

### Concentration Exercises - Answer Key

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|---|--|
| 1) 1.00 mol of NaCl in 2.00 L of solution.  | Ans = <u>0.500</u> M                     |
| 2) 0.50 mol of HCl in 1.00 L of solution.   | Ans = <u>0.50</u> M                      |
| 3) 98.0 g of H <sub>2</sub> SO <sub>4</sub> in 1.00 L of solution.  | Ans = <u>1.00</u> M                      |
| 4) 29.3 g of NaCl in 2.00 L of solution.  | Ans = <u>0.251</u> M                     |
| 5) 15.0 g of KCl in 1.80 L of solution.   | Ans = <u>0.113</u> M                     |
| 6) 2.00 mg of KCl in 515 mL of solution.  | Ans = <u>5.21x10<sup>-5</sup></u> M      |
| 7) 1.50x10 <sup>-2</sup> g of NaClO <sub>3</sub> in 200.0 mL of   | Ans = <u>7.04x10<sup>-4</sup></u> M      |
| 8) 58.5 g of NaCl in 1.00 kg of solutio   | Ans = <u>1.06</u> M                      |
| 9) Pure sulfuric acid (H <sub>2</sub> SO <sub>4</sub> ) wi  | Ans = <u>18.70</u> M                     |
| 10) 10.0 g of NaCl in 100.0 g of solution.  | Ans = <u>10.0</u> %                      |
| 11) 10.0 g of NaCl in 100.0 g of water.   | Ans = <u>9.09</u> %                      |
| 12) 98 g of H <sub>2</sub> SO <sub>4</sub> in 1.00 kg of solution.  | Ans = <u>9.8</u> %                       |
| 13) 2.00 mole of H <sub>2</sub> SO <sub>4</sub> in 1.00 kg  | Ans = <u>19.6</u> %                      |
| 14) 1.50 mole of H <sub>2</sub> SO <sub>4</sub> mixed with 1.00 kg  | Ans = <u>12.8</u> %                      |
| 15) 1.50 mole of NaCl mixed with 50.0 mol   | Ans = <u>8.8</u> %                       |
| 16) 1.0 mol of NaCl mixed with 2.0 kg of w  | Ans = <u>0.50</u> mol/kg                 |
| 17) 0.5 mol of HCl mixed with 1.0 kg of   | Ans = <u>0.50</u> mol/kg                 |
| 18) 98.0 g of H <sub>2</sub> SO <sub>4</sub> mixed to form 1.0 kg of solution. (note that there is not 1.0 kg solvent.) | Ans = <u>1.1</u> mol/kg                  |
| 19) 29.3 g of NaCl in 2.000 kg of solution.   | Ans = <u>0.254</u> mol/kg                |
| 20) 15.0 g of KCl in 1.800 kg of solution.  | Ans = <u>0.113</u> mol/kg                |
| 21) 2.0 mg of KCl in 515 mL of solution with a density of 1.002 g/mL.   | Ans = <u>5.2x10<sup>-5</sup></u> mol/kg  |
| 22) 1.50x10 <sup>-2</sup> g of NaClO <sub>3</sub> in 200.0 kg of sol  | Ans = <u>7.04x10<sup>-7</sup></u> mol/kg |
| 23) 58.5 g of NaCl in 1.00 L of solution whose density is 1.06 g/mL   | Ans = <u>1.00</u> mol/kg                 |
| 24) 50.0% sulfuric acid (H <sub>2</sub> SO <sub>4</sub> )   | Ans = <u>10.2</u> mol/kg                 |
| 25) 30.0% MgCl <sub>2</sub> solution.   | Ans = <u>4.50</u> mol/kg                 |

- 26) 20.0%  $\text{Fe}(\text{NO}_3)_3$  solution. Ans = 1.03 mol/kg
- 27) 40.0%  $(\text{NH}_4)_2\text{SO}_4$  solution. Ans = 5.05 mol/kg
- 28) 24.0% KBr solution. Ans = 2.66 mol/kg
- 29) 50.0% sulfuric acid ( $\text{H}_2\text{SO}_4$ ) with a density of 1.407 g/mL. Ans = 7.17 M
- 30) 30.0%  $\text{MgCl}_2$  solution with a density of 1.269 g/mL. Ans = 4.00 M
- 31) 20.0%  $\text{Fe}(\text{NO}_3)_3$  solution with a density of 1.1612 g/mL. Ans = 0.961 M
- 32) 40.0%  $(\text{NH}_4)_2\text{SO}_4$  solution with a density of 1.2284 g/mL. Ans = 3.72 M
- 33) 24.0% KBr solution with a density of 1.198 g/mL. Ans = 2.42 M
- 34) 1.088 M  $\text{H}_2\text{SO}_4$  with a density of 1.0661 g/mL  
Ans = 10.01 %  
Ans = 1.13 mol/kg
- 35) 5.62 M  $\text{HNO}_3$  with a density of 1.180 g/mL  
Ans = 30.0 %  
Ans = 6.80 mol/kg
- 36) 1.69 M HCl with a density of 1.0279 g/mL  
Ans = 6.00 %  
Ans = 1.75 mol/kg
- 37) 1.27 M  $\text{Na}_2\text{CO}_3$  with a density of 1.1244 g/mL  
Ans = 12.0 %  
Ans = 1.28 mol/kg
- 38) 4.24 M  $\text{NH}_4\text{NO}_3$  with a density of 1.1310 g/mL  
Ans = 30.0 %  
Ans = 5.36 mol/kg
- 39) 0.1256 M  $\text{NH}_4\text{NO}_3$  with a density of 1.0042 g/mL  
Ans = 1.001 %  
Ans = 0.1263 mol/kg
- 40) 0.255 mol/kg  $\text{NH}_4\text{NO}_3$  with a density of 1.0085 g/mL

- Ans = 2.00 %  
Ans = 0.252 M
- 41) 8.3 mol/kg  $\text{NH}_4\text{NO}_3$  with a density of 1.1790 g/mL  
Ans = 40.01 %  
Ans = 5.894 M
- 42) 0.0714 mol/kg  $\text{CuSO}_4$  with a density of 1.1063 g/mL  
Ans = 1.13 %  
Ans = 0.0781 M
- 43) 1.487 mol/kg  $\text{CuSO}_4$  with a density of 1.2146 g/mL  
Ans = 19.18 %  
Ans = 1.460 M
- 44) 2.23 mol/kg  $\text{Fe}(\text{NO}_3)_3$  with a density of 1.3164 g/mL  
Ans = 35.0 %  
Ans = 1.91 M
- 45) 6.86 mol/kg  $\text{HCl}$  with a density of 1.0980 g/mL  
Ans = 20.0 %  
Ans = 6.03 M
- 46) 2.21 mol/kg  $\text{NH}_4\text{NO}_3$  with a density of 1.0642 g/mL  
Ans = 15.0 %  
Ans = 2.00 M
- 47) 1.0 mole of  $\text{NaCl}$  in 5.0 mole of water.  
Ans = 0.17
- 48) 23 g of  $\text{NaCl}$  in 900.0 g of water.  
Ans = 0.0078
- 49) 10 g of  $\text{HCl}$  in 1.00 kg of water.  
Ans =  $4.9 \times 10^{-3}$
- 50) 1.00 mol/kg water solution of  $\text{NaCl}$ .  
Ans =  $1.77 \times 10^{-2}$
- 51) 1.0 mol/kg water solution of  $\text{H}_2\text{SO}_4$   
Ans =  $1.96 \times 10^{-2}$
- 52) 1.088 M  $\text{H}_2\text{SO}_4$  with a density of 1.0661 g/mL  
Ans =  $2.002 \times 10^{-2}$
- 53) 5.62 M  $\text{HNO}_3$  with a density of 1.180 g/mL  
Ans = 0.109
- 54) 1.69 M  $\text{HCl}$  with a density of 1.0279 g/mL  
Ans =  $3.05 \times 10^{-2}$

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55) 0.255 mol/kg  $\text{NH}_4\text{NO}_3$

$$\text{Ans} = \underline{4.57 \times 10^{-3}}$$

56) 8.333 mol/kg  $\text{NH}_4\text{NO}_3$

$$\text{Ans} = \underline{0.1304}$$

57) 1.487 mol/kg  $\text{CuSO}_4$

$$\text{Ans} = \underline{2.607 \times 10^{-2}}$$

58) 6.86 mol/kg  $\text{HCl}$

$$\text{Ans} = \underline{0.110}$$

59) 2.21 mol/kg  $\text{NH}_4\text{NO}_3$

$$\text{Ans} = \underline{3.83 \times 10^{-2}}$$

60) 1.27 M  $\text{Na}_2\text{CO}_3$  with a density of 1.1244 g/mL

$$\text{Ans} = \underline{2.26 \times 10^{-2}}$$

61) 4.24 M  $\text{NH}_4\text{NO}_3$  with a density of 1.1310 g/mL

$$\text{Ans} = \underline{8.74 \times 10^{-2}}$$

62) 0.1256 M  $\text{NH}_4\text{NO}_3$  with a density of 1.0042 g/mL

$$\text{Ans} = \underline{2.269 \times 10^{-3}}$$