# Calculating percent by mass/volume 

The concentration of a solution can be expressed as a percent - the ratio of solute to solution. This calculation is commonly performed based on the mass of a substance $(\mathrm{m} / \mathrm{m})$ or on the volume of substances $(\mathrm{v} / \mathrm{v})$. A solution that is composed of 5 g of salt for every 95 g of water will have a mass percent of $5 \%$.

$$
\frac{5 \mathrm{~g} \mathrm{NaCl}}{(5 \mathrm{~g}+95 \mathrm{~g}) \text { solution }} \times 100=5 \%
$$

| USEFUL EQUATIONS |  |
| :---: | :---: |
| Percent by Mass | $\frac{\text { mass solute }}{\text { mass solution }} \times 100$ |
| Percent by Volume | $\frac{\text { mass solute }}{\text { mass solution }} \times 100$ |
| Solution $=$ solute + solvent |  |
| $1 \mathrm{~kg}=1000 \mathrm{~g}$ | $1 \mathrm{~L}=1000 \mathrm{~mL}$ |

A solution made from 35 mL of ethanol and 65 mL of water will have a percent by volume of $35 \%$.

$$
\frac{35 \mathrm{~mL} \text { ethanol }}{(35 \mathrm{~mL}+65 \mathrm{~mL}) \text { solution }} \times 100=35 \%
$$

## Answer the following questions. Show all work and report answers with units.

1. What is the percent by mass of 5.0 g of iron (II) sulfate dissolved in 75.0 g of water?
2. A solution is made by adding 25 mL of benzene to 80 mL of toluene. What is the percent by volume of benzene?
3. A solution is formed by adding 35 g of ammonium nitrate to 250 g of water. What is the percent by mass of ammonium nitrate?
4. What is the percent by volume of a solution formed by mixing 25 mL of isopropanol with 45 mL of water?
5. What is the mass percent of each component in the mixture formed by adding 12 g of calcium sulfate, 18 g of sodium nitrate, and 25 g of potassium chloride to 500 g of water?
6. A solution is made by dissolving 125 g of sodium chloride in 1.5 kg of water. What is the percent by mass?
7. What is the percent by volume of a solution formed by added 15 L of acetone to 28 L of water?
8. An experiment requires a solution that is $80 \%$ methyl alcohol by volume. What volume of methyl alcohol should be added to 200 mL of water to make this solution?
