**Problem #1:** A solution of $H_2SO_4$ with a molal concentration of 8.010 m has a density of 1.354 g/mL. What is the molar concentration of this solution?

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**Problem #2:** A sulfuric acid solution containing 571.4 g of $H_2SO_4$ per liter of solution has a density of 1.329 g/cm$^3$. Calculate the molality of $H_2SO_4$ in this solution

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**Problem #3:** An aqueous solution is prepared by diluting 3.30 mL acetone (d = 0.789 g/mL) with water to a final volume of 75.0 mL. The density of the solution is 0.993 g/mL. What is the molarity, molality and mole fraction of acetone in this solution?

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**Problem #4:** Calculate the molality of 15.00 M HCl with a density of 1.0745 g/cm$^3$

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**Problem #5:** What is the mass of a sample of a 0.449 molal KBr that contains 2.92 kg of water?

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**Problem #6:** A 0.391 m solution of the solute hexane dissolved in the solvent benzene is available. Calculate the mass (g) of the solution that must be taken to obtain 247 g of hexane ($C_6H_{14}$).

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**Problem #7:** Calculate the mass of the solute $C_6H_6$ and the mass of the solvent tetrahydrofuran that should be added to prepare 1.63 kg of a solution that is 1.42 m.

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**Problem #8:** What is the molality of NaCl in an aqueous solution in which the mole fraction of NaCl is 0.100?

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**Problem #9:** Calculate the molality (m) of a 7.55 kg sample of a solution of the solute $CH_2Cl_2$ (molar mass = 84.93 g/mol) dissolved in the solvent acetone ($CH_3COH_3C$) if the sample contains 929 g of methylene chloride

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**Problem #10:** What is the molality of a 3.75 M $H_2SO_4$ solution with a density of 1.230 g/mL?

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**Problem #11:** What is the molality of NaCl in an aqueous solution which is 4.20 molar? The density of the solution is $1.05 \times 10^3$ g/L.

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**Problem #12:** Calculate the molarity of a 3.58 m aqueous RbCl solution with a density of 1.12 g/mL.

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**Problem #13:** Calculate the molality of a solution containing 16.5 g of naphthalene ($C_{10}H_8$) in 54.3 g benzene ($C_6H_6$).

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**Problem #14:** What is the molality of a solution consisting of 1.34 mL of carbon tetrachloride ($CCl_4$, density= 1.59 g/mL) in 65.0 mL of methylene chloride ($CH_2Cl_2$, density = 1.33 g/mL)?

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**Problem #15:** Determine concentration of a solution that contains 825 mg of $Na_2HPO_4$ dissolved in 450.0 mL of water in (a) molarity, (b) molality, (c) mole fraction, (d) mass %, and (e) ppm. Assume the density of the solution is the same as water (1.00 g/mL). Assume no volume change upon the addition of the solute.

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**Bonus Problem:** You are given 450.0 g of a 0.7500 molal solution of acetone dissolved in water. How many grams of acetone are in this amount of solution?