Worksheet on naming acids and bases

In chemistry and cooking, many substances dissolve in water to make it either acidic or basic/alkaline. A basic solution has a pH of more than 7, while an acidic solution has a pH of less than 7. Aqueous solutions with a pH of 7 are considered neutral. Acid-base indicators are substances used to determine roughly where a solution falls on the pH scale. An acid-base indicator is either a weak acid or a weak base that shows a change in colour as the concentration of hydrogen ions (H^+) or hydroxide (OH^-) changes into an aqueous solution. Acid-base indicators are most often used in a titration to identify the end point of an acid-base reaction. They are also used to evaluate pH values and for interesting demonstrations of color-changing science. Also known as: pH indicator Maybe the best known pH indicator is litmus. Blue Timol, Red Phenol, and Orange Methyl are all common acid-based indicators. Red cabbage can also be used as an acid-base indicator. If the indicator is a weak acid, the acid and its conjugated base are different colors. If the indicator is a weak base, the base, and its conjugated acid displays different colors. For a weak acid indicator with the HIn genus formula, the balance is achieved in solution according to the chemical equation: $HIn(aq) + H_2O(l) \leftrightarrow In^-(aq) + H_3O^+(aq)$ HIn(aq) is acid, which is a different color from the $In^-(aq)$ base. When the pH is low, the concentration of hydroinium Ion H_3O^+ is high and the balance is to the left, producing the color A. At a high pH, the concentration of H_3O^+ is low, so that the balance tends towards the right side of the equation and the color B is displayed. In an acidic solution, the balance is to the left, so the solution is colorless (too little anion magenta to be visible), but as the pH increases, the balance changes to the right and the magenta color is visible. The reaction equilibrium constant can be determined using the equation: $K_{In} = [H_3O^+][In^-] / [HIn]$ where KIn is the indicator dissociation constant. The color change occurs at the point where the concentration of acid and anion base are equal: $[HIn] = [In^-]$ which is the point at which half of the indicator is in the form of acid and the other half is its conjugated basis. A certain type of acid-base indicator is a universal indicator, which is a mixture of multiple indicators that gradually change color over a wide range of pH. Indicators are chosen so that mixing a few drops with a solution will produce a color that can be associated with an approximate pH value. Several household plants and chemicals can be used as pH, but in a laboratory setting, these are the most common chemicals used as indicators: Indicator Acid Color Base Color pH Range pKIn timol blue (first change) yellow red 1.2 - 2.8 1.5 methyl orange red yellow 3.2 - 4.4 3.7 bromocresol green yellow blue 3.8 - 5.4 5.4 methyl red red 4.8 - 6.0 5.1 bromothymol blue yellow blue 6.0 - 7.6 7.0 phenol red red 6.8 - 8.4 7.9 ta mol blue (second change) yellow blue 8.0 - 9.6 8.9 phenolphtalein magenta colorless 8.2 -10.0 9.4 Acid and base colors are relative. Also note that some popular indicators show more than one color change, because weak acid or weak base dissociates several times. Acid-base indicators are chemicals used to determine whether an aqueous solution is acidic, neutral or alkaline. Since acidity and alkalinity refer to pH, they can also be known as pH indicators. Examples of acid-base indicators include litmus paper, phenolphthalein, and red cabbage juice. An acid-base indicator is a weak acidic or weak base that dissociates in water to produce weak acid and its conjugated base or otherwise its weak base and conjugated acid. The species and its conjugate have different colors. The point at which an indicator changes colors is different for each chemical. There is a pH range over which the indicator is useful. So the indicator that might be good for one solution might be a bad choice to test another solution. Some indicators may not actually identify acids or bases, but you can only tell the approximate pH of an acid or a base. For example, orange methyl only works at an acidic pH. It would be the same color above a certain pH (acid) and also at neutral and alkaline values. An acid-base indicator is a weak acid or a weak base. The undissociated shape of the indicator is a different color from the iogenic shape of the indicator. An indicator does not change its color from pure acid to pure alkaline to the specific concentration of hydrogen ions, but rather, the color change occurs in a series of concentrations of hydrogen ions. This range is called a color change interval. It is expressed as a pH range. Weak acids are titted in the presence of indicators that change under slightly alkaline conditions. Weak bases should be titrated in the presence of indicators that change under slightly acidic conditions. Several acid-base indicators are listed below, some more than once if they can be used on multiple pH ranges. Specify the amount of indicator in aqueous solution (aq.) or alcohol (alc.). Tried-and-true indicators include thymol blue, tropeolin OO, methyl yellow, methyl orange, blue bromphenol, bromcresol green, methyl red, bromthymol red, phenol red, phenolphthalein, thymolphtalein, alysanine yellow, tropeolin O, nitratelin, and trinitrobenzoic acid. The data in this table are for sodium salts of thymol blue, bromphenol blue, tetrabromphenol blue, bromcresol green, methyl red, bromthymol blue, phenol red and cresol red. Lange's Handbook of Chemistry, 8th edition, Handbook Inc., 1952. Volumetric Analysis, Kolthoff & Stenge, Interscience Publishers, Inc., New York, 1942 and 1947. Indicator pH Interval Quantity per 10 ml Acid Base Timol Blue 1.2-2.8 1-2 drops 0.1% soln. in aq. red yellow Pentametoxi red 1.2-2.3 1 drop 0.1% 0.1% in 70% red-violet colorless alc. Tropeolin OO 1.3-3.2 1 drop 1% aq. yellow red soln 2.4-Dinitrophenol 2.4-4.0 1-2 drops 0.1% soln. in 50% alc. colorless yellow Methyl yellow 2.9-4.0 1 drop 0.1% soln. in 90% alc. yellow red Methyl orange 3.1-4.4 1 drop 0.1% aq. soln. red orange Bromphenol blue 3.0-4.6 1 drop 0.1% aq. soln. yellow blue-violet Tetrabromphenol blue 3.0-4.6 1 drop 0.1% aq. soln. yellow Alisarin sodium sulfonate 3.7-5.2 1 drop 0.1% aq. yellow soln α-Naphthyl red 3.7-5.0 1 drop 0.1% soln. in 70% alc. red yellow p-Etoxichrysoidine 3.5-5 1 drop 0.1% aq. soln. yellow Bromcresol green 4.0-5.6 1 drop 0.1% aq. soln. yellow Methyl red 4.4-6.2 1 drop 0.1% aq. soln. yellow violet Red chlorphenol 5.4-6.8 1 drop 0.1% aq. soln. yellow Bromphenol blue 6.2-7.6 1 drop 0.1% aq. soln. yellow p-Nitrophenol 5.0-7.0 1-5 drops 0.1% aq. soln. colorless yellow Azolitmin 5.0-8.0 5 drops 0.5% aq. soln. red blue Phenol red 6.4-8.0 1 drop 0.1% aq. soln. yellow red neutral red 6.8-8.0 1 drop 0.1% soln. in 70% alc. yellow red rosolic acid 6.8-8.0 1 drop 0.1% soln. in 90% alc. red yellow Cresol red 7.2-8.8 1 drop 0.1% aq. soln. red yellow α-Naphthhchalkhalein 7.3-8.7 1-5 drops 0.1% soln. in 70% alc. rose green Tropeolin OOO 7.6-8.9 1 drop 0.1% aq. soln. yellow rose-red Timol blue 8.0-9.6 1-5 drops 0.1% aq. soln. yellow blue Phenolftalein 8.0-10.0 1-5 drops 0.1% soln. in 70% colorless red alc. α-Naphtholbenzenein 9.0-11.0 1-5 drops 0.1% soln. in 90% blue yellow alc. Timolfthalein 9.4-10.6 1 drop 0.1% soln. in 90% alc. blue colorless Nile blue 10.1-11.1 1 drop 0.1% aq. soln. blue red Alisarin yellow 10.0-12.0 1 drop 0.1% aq. soln. yellow lilac Salicyl yellow 10.0-12.0 1-1 5 drops 0.1% soln. in 90% alc. yellow orange-brown Diazo violet 10.1-12.0 1 drop 0.1% aq. soln. yellow violet Tropeolin O 11.0-13.0 1 drop 0.1% aq. soln. yellow orange-brown Nitramine 11.0-13.0 1-2 drops 0.1% soln in 70% alc. colorless orange-brown Poirrier's blue 11.0-13.0 1 drop 0.1% aq. soln. blue violet-pink Trinitrobarzoic acid 12.0-13.4 1 drop 0.1% aq. soln. colorless orange-red A study conducted by the Canadian Dental Association found that toothpaste varied between a neutral acid, and basic pH level , depending on the ingredients it contained. The average pH level of nine toothpastes tested was 6.83 (slightly acidic). They had a number of pH levels, from 4.22 (acid) to 8.35 (slightly alkaline or basic). Seven of these measured at a neutral point (a level of seven). Toothpastes containing fluoride, sodium lauryl sulfate, sugar and hard abrasives are more acidic than those without these ingredients. Xylitol, in particular, has been shown to greatly reduce the level of acid in the paste Teeth. Other ingredients that increase the alkalinity of a toothpaste include sodium bicarbonate, tetrasodium pyrophosphate and sodium carbonate peroxide. Peroxide. Peroxide.