

UNIT III: SOLUBILITY

REVIEW PROBLEMS (3.1-3.8)

Do as many of these problems as you can and check your answers with the key (<http://mscoolidge.wordpress.com/chemistry-12/>). Get help on any you don't understand. This sheet contains most of the major types of problems found in the solubility unit.

- Identify each of the following as ionic, partially ionic, or molecular substances.
a) $\text{NaCl}_{(aq)}$ b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}_{(aq)}$ c) $\text{CCl}_4(l)$ d) $\text{HNO}_3(aq)$ e) $\text{C}_2\text{H}_6(l)$
- A chemistry stockroom contains a bottle of 12.0 M HCl. A teacher needs to make up 800.0 mL of a 3.0 M solution of HCl. What volume of the stock solution (12.0 M) does the teacher need to use?
- If 25.0 mL of 0.90 M HCl is added to 125.0 mL of water, what is the final [HCl]?
- Calculate the $[\text{Na}^+]$ in a 0.55 M solution of sodium acetate. (Write the proper formula for sodium acetate first.)
- 200 mL of 0.500 M NaCl is mixed with 300 mL of 0.200 M CaCl_2 . Calculate the final total $[\text{Cl}^-]$.
- Calculate the *molar solubility* of BaCO_3 in water.
- Calculate the number of grams of CaC_2O_4 which will dissolve in 1.5 L of water at 25 °C.
- The solubility of CoCO_3 in water is 1.189×10^{-3} grams per liter. Calculate the K_{sp} for CoCO_3 .
- It is found that 1.892×10^{-13} grams of the compound cadmium (II) sulphide (CdS) will dissolve in 350.0 mL of water to form a saturated solution. Using this data, calculate the value for the K_{sp} of CdS .
- Calculate the maximum mass of $\text{Mg}(\text{OH})_2$ which will dissolve in 150.0 mL of water. Show all of your steps clearly.
- Calculate the molar solubility of calcium oxalate (CaC_2O_4). Show all of your steps clearly.
- If 250.0 mL of 0.000340M $\text{Cu}(\text{NO}_3)_2$ is mixed with 350.0 mL of 3.12×10^{-4} M KIO_3 , will a precipitate form? Show all of your steps clearly.

Name _____

Date _____

13. Calculate the maximum $[F^-]$ that can exist in a solution in which $[Sr^{2+}] = 0.00050 \text{ M}$. Show all of your steps clearly.

14. Calculate the mass of Na_2CO_3 that must be added to 2.50 L of 0.00085 M MgCl_2 in order to just start precipitation. Show all of your steps clearly.

15. A sample of a saturated solution of MgF_2 was evaporated and the following data table was constructed. Use this data to calculate the value of K_{sp} for MgF_2 at 25°C .

Mass of empty evaporating dish	78.5418 g
Mass of evaporating dish and MgF_2 residue after evaporation	78.5434 g
Volume of saturated MgF_2	100.00 mL
Temperature 25.0°C	

16. Calculate the $[Ag^+]$ required to just start precipitation of Ag_2CO_3 in a 0.0030 M solution of $(NH_4)_2CO_3$.

17. A solution is prepared by mixing 20.0 mL of 0.60 M Na_2SO_4 with 60.0 mL of 1.1 M NaOH . Calculate the $[Na^+]$ in the final mixture.

18. The molar solubility of nickel (II) sulphide is $3.317 \times 10^{-11} \text{ M}$. Calculate the value of the solubility product for nickel (II) sulphide. Show all of your work clearly.

19. A solution of potassium chloride is titrated with 0.200 M silver nitrate solution. The following data table was obtained.

	Trial 1	Trial 2	Trial 3
Initial $AgNO_3$ burette reading (mL)	0.00	5.26	14.63
Final $AgNO_3$ burette reading (mL)	5.26	12.19	19.87
Volume of KCl titrated	25.0	25.0	25.0

Use the information in the data table to calculate the $[Cl^-]$ in the KCl solution. Show all of your work clearly.