

# More Solution Calculations

47. What is the concentration in moles per litre of a solution that contains 39.2 g of  $\text{H}_3\text{PO}_4$  in 500 mL of solution? 0.800 M
48. What is the concentration in moles per litre of a solution that contains 100 g of  $\text{Na}_2\text{SO}_4$  in 10.0 L of solution? 0.0704 M
49. How many grams of  $\text{C}_6\text{H}_{12}\text{O}_6$  are contained in 250 mL of a 0.050 mol/L solution of  $\text{C}_6\text{H}_{12}\text{O}_6$  in water? 2.25g  $\text{C}_6\text{H}_{12}\text{O}_6$
50. How many grams of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  are required to prepare 2.0 L of a 3.0 mol/L copper sulfate solution? 1500g  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
51. Sodium phosphate,  $\text{Na}_3\text{PO}_4$  (known commercially as TSP), is used for cleaning grease and oil spills. Describe precisely how you would prepare 250 mL of a 0.320 mol/L solution of  $\text{Na}_3\text{PO}_4$ . 13.1g  $\text{Na}_3\text{PO}_4$
52. What volume of 0.14 mol/L hydrochloric acid would contain 5.0 g of HCl? 0.980 L
53. What volume of 0.95 mol/L  $\text{Na}_2\text{SO}_4$  would be required to prepare 200 mL of 0.15 mol/L  $\text{Na}_2\text{SO}_4$ ? 31.6 mL
54. If 55.0 mL of 0.55 mol/L  $\text{Na}_2\text{SO}_4$  are diluted to a final volume of 250 mL, what is the new concentration of the  $\text{Na}_2\text{SO}_4$  in moles per litre? 0.121 M
55. To what final volume would 50.0 mL of 1.50 mol/L  $\text{HNO}_3$  have to be diluted to prepare 0.45 mol/L  $\text{HNO}_3$ ? 167 mL
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56. How many grams of  $\text{Ca}(\text{NO}_3)_2$  can be prepared by reacting 125 mL of 5.00 mol/L  $\text{HNO}_3$  with an excess of  $\text{Ca}(\text{OH})_2$ ? 51.3g  $\text{Ca}(\text{NO}_3)_2$
- $$2\text{HNO}_3(\text{aq}) + \text{Ca}(\text{OH})_2(\text{s}) \rightarrow \text{Ca}(\text{NO}_3)_2(\text{aq}) + 2\text{H}_2\text{O}(\ell)$$
57. If 0.200 g of  $\text{Na}_2\text{CO}_3$  completely reacts with 30.0 mL of HCl, what is the concentration of the HCl in moles per litre? 0.126 M HCl
- $$\text{Na}_2\text{CO}_3(\text{aq}) + 2\text{HCl}(\text{aq}) \rightarrow 2\text{NaCl}(\text{aq}) + \text{H}_2\text{O}(\ell) + \text{CO}_2(\text{g})$$
58. If 50.0 mL of  $\text{H}_2\text{SO}_4$  yields 0.300 g of  $\text{BaSO}_4$  when reacted with excess  $\text{BaCl}_2$ , what is the concentration of the  $\text{H}_2\text{SO}_4$  in moles per litre? 0.0257 M
- $$\text{BaCl}_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{HCl}(\text{aq})$$
59. How many grams of  $\text{Fe}^{2+}$  are required to react with 30.1 mL of 0.0165 mol/L  $\text{K}_2\text{Cr}_2\text{O}_7$  solution? 0.166g  $\text{Fe}^{2+}$
- $$14\text{H}^+(\text{aq}) + 6\text{Fe}^{2+}(\text{aq}) + \text{K}_2\text{Cr}_2\text{O}_7(\text{aq}) \rightarrow 6\text{Fe}^{3+}(\text{aq}) + 2\text{Cr}^{3+}(\text{aq}) + 2\text{K}^+(\text{aq}) + 7\text{H}_2\text{O}(\ell)$$
60. What is the maximum number of grams of NaCl that can be produced when 50.0 mL of 0.120 mol/L NaOH reacts with 39.4 mL of 0.165 mol/L HCl? 0.351g NaCl
- $$\text{NaOH}(\text{aq}) + \text{HCl}(\text{aq}) \rightarrow \text{NaCl}(\text{aq}) + \text{H}_2\text{O}(\ell)$$
61. How would you prepare 500 g of an aqueous solution containing 2.50% by mass of sodium chloride? 12.5g NaCl  
487.5 mL  $\text{H}_2\text{O}$
62. If concentrated ammonia solution is 27.0%  $\text{NH}_3$  and has a density of 0.90 g/mL, what is the concentration of this solution in moles per litre? 14.3 M
63. If a concentrated solution of acetic acid is 99.5%  $\text{HC}_2\text{H}_3\text{O}_2$  and has a density of 1.05 g/mL, what is the concentration of this acid in moles per litre? 17.4 M