

## Solubility Calculations Worksheet

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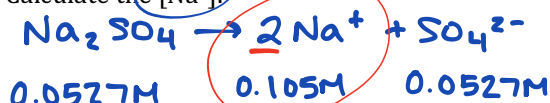
Key

1. 5.62g of  $\text{Na}_2\text{SO}_4$  is dissolved in enough water to make 750.0 mL of solution.

a. Calculate the  $[\text{Na}_2\text{SO}_4]$ .

$$\frac{5.62 \text{ g } \cancel{\text{Na}_2\text{SO}_4}}{750.0 \text{ mL}} \times \frac{1000 \text{ mL}}{1 \text{ L}} \times \frac{1 \text{ mol } \cancel{\text{Na}_2\text{SO}_4}}{142.1 \text{ g}} = 0.0527 \text{ M } \text{Na}_2\text{SO}_4$$

b. Calculate the  $[\text{Na}^+]$ .



2. 250.0 mL of water are added to 600.0 mL of a 6.0 M HCl solution. Calculate the final  $[\text{HCl}]$ .

$$C_1 V_1 = C_2 V_2$$

$$(600.0 \text{ mL})(6.0 \text{ M}) = (850.0 \text{ mL})(C_2)$$

$$C_2 = 4.2 \text{ M HCl}$$

3. Calculate the mass of  $\text{K}_2\text{CrO}_4$  needed to make 3.00 L of a 0.0200 M solution.

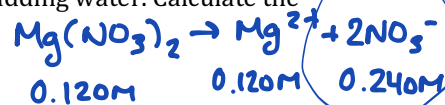
$$\frac{3.00 \text{ L}}{1} \times \frac{0.0200 \text{ mol } \cancel{\text{K}_2\text{CrO}_4}}{1 \text{ L}} \times \frac{194.2 \text{ g}}{1 \text{ mol } \cancel{\text{K}_2\text{CrO}_4}} = 11.7 \text{ g } \text{K}_2\text{CrO}_4$$

4. 150.0 mL of a 0.400 M solution of  $\text{Mg}(\text{NO}_3)_2$  is diluted to a volume of 500.0 mL by adding water. Calculate the final nitrate ion concentration.

$$C_1 V_1 = C_2 V_2$$

$$(0.400 \text{ M})(150.0 \text{ mL}) = (C_2)(500.0 \text{ mL})$$

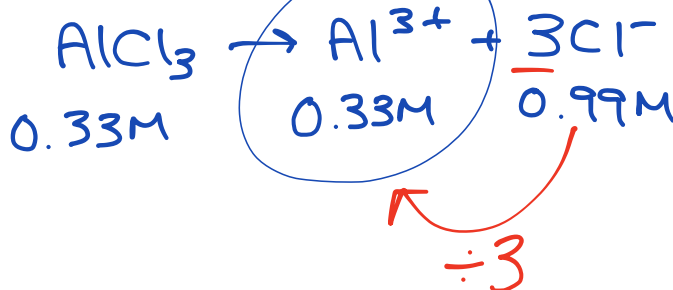
$$C_2 = 0.120 \text{ M} = \text{Mg}(\text{NO}_3)_2$$



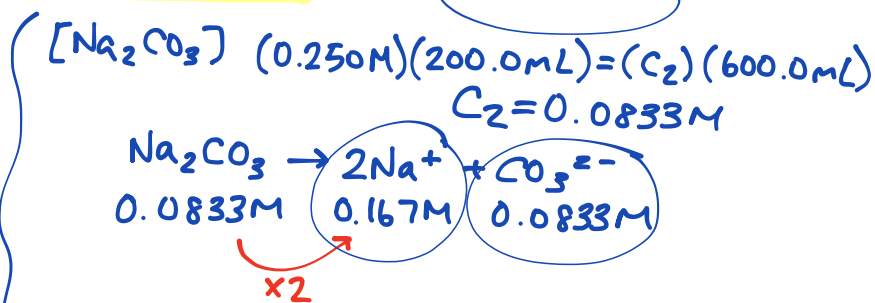
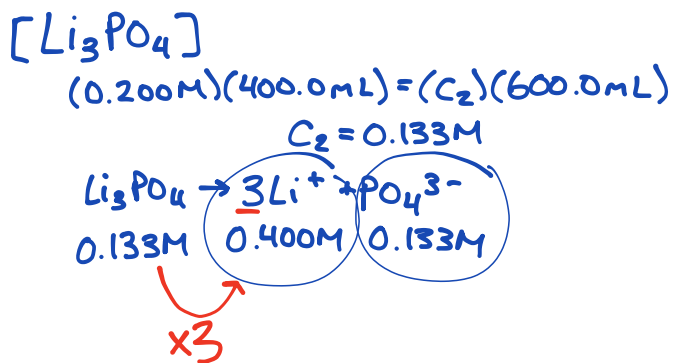
5. What volume of 0.250 M  $\text{NaNO}_3$  solution needs to be evaporated in order to produce 68.0 grams of solid  $\text{NaNO}_3$ ?

$$68.0 \text{ g } \cancel{\text{NaNO}_3} \times \frac{1 \text{ mol } \cancel{\text{NaNO}_3}}{85.0 \text{ g}} \times \frac{1 \text{ L}}{0.250 \text{ mol}} = 3.2 \text{ L } \text{NaNO}_3$$

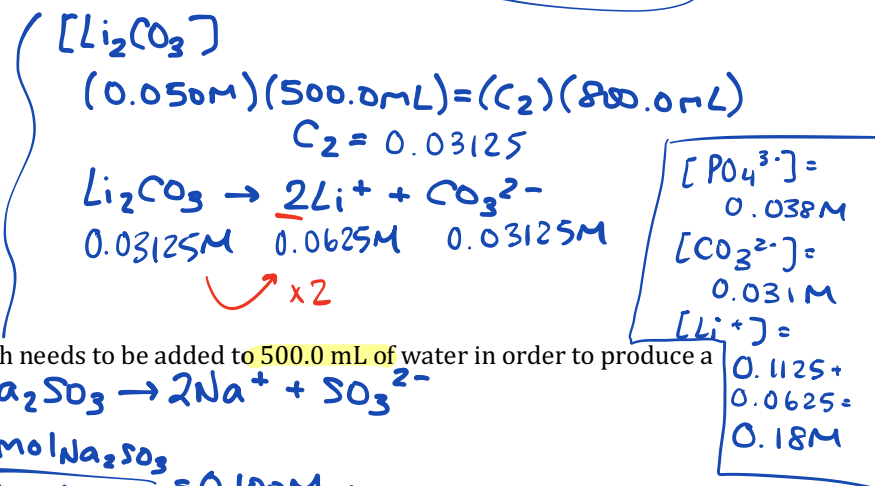
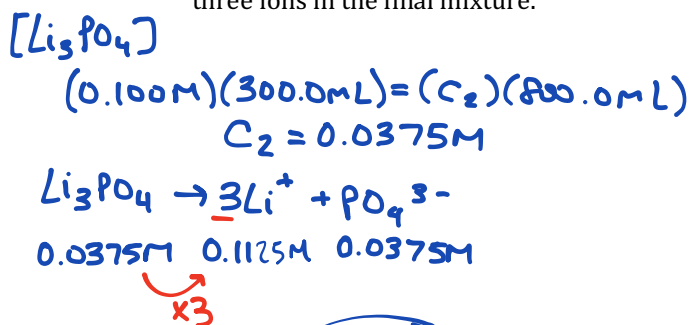
6. The concentration of chloride ion,  $[\text{Cl}^-]$  in a solution of aluminum chloride is 0.99 M. Calculate the  $[\text{Al}^{3+}]$  in the same solution.



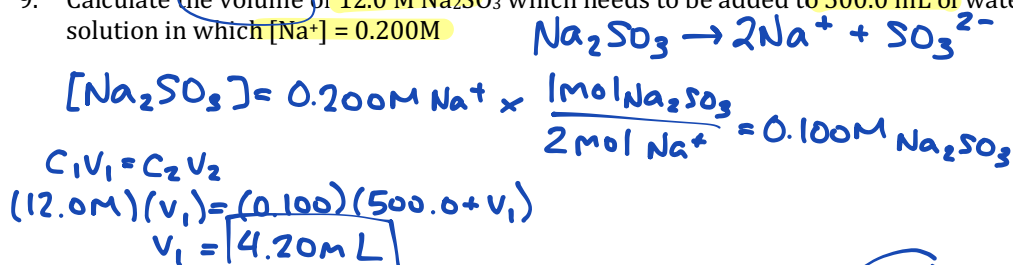
7. 400.0 mL of 0.200 M  $\text{Li}_3\text{PO}_4$  is mixed with 200.0 mL of 0.250 M  $\text{Na}_2\text{CO}_3$ . Calculate the final concentration of all four ions in the final mixture.



8. 300.0 mL of 0.100 M  $\text{Li}_3\text{PO}_4$  is mixed with 500.0 mL of 0.050 M  $\text{Li}_2\text{CO}_3$ . Calculate the final concentration of all three ions in the final mixture.



9. Calculate the volume of 12.0 M  $\text{Na}_2\text{SO}_3$  which needs to be added to 500.0 mL of water in order to produce a solution in which  $[\text{Na}^+] = 0.200\text{M}$



10. The molar solubility of calcium sulphate is  $8.43 \times 10^{-3}\text{M}$ . Calculate the mass of solid calcium sulphate which can be evaporated from 250.0 mL solution of calcium sulphate.

$$250.0\text{mL CaSO}_4 \times \frac{1\text{L}}{1000\text{mL}} \times \frac{8.43 \cdot 10^{-3}\text{mol}}{1\text{L}} \times \frac{136.2\text{g}}{1\text{mol}} = 0.287\text{g CaSO}_4$$

11. It is found that 13.01g is the maximum mass of  $\text{PbCl}_2$  which will dissolve in 3.0L of solution. Use this information to calculate the concentration of  $\text{PbCl}_2$ .

$$\frac{13.01\text{g PbCl}_2}{3.0\text{L}} \times \frac{1\text{mol PbCl}_2}{278.2\text{g}} = 0.016\text{M PbCl}_2$$

12. The concentration of silver iodate ( $\text{AgIO}_3$ ) is  $1.79 \times 10^{-4}\text{M}$ . Calculate the mass of silver iodate that can be dissolved in 650 mL of water.

$$650.0\text{mL} \times \frac{1\text{L}}{1000\text{mL}} \times \frac{1.79 \cdot 10^{-4}\text{mol}}{1\text{L}} \times \frac{282.8\text{g}}{1\text{mol AgIO}_3} = 0.0329\text{g AgIO}_3$$