

Molarity Madness #1

1. What is the molarity of a solution if 21 grams of NaHCO_3 is dissolved into 0.50 Liter of water?

$$\frac{21}{84} = .25 \text{ moles } \text{NaHCO}_3$$

$$[\text{NaHCO}_3] \frac{.25}{.50} = .50 \text{ M}$$

2. What is the molarity of a solution if 53 grams of Na_2CO_3 is dissolved into 0.250 Liter of water?

$$\frac{53}{106} = .50 \text{ moles } \text{Na}_2\text{CO}_3$$

$$[\text{Na}_2\text{CO}_3] \underline{2.0 \text{ M}}$$

$$[\text{Na}^+] \underline{4.0 \text{ M}}$$

$$\frac{.50}{.25} = 2 \text{ M}$$

$$[\text{CO}_3^{2-}] \underline{2.0 \text{ M}}$$

3. What is the final molarity if 320 mL of 0.50 M HCl is diluted to a final volume of 480 mL?

$$(.50)(.320) = (M)(.480)$$

$$[\text{HCl}] \underline{.33 \text{ M}}$$

$$(.50)(320) = (M)(480)$$

$$\frac{160}{480} = M(480)$$

4. What is the final concentration of K^+ ions if the following are mixed?

120 mL of 0.10 M K_2SO_4 $(.10)(.120) = .012 \text{ moles} \times 2 = .024$

250 mL of 0.20 M KOH $(.20)(.250) = .05 \text{ moles}$

180 mL of 0.10 M K_3PO_4 $(.10)(.180) = .0180 \times 3 = .054 \text{ moles}$

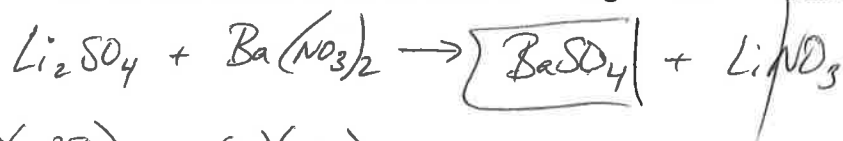
450 mL of 0.10 M KNO_3 $(.10)(.450) = .045 \text{ moles}$

$$\text{total moles K} = .024 + .05 + .054 + .045$$

1 Liter

$$[\text{K}^+] \underline{.173 \text{ M}}$$

5. A 250 mL sample of 0.10 M Li_2SO_4 solution is added to 200 mL of 0.20 M $\text{Ba}(\text{NO}_3)_2$ solution. What are the concentrations of the ions remaining dissolved in solution?



$$(.10)(.250) = .025 \text{ moles}$$

$$(.20)(.200) = .040 \text{ moles}$$

$$.050 \text{ moles Li}^+$$

$$.040 \text{ moles Ba}^{2+}$$

$$.025 \text{ moles SO}_4^{2-}$$

$$.080 \text{ moles NO}_3^-$$

Limiting

$$\text{Ba}^{2+} = .040 - .025 = .015 \text{ moles Ba}^{2+}$$

$$[\text{Li}^+] = \frac{.050}{.450} = .11$$

$$[\text{SO}_4^{2-}] = 0$$

$$[\text{Ba}^{2+}] = \frac{.015}{.450} = .033$$

$$[\text{NO}_3^-] = \frac{.080}{.450} = .178$$

$$.18 \text{ M}$$

6. If 0.30 moles of solid MgCl_2 is mixed with 500 mL of water containing 0.40 moles of solid Na_2SO_4 , what are the final concentrations of the ions?



$$\text{Mg} \quad .30 \text{ moles}$$

$$\text{Na}^+ \quad .80 \text{ moles}$$

$$\text{Cl}^- \quad .60 \text{ moles}$$

$$\text{SO}_4^{2-} \quad .40 \text{ moles}$$

No Rxn = All soluble

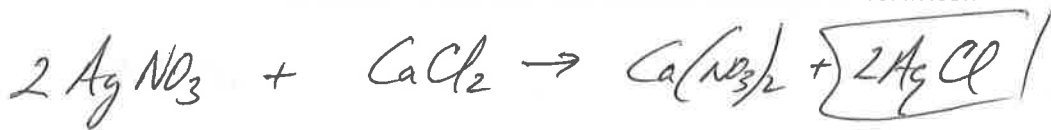
$$[\text{Mg}^{2+}] = \frac{.30}{.500} = .6 \text{ M}$$

$$[\text{Cl}^-] = \frac{.60}{.50} = 1.2 \text{ M}$$

$$[\text{Na}^+] = \frac{.80}{.50} = 1.6 \text{ M}$$

$$[\text{SO}_4^{2-}] = \frac{.40}{.50} = .8 \text{ M}$$

7. A 300. mL sample of 0.15 M AgNO_3 solution is added to 200. mL of 0.10 M CaCl_2 solution. What are the final concentrations of the ions that remain dissolved in solution?



$$(.15)(.300)$$

$$(.10)(.200)$$

$$.045 \text{ moles AgNO}_3$$

$$.020 \text{ moles CaCl}_2$$

$$.045 \text{ moles Ag}^+$$

$$.020 \text{ moles Ca}^{2+}$$

$$.045 \text{ moles NO}_3^-$$

$$.040 \text{ moles Cl}^-$$

Limit

Ag Moles

$$.045$$

$$- .040$$

$$= .005 \text{ moles}$$

$$[\text{Ag}^+] = \frac{.005}{.500} = .01 \text{ M}$$

$$[\text{NO}_3^-] = \frac{.045}{.500} = .09 \text{ M}$$

$$[\text{Ca}^{2+}] = \frac{.020}{.500} = .04 \text{ M}$$

$$[\text{Cl}^-] = 0$$