

Concentration Calculations: I

1. Calculate the concentration of the following solutions:
- 825 mL that contains 30.0 g of acetic acid, CH_3COOH
 - 2500 mL that contains 49.0 g phosphoric acid, H_3PO_4
 - 1.50 dm^3 that contains 102 g potassium hydroxide, KOH
 - 1.25 L that contains 8.50 g of sodium nitrate, NaNO_3

Answer: 1. a. 0.605 M, b. 0.200 M, c. 1.21 M, d. 0.0800 M

2. How many cubic decimeters of solution can be made from each of the following ?
- 2.00 M solution using 80.0 g NaOH
 - 0.500 M solution using 80.0 g NaOH
 - 6.00 M solution using 126 g HNO_3
 - 0.100 M solution using 170.0 g NaNO_3

Answer: 2. a. 1.00 L, b. 4.00 M, c. 0.333 L, d. 20.0 L

3. Calculate the mass of solute in the following solution:
- 750.0 mL of a CaCl_2 solution that is 0.500 M
 - 3000.0 mL of a KOH solution that is 2.50 M
 - 250.0 mL of a Na_2SO_4 solution that is 2.00 M
 - 50.0 mL of a NaNO_3 solution that is 0.100 M

Answer: 3. a. 41.6 g, b. 420 g, c. 71.0 g, d. 0.424 g

4. Suppose that you need 5.00 L of a 0.10 mol/L sodium nitrate solution. What mass of sodium nitrate must you use. Describe how you would prepare this solution.

5. Suppose that you want to make as large a volume of 5.00 mol/L sodium chloride solution as possible. You have a bottle that contains 1.17 kg of this substance. What volume of solution can you make?

6. If 8 g of sodium hydroxide, NaOH , is dissolved in 100 mL of solution, what is the molar concentration of this solution?

7. If 20.8 g of barium chloride, BaCl_2 , is dissolved in 200 mL of solution, what is the molar concentration of this solution? What is the concentration of the chloride ions?

8. You purchased a 25 mL container of a 15 % m/V hydrogen peroxide solution. However, before the hydrogen peroxide can be used to disinfect a wound, it must be diluted with water to a concentration of 2.55% m/V. What will the final volume of the solution if you dilute all 25 mL of the hydrogen peroxide that you purchased?

9. You need 100 mL of a 0.1 mol/L hydrochloric acid, HCl, and all you have in stock is a bottle labeled 12.0 M HCl. How can you prepare the solution you need?

10. If 0.75 L of a 5.00 M solution of HCl is diluted to a volume of 1.80 L by adding water, what is the concentration of the resulting diluted solution?

11. How many mL of water will be required to dilute 11 mL of a 0.45 H₂SO₄ to a concentration of 0.12 M?

12. It is desired to produce 1.00 L of 0.05 M nitric acid, HNO₃, by diluting 14.00 M nitric acid. Calculate the volume of the concentrated acid and the volume of water required for the dilution.

13. A chemist adds water to a 120 mL of a 6.0 M solution of NaOH until the final volume is 2.0 L. What is the molarity of the resulting solution?

14. What concentration results when 150 mL of a 0.36 M solution of magnesium sulphate, MgSO₄, are added to a 750 mL of water?

15. Ms. Pall needs 5.0 L of HCl for a class experiment, A supply of 14.6 M solution of concentrated HCl is available. What volume of the concentrated acid should be measured out, by Ms. Pall to add to water to make up the final volume of 5.0 L?

16. How much of 15.4 mol/L solution of HNO₃ is needed so that the dilution results in 150 mL of 0.200 mol/L solution?

17. Given an ammonia, NH₃, solution with a concentration of 15.0 mol/L, how would you prepare 1.00 L of dilute ammonia with a concentration of 0.100 mol/L? How much water was added to prepare the dilute solution?

18. If 10.0 mL of a 0.56 mol/L solution of aluminum nitrate, Al(NO₃)₃, is diluted to 250.0 mL, what is...

- The concentration of aluminum nitrate in the new solution?
- The concentration of the nitrate ions in the new solution?

19. Calculate the concentration of the solution formed if a 25.0 mL sample of HNO₃, 10.0 M is placed in a 500.0 mL volumetric flask and the flask is filled up to the mark with distilled water.

10. What is the total volume of 3.0 M H₂SO₄, that can be prepared from 5.00 L of concentrated sulphuric acid (18 M)?