Dilute and concentrated

Dilute and concentrated solution class 9. Dilute and concentrated acid difference. Dilute and concentrated acid. Dilute and concentrated definition. Dilute and concentrated solution meaning. Dilute and concentrated acid meaning. Dilute and concentrated solution. Dilute and concentrated urine.

A solution is a type of mixture in which one or more things are added. The added thing is known as a solute, while the added thing is called a solvent. One of the key characteristics of a solution is that it is a homogeneous mixture, which means that the two or more ingredients in a solution cannot be seen by the naked eye; instead, they should all be seen as one. Similarly, the ingredients cannot be separated easily. Effectine Examples. Imagine mixing a spoonful of sand in a glass of water. While the sand will mix in the water, it will not dissolve. The grains of the sand will still be visible to the naked eye as they float, whirl or settled in the glass of water. Sand can also be easily removed by filtering water. So while this is a kind of mixture, it cannot be called a homogeneous mixture or a solution. Learning outcomes define concentration. Use the concentrated and diluted terms to describe the relative concentration of a solution. Calculate the molarity of a solution. Calculate the percent concentration (m / m, v / v, m / v). Describe a solution whose concentration is in \ (\ text {ppm}}) or \ (\ text {ppb} \). Use concentration units in the calculations. Determine equivalents for an ion. Complete calculations related to moles, volumes or mass equivalents. Complete the dilution calculations. There are several ways to express the amount of solute in a solution. The concentration of a solution is a measure of the amount of solute that has been dissolved in a certain amount of solvent or solution. A concentrated solution is one that has a relatively large amount of dissolved solute. A diluted solution is one that has a relatively small amount of dissolved solute. However, these terms are relative and we need to be able to express concentration more precisely and quantitatively. However, concentrate and dilute are useful as terms for comparing one solution to another (see figure below). Also, keep in mind that the words “concentrated” and “diluted” can be used as verbs. If you were to heat up a solution, evaporating the solvent, you’d focus, because the solute-to-solvent ratio would be increasing. If I had to add more water to an aqueous solution, I’d divide it because the solute to solvent ratio would decrease. Figure \ (\ PageIndex {1} \): Solutions of a red dye in water from the most diluted (left) to the most concentrated (right). One way to describe the concentration of a solution is a percentage of the percentage of the solution composed of the solute. This percentage can be determined in one of three ways: (1) the mass of the solute divided by the mass of the solution, (2) the volume of the solute divided by the volume of the solution, or (3) the mass of the solute For the volume of the solution. As these methods generally give rise to different valleys, it is important to always indicate how a percentage date has been calculated. When the soluto in a solution is a one a convenient way to express the concentration is a mass percentage (mass/mass), which is the grams of solute for \ (100 \: \text{g}\) solution. \[\text{Massual Percentage} = \frac{\text{ solute massa}}{\text{solution mass}\%\] Suppose a solution has been prepared by fading \ (25.0 \: \text{g}\) of sugar in \ (100 \text{g}\) of water. The mass percentage would be calculated as follows: \[\text{Percentage in mass} = \frac{25 \: \text{g sugar}}{125 \: \text{g solution} \times 100\% = 20\% \: \text{zucchero}\] Sometimes, you may want to prepare a certain amount of solution with a certain percentage in mass and you will need to calculate which amount of the solute is necessary. For example, let's say you have to \ (3.00 \times 10^3 \: \text{g}\) of a sodium chloride solution which is \ (5.00\%\) in mass. You can reorganize and solve the solute mass. \[\begin{align} \%\: \text{per mass} &= \frac{\text{ solute massa}{\text{text solution massa}} \times 100\%\\ 5.00\% &= \frac{\text{ solute massa}{3.00 \times 10^3 \: \text{g}} \times 100\%\text\text Note that it was necessary to subtract the \ mass (\ce{NaCl}\)\ (\left (150 \: \text{g} \right)\) from the \ solution mass (\left (3.00 \times 10^3 \: \text{g} \right) \) to calculate the water mass to be added. The solute percentage in a solution can be determined more easily in volume when the solute and solvent are both liquids. The volume of the solute divided by the volume of the solution expressed as a percentage, gives the percentage in volume (volume/volume) of the solution. If you prepare a solution by taking \ (40. \text{mL}\) of ethanol and adding enough water to get \ (240. \: \text{mL}\) of solution, the percentage in volume is: \[\begin{align} \text{percent in volume} &= \frac{\text{\volume of solute}}{\text{volume of solution}} \times 100\ Often the labels of ingredients on food and medicines show quantity expressed in percentages (see figure below). Figure \ (\PageIndex{2}\): Hydrogen peroxide is commonly sold as a \ (3\%\) solution in volume to be used as a disinfectant. It should be noted that, unlike the mass, you can not simply sum the solute and solvent volumes to get the final volume of the solution. When adding a solute and a solvent together, the mass is preserved, but not the volume. In the previous example, a solution was made by starting with \ (40 \: \text{mL}\) of ethanol and adding enough water to get \ (240 \: \text{mL}\) of solution. The simple mixture \ (40 \: \text{mL}\) of ethanol and \\: \text{mL}\) of water would not give the same result, since the final volume probably would not be exactly \ (240 \: \text{mL}\). The mass-volume percentage is also used incases and is calculated similarly to the previous two percentages. The mass/volume percentage is calculated by dividing the mass of the solute by the volume of the solution and expressing the result as a percentage. For example, if a solution is prepared by \ (10 ââ\: \ ce {nacl} \) in sufficient water to create a solution \ (150 \: \ text {ml} \), the concentration of the mass volume is \ [\ Begin {alline} \ text {mass volume concentration} and \ frac {\ text {solute mass}}} {\ text {solution}}} \ times 100 \% \\ & = \ frac {10 \: \ text {g } \: \ \ {nacl}} {150 \: \ text {ml solution}}} Times 100 \% \\ & = 6.7 \% \ end {alline} \] Two other units of concentration are parts per million and parts per billion. These units are used for very small concentrations of solute such as the amount of lead in drinking water. Understanding these two units is much easier if you consider a percentage as parts percent. Remember that \ (85\%\) is the equivalent of 85 over one hundred. A solution that is \ (15 \: \ text {ppm} \) is 15 parts solute for 1 million parts solutions. A \ (22 \: \ text {ppb} \) solution is 22 parts solute per billions of parts. While there are several ways to express two units of \ (\ text {ppm}}) and \ (\ text {ppb} \), we treat them as \ (\ text {mg} \) or \ (\ MU \) text {g} \) solutes for \ (\ text {l} \) solution, respectively. For example, \ (32 \: \ text {ppm}}} could be written as \ (\ frac {32 \: \ text {mg soluute}} {1 \: \ text {l solution}} \) while \ (59 \: \ text {ppb}}) can be written as \ (\ frac {59 \: \ mu \ text {g soluute}} {1 \: \ text {l solution}} Chemicals mainly require the concentration of solutions to be expressed in a way which represents the number of particles present which could react according to a particular chemical equation. Because percent measurements are based on mass or volume, they are generally not useful for chemical reactions. A concentration unit based on moles is preferable. The molarity \ (\ left (\ text {m} \ right) \) of a solution is the number of moles of solute dissolved in one liter of solution. To calculate the molarity of a solution, divide the solute moles by the volume of the solution expressed in litres. \ [\ text {molarity} \: \ left (\ text {m} \ right) = \ frac {\ text {molarity}}} {\ text {liters of solution} = \ frac {\ text {mol} } {\ text {l}} \] Note that the volume is in litres of solution and not litres of solvent. When a molar is reported, the unit is the symbol \ (\ text {m} \), which is read as “molar.” For example, a solution labeled as \ (1.5 \: \ text {m} \: \ ce {nh_3} \) is a 1.5 molar ammonia solution. Example \ (\ PageDex {1} \) A solution is prepared dissolution \ (42.23 \: \ text {G} \) of \ (\ CE {nh_4cl} \) in enough water to make \ (500.0 \: \ text {ml} \) of Calculate her molarity. Solution Step 1: List the quantities notes and plan the problem. Mass Note of (500.0: text {ml} = 0.5000: text {l} unknown molarity (=?: Text {m}) the mass of ammonium chloride is first converted into mole. Then, the molarity is calculated by dividing it by liters. Note that the indicated volume has been converted into liters. Step 2: Fix. \[42.23\:\text{g}\:\ce{NH_4Cl}\\times \frac{1\:\text{mol}\:\ce{NH_4Cl}}{53.50\:\text{g}\:\ce{NH_4Cl}}= 0.7893\:\text{mol}\:\ Step 3: Think about your result. Molarity is \ (1.579 \: \text{M}\), which means that a liter of the solution would contain 1.579 piers of \ (\ce{NH_4Cl}\). There are four significant figures. Figure \ (\PageIndex{3}\): Volumetric balloons are of different sizes, each designed to prepare a different volume of solution. When adding water to a water solution, the concentration of the water decreases. This is because the number of moles of the solute does not change, but the total volume of the solution increases. We can set an equality between the grooves before dilution (1) and the grooves after dilution (2). \[\text{mol}_1 = \text{mol}_2\] Since the grooves in a solution are equal to the molarity multiplied by the volume in liters, we can set them equal. \[M_1 \times L_1 = M_2 \times L_2\] Finally, since the two sides of the equation are equal to each other, the volume can be of any unit of measurement, provided that unit is the same from both sides. Our equation to calculate the molarity of a diluted solution becomes: \[M_1 \times V_1 = M_2 \times V_2\] In addition, the concentration can be in any other unit provided \ (M_1\) and \ (M_2\) are in the same unit. Suppose we have \ (100. \: \text{mL}\) of a \ (2.0 \: \text{M}\) solution of \ (\ce{HCl}\). Dilute the solution by adding sufficient water to obtain the volume of the solution \ (500. \text{mL}\). The new molarity can be easily calculated using the above equation and solving \ (M_2\). \[M_2 = \frac{M_1 \times V_1}{V_2} = \frac{2.0 \: \text{M} \times 100. \: \text{mL}{500. \: \text{mL}} = 0.40 \: \text{M}\: \ce{HCl}\] five, since the new volume is five times larger than the original volume. Consequently, molarity is a fifth of its original value. Another common dilution problem consists in deciding how much a highly concentrated solution is needed to obtain a desired amount of solution with a lower concentration. The highly concentrated solution is typically referred to as a mother's solution. Example \ (\PageIndex{2}\) Nitric acid \ (\left (\ce{HNO_3} \right) \) is a powerful and corrosive acid. If ordered by a chemical supplier, its molarity is \ (16 \: \text{M}\). How much nitric acid mother solution should be used to make \ (8.00 \: \text{L}\) of a \ (0.50 \text{M}\) solution? Step 1: List known quantities and plan the problem. Title\ (\ce{HNO_3}\: \left (M_1 \destra) = 16 \: \text{M}\)\ (V_2 = 8.00 \:\:(M_2 = 0.50: text {m}) Unknown stock volume {{hno_3} Is (v_1), the necessary volume of the concentrated stock solution. Step 2: resolve. [V_1 = frac {m_2 times v_2} {v_1} = frac {0.50: text {m} Times 8.00: text {l}} {16: {m}} = 0.25: notext {l} = 250: text {ml} step 3: think about the result. The dilution from (16: Text {M}) A (0.5: Text {M} is a factor of 32. The concentration is important in health care because it is used in many ways. E 'Even fundamental to use unit with any value to ensure the correct dosage of drugs or ratio levels of substances in the blood, to name only two. Another way of looking at concentration as in IV solutions and blood is in terms of equivalent. a Equivalent is equal to a charge of charge in an ion. The value of the equivalents is always positive regardless of the charge. For example I, ({na ^ +}) and ([begin {array} {ll] textbf {}}} {equivalents} \ {na ^ +} & 1 2+}} & 2 {{^ {3+}} & 3 {\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ cl Cl click cl cl The equivalents are used because the concentration of accusations are used to be used It is important for the identity of the solutes. For example, a standard IV solution does not contain the same blood solutes, but the concentration of the accusations is the same. Sometimes, the concentration is lower in which MILLIEQUIVALENTS CASE (LEFT (. Just like metric prefixes used with basic units, milli is used to change the equivalents in a way (1: text {EQ} = 1000: text {meq}). Example (PageIndex {3}) How many equivalents of (CA ^ {2 +}}) are present in a solution that contains 3.5 Milights)? Solution Use the ratio between wheels and equivalent of (CA ^ {2 +}} to find the answer. [3.5: \\\ \\ \\ \\ \\ \ }} Example (PageIndex {4} A patient received (1.50: Text {L}) of saline solution that has a concentration of (154: text {meq / l} ce {na ^ +} which sodium mass has received the patient?) and the equivalent and molar mass of sodium. Note that if this problem had a different ion with a different charge, this should be considered in the calculation. [1.50: \cdot \frac{154 \: \text{mEq}}{1 \: \text{L}}} \cdot \frac{1 \: \text{Eq}}{1000 \: \text{mEq}}} \cdot \frac{1 \ \text{mol} \ \ce{Na^+}}}{1 \\\ \ce{Na^+}} = 5.31 \: \text{g} \: Translation: Contributors and Attribution CK-12 Foundation by Sharon Sharon Richard Parsons, Therese Forsythe, Shonna Robinson and Jean Dupon. Allison Soult, Ph.D. (Department of Chemistry, University of Kentucky)