

- 368.** A student takes a sample of KOH solution and dilutes it with 100.00 mL of water. The student determines that the diluted solution is 0.046 M KOH, but has forgotten to record the volume of the original sample. The concentration of the original solution is 2.09 M. What was the volume of the original sample?
- 369.** A chemist wants to prepare a stock solution of H_2SO_4 so that samples of 20.00 mL will produce a solution with a concentration of 0.50 M when added to 100.0 mL of water.
- What should the molarity of the stock solution be?
 - If the chemist wants to prepare 5.00 L of the stock solution from concentrated H_2SO_4 , which is 18.0 M, what volume of concentrated acid should be used?
 - The density of 18.0 M H_2SO_4 is 1.84 g/mL. What mass of concentrated H_2SO_4 should be used to make the stock solution in (b)?
- 370.** To what volume should 1.19 mL of an 8.00 M acetic acid solution be diluted in order to obtain a final solution that is 1.50 M?
- 371.** What volume of a 5.75 M formic acid solution should be used to prepare 2.00 L of a 1.00 M formic acid solution?
- 372.** A 25.00 mL sample of ammonium nitrate solution produces a 0.186 M solution when diluted with 50.00 mL of water. What is the molarity of the stock solution?
- 373.** Given a solution of known percentage concentration by mass, a laboratory worker can often measure out a calculated mass of the solution in order to obtain a certain mass of solute. Sometimes, though, it is impractical to use the mass of a solution, especially with fuming solutions, such as concentrated HCl and concentrated HNO_3 . Measuring these solutions by volume is much more practical. In order to determine the volume that should be measured, a worker would need to know the density of the solution. This information usually appears on the label of the solution bottle.
- Concentrated hydrochloric acid is 36% HCl by mass and has a density of 1.18 g/mL. What is the volume of 1.0 kg of this HCl solution? What volume contains 1.0 g of HCl? What volume contains 1.0 mol of HCl?
 - The density of concentrated nitric acid is 1.42 g/mL, and its concentration is 71% HNO_3 by mass. What volume of concentrated HNO_3 would be needed to prepare 10.0 L of a 2.00 M solution of HNO_3 ?
 - What volume of concentrated HCl solution would be needed to prepare 4.50 L of 3.0 M HCl? See (a) for data.
- 374.** A 3.8 M solution of FeSO_4 solution is diluted to eight times its original volume. What is the molarity of the diluted solution?
- 375.** A chemist prepares 480. mL of a 2.50 M solution of $\text{K}_2\text{Cr}_2\text{O}_7$ in water. A week later, the chemist wants to use the solution, but the stopper has been left off the flask and 39 mL of water has evaporated. What is the new molarity of the solution?
- 376.** You must write out procedures for a group of lab technicians. One test they will perform requires 25.00 mL of a 1.22 M solution of acetic acid. You decide to use a 6.45 M acetic acid solution that you have on hand. What procedure should the technicians use in order to get the solution they need?
- 377.** A chemical test has determined the concentration of a solution of an unknown substance to be 2.41 M. A 100.0 mL volume of the solution is evaporated to dryness, leaving 9.56 g of crystals of the unknown solute. Calculate the molar mass of the unknown substance.
- 378.** Tincture of iodine can be prepared by dissolving 34 g of I_2 and 25 g of KI in 25 mL of distilled water and diluting the solution to 500. mL with ethanol. What is the molarity of I_2 in the solution?
- 379.** Phosphoric acid is commonly supplied as an 85% solution. What mass of this solution would be required to prepare 600.0 mL of a 2.80 M phosphoric acid solution?
- 380.** Commercially available concentrated sulfuric acid is 18.0 M H_2SO_4 . What volume of concentrated H_2SO_4 would you use in order to make 3.00 L of a 4.0 M stock solution?
- 381.** Describe how to prepare 1.00 L of a 0.495 M solution of urea, NH_2CONH_2 , starting with a 3.07 M stock solution.
- 382.** Honey is a solution consisting almost entirely of a mixture of the hexose sugars fructose and glucose; both sugars have the formula $\text{C}_6\text{H}_{12}\text{O}_6$, but they differ in molecular structure.
- A sample of honey is found to be 76.2% $\text{C}_6\text{H}_{12}\text{O}_6$ by mass. What is the molality of the hexose sugars in honey? Consider the sugars to be equivalent.
 - The density of the honey sample is 1.42 g/mL. What mass of hexose sugars are in 1.00 L of honey? What is the molarity of the mixed hexose sugars in honey?
- 383.** Industrial chemicals used in manufacturing are almost never pure, and the content of the material may vary from one batch to the next. For these reasons, a sample is taken from each shipment and sent to a laboratory, where its makeup is determined. This procedure is called assaying. Once the content of a material is known, engineers adjust the manufacturing process to account for the degree of purity of the starting chemicals.
- Suppose you have just received a shipment of sodium carbonate, Na_2CO_3 . You weigh out 50.00 g of the material, dissolve it in water, and dilute the solution to 1.000 L. You remove 10.00 mL from the solution and dilute it to 50.00 mL. By measuring the amount of a second substance that reacts with Na_2CO_3 , you determine that the concentration of sodium carbonate in the diluted solution is 0.0890 M. Calculate the percentage of Na_2CO_3 in the original batch of material. The molar mass of Na_2CO_3 is 105.99 g. (Hint: Determine the number of moles in the original solution and convert to mass of Na_2CO_3 .)
- 384.** A student wants to prepare 0.600 L of a stock solution of copper(II) chloride so that 20.0 mL of the stock solution diluted by adding 130.0 mL of water will yield