Chemistry: Molarity of Solutions

Directions: Solve each of the following problems. Show your work and include units for full credit.

1. What mass of the following chemicals is needed to make the solutions indicated?
   a. 1.0 liter of a 1.0 M mercury (II) chloride (HgCl₂) solution
   b. 2.0 liters of a 1.5 M sodium nitrate (NaNO₃) solution
   c. 5.0 liters of a 0.1 M Ca(OH)₂ solution
   d. 100 mL of a 0.5 M (NH₄)₃PO₄ solution

2. Calculate the molarity of the following solutions.
   a. 12 g of lithium hydroxide (LiOH) in 1.0 L of solution
   b. 198 g of barium bromide (BaBr₂) in 2.0 L of solution
   c. 54 g of calcium sulfide (CaS) in 3.0 L of solution

3. Calculate the volume of each solution, in liters.
   a. a 1.0 M solution containing 85 g of silver nitrate (AgNO₃)
   b. a 0.5 M solution containing 250 g of manganese (II) chloride (MnCl₂)
   c. a 0.4 M solution containing 290 g of aluminum nitrate (Al(NO₃)₃)

Answers:
1a. 272 g HgCl₂
1b. 255 g NaNO₃
1c. 37 g Ca(OH)₂
1d. 7.5 g (NH₄)₃PO₄
2a. 0.50 M LiOH (aq)
2b. 0.33 M BaBr₂ (aq)
2c. 0.25 M CaS (aq)
3a. 0.50 L AgNO₃ (aq)
3b. 4.0 L MnCl₂ (aq)
3c. 3.4 L Al(NO₃)₃ (aq)
4. How many grams of potassium chloride (KCl) are required to make 2.0 L of a 3.0 M solution?

5. How many grams of magnesium chloride (MgCl₂) are needed to make 6.0 L of a 3.0 M solution?

6. What mass of barium chloride (BaCl₂) is needed to make 0.5 L of a 4.0 M solution?

7. What mass of iron (II) sulfate (FeSO₄) is needed to make 200 mL of a 0.25 M solution?

8. What is the molarity of a solution in which 1.6 g of sodium hydroxide (NaOH) are dissolved in 125 mL of solution?

9. What is the molarity of a solution in which 5.0 g of sodium carbonate (Na₂CO₃) are dissolved in 200 mL of solution?

10. How many grams of silver nitrate (AgNO₃) are needed to make 2.0 L of a 0.10 M solution?

11. 2.0 L of a solution contain 25 g of potassium permanganate (KMnO₄). What is the molarity of the solution?

12. How many grams of glycerine (C₃H₈O₃) are needed to make 100 mL of a 2.5 M solution?

13. What is the molarity of a solution containing 150 g of zinc sulfate (ZnSO₄) per liter?

14. A test tube contains 10 mL of a 3.0 M CaCO₃ solution. Calculate the number of grams of CaCO₃ in the tube.

Answers:
4. 448 g KCl
5. 1715 g MgCl₂
6. 417 g BaCl₂
7. 7.6 g FeSO₄
8. 0.32 M NaOH (aq)
9. 0.24 M Na₂CO₃ (aq)
10. 34 g AgNO₃
11. 0.08 M KMnO₄ (aq)
12. 23 g C₃H₈O₃
13. 0.93 M ZnSO₄ (aq)
14. 3.0 g CaCO₃