***Chemistry***

**3: Composition of Substances and Solutions**

**3.4: Other Units for Solution Concentrations**

69. Consider this question: What mass of a concentrated solution of nitric acid (68.0% HNO3 by mass) is needed to prepare 400.0 g of a 10.0% solution of HNO3 by mass?

(a) Outline the steps necessary to answer the question.

(b) Answer the question.

Solution

(a) The dilution equation can be used, appropriately modified to accommodate mass-based concentration units:

%mass1 × mass1 = %mass2 × mass2

This equation can be rearranged to isolate mass1 and the given quantities substituted into this equation.

(b) 

71. What mass of solid NaOH (97.0% NaOH by mass) is required to prepare 1.00 L of a 10.0% solution of NaOH by mass? The density of the 10.0% solution is 1.109 g/mL.

Solution

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The mass of pure NaOH required is

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This mass of NaOH must come from the 97.0% solution:



73. The hardness of water (hardness count) is usually expressed in parts per million (by mass) of CaCO3, which is equivalent to milligrams of CaCO3 per liter of water. What is the molar concentration of Ca2+ ions in a water sample with a hardness count of 175 mg CaCO3/L?

Solution

Since CaCO3 contains 1 mol Ca2+ per mol of CaCO3, the molar concentration of Ca2+ equals the molarity of CaCO3:



75. In Canada and the United Kingdom, devices that measure blood glucose levels provide a reading in millimoles per liter. If a measurement of 5.3 m*M* is observed, what is the concentration of glucose (C6H12O6) in mg/dL?

Solution

1 mg/dL = 0.01 g/L and 1 L = 10 dL

5.3 mmol/L × 180.158 mg/mmol = 9.5 × 102 mg/L

9.5 × 102mg/L ×= 95 mg/dL

77. Copper(I) iodide (CuI)is often added to table salt as a dietary source of iodine. How many moles of CuI are contained in 1.00 lb (454 g) of table salt containing 0.0100% CuI by mass?

Solution

0.0100% of 454 g is (0.000100 × 454 g) = 0.0454 g;

Molar mass of CuI = 63.546 + 126.90447 = 190.450 g/mol;



79. D5W is a solution used as an intravenous fluid. It is a 5.0% by mass solution of dextrose (C6H12O6) in water. If the density of D5W is 1.029 g/mL, calculate the molarity of dextrose in the solution.

Solution

The molar mass of C6H12O6 is 6 × 12.011 + 12 × 1.00794 + 6 × 15.9994 = 180.2 g/mol. In 1.000 L, there are:

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Since we selected the volume to be 1.00 L, the molarity of dextrose is

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