H_2 gas will you produce at STP?

$$1.2 \text{ M HNO}_3 \times .65 \text{ L} = .78 \text{ mol HNO}_3$$

$$\frac{.78 \text{ mol HNO}_3 \left| \frac{1 \text{ mol H}_2}{2 \text{ mol HNO}_3} \right. = .39 \text{ mol H}_2}{.39 \text{ mol H}_2 \left| \frac{22.4 \text{ L at STP}}{1 \text{ mol H}_2} \right. = 8.7 \text{ L at STP}}$$



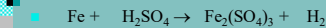
- If you have .65 L of 1.2 M HNO_3 and you react it completely, what conc. of $\text{Zn(NO}_3)_2$ will be left if the volume increases to .75 L?



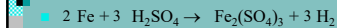
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$$\frac{.78 \text{ mol HNO}_3 \left| \frac{1 \text{ mol Zn(NO}_3)_2}{2 \text{ mol HNO}_3} \right. = .39 \text{ mol Zn(NO}_3)_2}{.39 \text{ mol Zn(NO}_3)_2 \left| \frac{.75 \text{ L}}{.39 \text{ mol Zn(NO}_3)_2} \right. = .52 \text{ M Zn(NO}_3)_2}$$



- If 350 mL of 2.3 M H_2SO_4 is completely reacted, what is the volume of hydrogen gas produced at 24° C and 114 kPa?



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$$.35 \text{ L} \times 2.3 \text{ M} = .805 \text{ mol H}_2\text{SO}_4$$

$$\frac{.805 \text{ mol H}_2\text{SO}_4 \left| \frac{1 \text{ mol H}_2}{1 \text{ mol H}_2\text{SO}_4} \right. = .805 \text{ mol H}_2}{\text{PV} = \text{nRT}} = 17 \text{ L H}_2$$

$$114 \text{ kPa V} = .805 \text{ mol} (8.31) 297 \text{ K}$$