Buffers lab answers

In chemical equations, variables surrounded by brackets [and] are expressions of concentration, or a certain number of molecules in a given solution volume. For example, if you see [H+] in the equation, this is read as a concentration of hydrogen ions. The concentration of the solution is often expressed in units of flies per liter (mol/L). Just as a dozen represent the number of 12 items, one fly represents an amount of about 6,022 X 1023 items. one dozen molecules = 12 molecules one mole molecule = 602.2 million molecules! Note: n is used in equations to indicate the quantity measured in flies. For example if you see nAcid in the equation, it is read as an acid fly. The term Molarity indicates that the concentration of the solution is in units of flies per liter. One molar solution (1 M) contains one solute mole in each liter of that solution. Reagents used in the laboratory will often be labeled with their concentration expressed in terms of molarity. The relative concentration of H+ or OH- can change very dramatically in the solution, so the logarithmic scale (called pH) instead of the linear scale is used to express concentration. Equations 2 and 3 can be used to calculate pH based on hydrogen ion concentration or vice versa. Equation 2. To calculate pH based on hydrogen ion concentration [H+]: pH = -log [H+] Equation 3. To calculate the concentration of hydrogen ions [H+] based on pH: [H+] = 10-pH The buffer is a mixture of weak acid (HA) and its salts (e.g., NaA), and is sometimes referred to as a furnace-acid pair. As mentioned above, buffers have a major role in stabilizing the pH of the living system. Vertebrate organisms maintain a blood pH using a buffer consisting of a mixture of carbonic acid (H2CO3) and sodium bicarbonate (Na+HCO3-). The weak acid in this buffer is carbonic acid and its salt is sodium bicarbonate. When dissolved in water, sodium bicarbonate separates completely into sodium ions (Na+) and bicarbonate ions (HCO3-). H2CO3 is an HCO3-conjugation acid- and HCO3- is the conjugation base of H2CO3. Together, these conjugated acid-base pairs serve as bicarbonate buffer systems. Buffer systems are also very important for experimental cell biology. PH solution buffers can be calculated as follows: Equation 4. THE PH of the buffer solution can be calculated as follows: \[pH=pK_a + log \frac{n_A}{n_{HA}}onumber\] Where pKa = acid dissociation constant, nA = the initial number of salt flies in the buffer, and nHA = the initial number of acid flies in the buffer. If you know these values, it is possible to calculate the pH of the buffer system accurately before you create them! PKa acetic acid (used in today's experiment) is 4.75 Equation 5. To find the base volume of conjugation or acid conjugation: nA = conjugation base volume (mL) \(\times \dfrac{1\: L}{100\: mL} \times \) conjugation base concentration (mol/L) = conjugation acid volume (mL) \(\times \dfrac{1\: L}{100\: mL} \times \) concentration of conjugation acid (mol/L) PH solution can be approximately ized using paper strips treated with reagents of discoloration indicators. The strip is dipped in a solution to be tested for a few seconds and then removed. The color strip indicator is then compared to the reference chart, often printed on the side of the strip container. The reference color on the chart that best matches the color of the reacting strip will have a pH value printed underneath it and it will be a pH estimate. One of the advantages of using pH indicator strips is that they are relatively inexpensive, easy to use, and adequate to determine the pH in which unit error +/- 1 pH is acceptable. A more accurate method for determining pH is to use a calibrated pH meter, which can determine the exact pH to one or more decimal places depending on the quality of the device. The pH meter measures the acidity of the solution. It is a scientific instrument that uses electrodes to measure the concentration of hydrogen ion (proton) water-based solutions. Basically, a pH meter is a voltmeter that will measure the difference between two electrodes. The probe you place into the solution contains reference electrodes and detector electrodes. Reference electrodes are not affected by the measured solution and come into contact with potassium chloride solution. The detector electrode comes into contact with the testing solution. Hydrogen ions in the test solution interact with electrodes and differences in electrical potential between two electrodes are detected and reported as millivolts or converted to pH values. For accurate measurement, it is important to calibrate your pH meter before use with a buffer solution of a known value. It is best to calibrate your meter with a buffer solution that is near the anticipated or desired pH of your testing solution. You should also remove the probe with laboratory wipes among the solutions to avoid contamination but avoid rubbing. Scrubbing the probe can cause a static electrical charge to build electrodes that will cause inaccurate readings to occur. Accidentally letting the probe dry will also cause it to stop working so that it always keeps the end of the probe immersed in a containment solution when not taking measurements. Remember to return it to the storage solution as soon as you're done with the experiment. Calibration of the pH meter for pH 4, 7, and 10 before taking measurements. If calibrated correctly, your pH meter must produce measurements with pH unit accuracy of +/- 0.06. Always test your meter after calibration using a standard buffer and recalibrate the meter if necessary before proceeding. Your instructor will demonstrate proper calibration, maintenance and use of the meter. Be sure to make a good note! Copyright - Live Lab | 1 / 8 Student Name Mohammed Alnaimi Alnaimi ID 48408 Lessons Using Buffers Institution Ocean County College Session 2019L3 CHEM 182 DL1 Course CHEM 182 DL1 Instructor Nancy Marashi Final Report Exercise 1 CHEM 182 DL1 Using Buffers The purpose of buffering is to maintain an almost constant pH by minimizing pH changes, when little acid or base is added to the solution. 1. Explain the purpose of buf fer. Copyright 2019 - Live Lab | 2 / 8 Buffer Solution: CH3COOH(aq)+NaOH(aq) ---- > CH3CooNa(aq)+H2O(l) Buffer solution contains acetic acid and weak acid and sodium acetate as the basis of its conjugation. If we add a strong HCl to the buffer solution above, sodium acetate will react with HCl as in the chemical equation below: HCl(aq)+CH3COONa(s) ----> CH3COOH(aq)+NaCl(s) If we add sodium hydroxide to the acetic acid buffer solution in the buffer it will react as in the equation e=following chemical reaction: NaOH(aq)+CH3COOH(aq) ----> CH3COONa(s)+H2O(l) 2. Write chemical equations for neutralization reactions that occur when HCL and NaOH are added to the buf fer solution. In front of the buffer, the addition of HCl 0.1M or 0.1 M NaOH resulted in no pH change. The solution is able to maintain an almost constant pH when a smaller/diluted concentration of acid or base rah is added. 3. How do the results in Data Tables 1 and 2 support the role of buf fer? Copyright 2019 - Live Lab | 3/8 In the presence of acetic acid buffer solution, the addition of diluted acid and diluted base does not affect the pH of the solution, as shown in tables 1 and 2. However, the addition of higher concentrations of strong and basic acids changes pH levels significantly. A concentrated solution of either acid or base has a significant effect in the pH of acetic acid buffer solution while diluted acid and base rah have no effect on pH indicating the buffer capacity of acetic acid buffer solution can withstand only a small amount of diluted acid and base. 4. Explain the buf fer capacity of buf acetic acid fer solution in relation to concentrated acid addit ions and dilute and laksanat. Reference the results in data tables 1,2,3, and 4 in your answers. Distilled water does not act as a buffer because it is unable to withstand or support the solution after the addition of acid or base. 5. Does distilled water act as a buf fer in experiments? Use the results in Data Tables 5 and 6 to support your answers. Copyright 2019 - Live Lab | 4/8 Data Table 1: Adding 0.1 M HCl from D1 to A1 pH = pKa + log [A-]/[HA] PH = PKa + log[CH3COONa]/[CH3COOH] 5.27 = 4.74 + log CH3COONa]/1 log[CH3COONa] = 5.27-4.74 log[CH3COONa] = 0.53 no fly CH3COONa = 100.53 = 3.3884moles 6. Buf fer acetic acid solution is required to have a pH of 5.27. You have a solution that contains 0.01 moles of acetic acid. What sodium acetate molaritas need add to solution? T T Acetic acid first aid is 4.74. Display all calculations in your answers.a Copyright 2019 - Live Lab | 5/8 Data Table 2: Adding 0.1 M NaOH from D6 to A6 Number of Drops pH Solutions 0 2 4 6 8 10 12 14 16 6 6 6 6 6 6 6 6 6 Copyright 2019 - Live Lab | 6/8 Data Table 3: Adding 6 M HCl of Pipettes into B1 Number of Drops pH Solution 0 2 4 6 8 10 12 14 16 6 6 66 1 6 6 6 6 6 6 6 Number of Drops pH Solution 0 2 4 6 8 10 6 6 4 2 2 2 2 Copyright 2019 - Live Lab | 7/8 Data Table 4: Adding 6 M NaOH from Pipettes into Data Table B6 5: Adding 0.1M HCl of D1 into Data Table C1 6: Adding 0.1M NaOH of D6 into C6 Number of Drops pH Solutions 0 2 4 6 8 10 6 6 6 8 10 12 Number of Drops pH Solutions 0 2 4 6 8 10 7 6 4 4 4 4 Copyright 2019 - Direct Lab | 8/8 Number of Drops pH Solutions 0 2 4 6 8 10 6 8 10 12 12 12 12 12 12