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Ph of ethanoic acid 1m

I'm guessing that most of us working in the lab would find it more convenient to measure a pH rather than calculating a theoretical value. But at times it can be very useful to make this calculation and get an idea of what to expect. As for chromatography, all columns have suggested operating areas for pH, so it is important to know whether it is safe to inject your sample or not. Of course, this relates more to reverse phase LC, because sample extracts usually contain at least some water. (In fact, pH can only be measured by the presence of water to allow for dissociation.) Here's what you need to know to calculate pH: For weak acids or weak bases, pKa of acid or compound in solution Molarity (M) of the solution, which is defined as moles per liter If the concentration is known only in weight units / volume, you must know the molecular weight of the acid or compound. If the concentration is known only in terms of volume/ volume, you must know the density of the acid or compound. For strong acids there might be a need to calculate pH as well as for strong bases, but acids are much more commonly used with reverse phase LC, so our discussion here will be limited to acids. Before calculating the pH, you must first determine the molar tooth of your resolution. Sample calculation: 0,2 % TFA (in water), v/v or volume/volume Density =1.49 g/ml Molecular weight =114 g/mole Molarity =2mL/1 L x 1.1. 49g/ml x 1 mole/114g= 0,026 moles/L =0,026M Then the molarity concentration of H+ ions from the dissociated substance in the solution is determined. This is necessary because pH is defined as the negative log of the concentration of H+ ions in mol whittite expressed as [H+]. In the example above, TFA is a strong acid, so is 100% dissociated. In this case, the calculation is easy because the molarity of H+ ions is the same as the molarity of the acid's molarity. It's 0.026M. So pH is calculated for example like this: pH = -log (0.026) = 1.6 A good reference that can guide you through the calculations for pH and related topics can be found here on Purdue University's website: For weak acids or bases above is for a strong acid. To make this calculation for a weak acid or base, you would need to know Ka, which is acid dissociation constant for acid, or pka, which is the negative log of Ka. For this discussion we will focus primarily on weak acids using the following equations: Ka = [H+] [A-]/[HA] pKa = -log Ka Let's make an example here for a monoprotic weak acid, in this case a 1M solution of acetic acid. If you look up pKA for acetic acid, you will find that it is 4,754. So using the above equations, we calculate: So now we know that a 1 M acetic acid solution has a pH standard of 2.38. The next question you may relate to: actual limits that we recommend for our columns. The following table lists some general guidelines for HPLC: If you compare the above ranges with the example we did earlier for TFA, you can see that a 0.2% TFA resolution is a little too acidic (pH= 1.6) for most of our HPLC columns. It's easy to see why we don't recommend TFA as a mobile phase modifier very often. Also, I always try to remind people to check their mobile phase on a regular basis, as errors in preparation can lead to column damage if it were to go unnoticed. On the other hand, our result for 1M acetic acid solution is too close for comfort to the lower pH limit for all our fully porous particle columns. But it should be OK for any of our Raptor columns. Again, it is a good practice to check the pH and be sure no mistakes were made. 1M is actually higher than you would normally see for HPLC mobile phases. Usually for this reason, acetic acid does not pose too much cause for concern. For guidance with GC columns see the following FAQ and blog post: Can I inject acids or bases on my polysiloxane column? Will they damage the column? Capillary GC Column Killers-Part 1 I hope you have found the suggestions and information here useful. Thank you for reading. Tags: acids, bases, calculations, mobile phase, pH 0.1 M acetic acid Methyl orange indicator solution, dropping bottle 5 hydrometer cylinders 10 ml degree. cylinder 100 ml graduated cylinder pH meter and digital display buffer array of methyl orange indicator touch rods Mark both sets of cylinders as follows: 10-1M, 10-2M, 10-3 M, 10-4 M, 10-5 M. Be sure to mark both sets of cylinders this way. Add the methyl orange indicator to each concentration of acetic acid and compare the color to the buffer array. Use the pH meter's digital display to take the pH concentration pH. Tip: This demonstration can be used in conjunction with demonstration Strong Acids - pH of HCl. Discussion acetic acid solutions with the following concentrations have pH-indicated: Concentration inM acetic acid pH 0.1 2.87 0.01 3.37 0.001 3.8 0.0001 4.3 0.00001 Vinegar is ~ 5% acetic acid solution, which is ~0.9 M, which is ~ pH 2.4. Share PrintPDF Back to lecture demo index To schedule a demonstration, log in to online lecture demonstration scheduler. Log in with your netid in the form of netid<userid> Example: netid\jim pH CalculatorSensorex2020-01-27T14:45:30-08:00 CalculatorSensorex2020-01-27T14:45:30-08:00 <userid>

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