CHEMISTRY

PREPARING SOLUTIONS

In the chemical storage area of the lab, many solutions are on the shelf at a specific concentration from the supplier. This is called the ***Standard Solution***.

Most of the time, the standard solution is very concentrated and needs to be ***diluted*** so it lasts longer and is safer to use.

Diluting a Solution:

Ex:

The formula for diluting a solution is as follows:

$$C_1V_1 = C_2V_2$$

C_1 –
V_1 –
C_2 –
V_2 –

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Ex: *For a Lab, Mr. Caslick must make 2.0 L of 0.10 M sulfuric acid. The standard solution in the storage cabinet is 18 M. What volume of the concentrated standard solution is needed?*

Ex: *Stock HCl has a concentration of 12 M. If you took 20 mL of it and mixed it with 480 mL of water, what would the concentration of your diluted solution be?*

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Practice Problems

51. Suppose that you are given a stock solution of 1.50 mol/L ammonium sulfate, $(NH_4)_2SO_4(aq)$. What volume of the stock solution do you need to use to prepare each of the following solutions?
- **a.** 50.0 mL of 1.00 mol/L $(NH_4)_2SO_4(aq)$
- **b.** 200 mL of 0.800 mol/L $(NH_4)_2SO_4(aq)$
- **c.** 250 mL of 0.300 mol/L $NH_4^+(aq)$

52. What is the concentration of the solution that is obtained by diluting 60.0 mL of 0.580 mol/L potassium hydroxide to each of the following volumes?
- **a.** 350 mL
- **b.** 180 mL
- **c.** 3.00 L

53. What volume of a 1.60 mol/L stock solution of calcium chloride, $CaCl_2(aq)$, would you use to make 0.500 L of a 0.300 mol/L solution?

54. Water is added to 100 mL of 0.15 mol/L sodium nitrate, $NaNO_3(aq)$, to make 700 mL of diluted solution. Calculate the molar concentration of the diluted solution.

55. A solution is made by diluting 25 mL of 0.34 mol/L calcium nitrate, $Ca(NO_3)_2(aq)$, solution to 100 mL. Calculate the following concentrations for the solution:
- **a.** the concentration of calcium nitrate
- **b.** the concentration of nitrate ions

56. A laboratory stockroom has a stock solution of 90% (m/v) sulfuric acid, $H_2SO_4(aq)$. If a technician dilutes 50 mL of the stock solution to a final volume of 300 mL, what will be the new mass/volume percent concentration? (**Hint:** The dilution formula can be used for concentration expressed in any units, provided that the units remain the same.)

57. What volume of 1.25 mol/L potassium iodide solution can you make with 125 mL of 3.00 mol/L potassium iodide solution?

58. Hydrochloric acid is available as a stock solution with a concentration of 10 mol/L. If you need 1.0 L of 5.0 mol/L hydrochloric acid, what volume of stock solution should you measure out? Approximately how much distilled water will you need to make the dilution?

59. Write a procedure you could use to make each aqueous solution using a solid solute.
- **a.** 50 mL of 0.25 mol/L silver nitrate, $AgNO_3(aq)$
- **b.** 125 mL of 0.350 mol/L potassium carbonate, $K_2CO_3(aq)$
- **c.** 400 mL of 0.200 mol/L potassium permanganate, $KMnO_4(aq)$

60. Outline a procedure for making each aqueous solution by diluting a stock solution.
- **a.** 0.50 L of 1.0 mol/L sodium hydroxide, NaOH(aq), using 17 mol/L sodium hydroxide
- **b.** 150 mL of 0.300 mol/L ammonia, $NH_3(aq)$, using 6.0 mol/L ammonia
- **c.** 1.75 L of 0.0675 mol/L ammonium bromide, $NH_4Br(aq)$, using 0.125 mol/L ammonium bromide

51. **a.** 33.3 mL
b. 107 mL
c. 25 mL

52. **a.** 0.99 mol/L
b. 0.19 mol/L
c. 0.0116 mol/L

53. 0.0938 L

54. 0.02 mol/L

55. **a.** 0.08 mol/L
b. 0.2 mol/L

56. 15% (m/v)

57. 3.00×10^2 mL

58. 0.5 L; about 0.5 L

59. **a.** Mass 2.1 g $AgNO_3(s)$
b. Mass 6.05 g $K_2CO_3(s)$
c. Mass 12.6 g $KMnO_4(s)$

60. All parts: Your procedure should be similar to the procedur outlined in Table 8.8.
- **a.** Dilute 29 mL
- **b.** Dilute 7.5 mL
- **c.** Dilute 945 mL