



## Proper pH for Accords, Perfumes, and Tinctures

A Helpful Guide for Artisan and Independent Perfumers

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**Introduction:** Many artisan and independent perfumers are self-taught, and many of us do not have a familiarity with chemistry. We wrote this paper on the proper pH of accords, perfumes, and tinctures when we realized that our research did not discover any books or perfumery courses covering the topic of this paper.

Perfumers realize the need to age their accords and perfumes, and they recognize that changes happen with aging. No perfumer wants to release a perfume that “goes bad.” This paper details a method for avoiding that by examining and explaining some detrimental chemical reactions that may occur.

Many artisan perfumers also make their own tinctures from fragrant materials, such as flowers, leaves, seeds, dried fruits, and, in the animal realm: ambergris, hyraceum, and other animal extracts and materials. These tinctures can also “go bad” if the pH is not correct.

**This paper explains and gives instructions for a method that can be used to stop and reverse a change in pH that can occur in accords, perfumes, and tinctures.**

**Definition of pH:** “In chemistry, pH is a measure of the activity of the (solvated) hydrogen ion.  $p[H]$ , which measures the hydrogen ion concentration, is closely related to, and is often written as, pH.[1] Pure water has a pH very close to 7 at 25°C. Solutions with a pH less than 7 are said to be acidic and solutions with a pH greater than 7 are basic or alkaline. The pH scale is traceable to a set of standard solutions whose pH is established by international agreement.[2] Primary pH standard values are determined using a concentration cell with transference, by measuring the potential difference between a hydrogen electrode and a standard electrode such as the silver chloride electrode. Measurement of pH for aqueous solutions can be done with a glass electrode and a pH meter, or using indicators. You may be familiar with the pH of soil or water or food or drink items. A low pH means something is on the sour, or acidic side, and generally means 6.0 and below. A high pH indicates alkalinity, sometimes called sweet, and ranges from 7.5 to 9. Neutral pH is 7.” from Wikipedia

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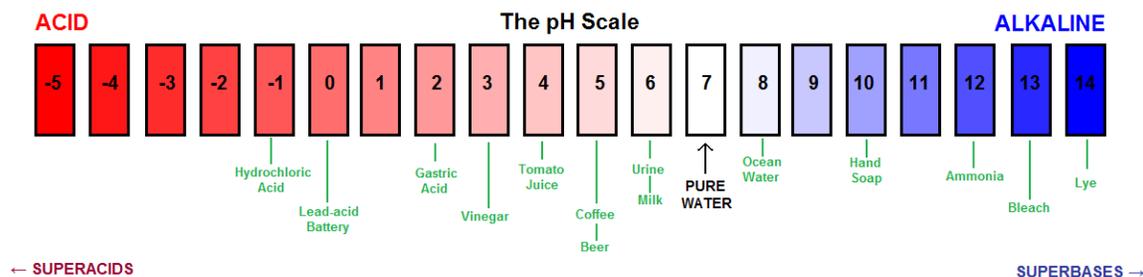


Image of pH scale from Wikipedia

**Relevance of pH to Accords, Perfumes, and Tinctures:** When making an accord, perfume, or tincture, some of the aromatics, either in dry plant or animal product form, or as an absolute, essential oil, or other extract, may have an acidic pH. This can have a detrimental effect on the accord, perfume, or tincture, causing it to go bad – meaning that the scent changes from what is first smelled upon mixing, and then at a time period later, when evaluating the evolution of the mixture, or from the scent that was desired when the perfume was conceived.

A perfumer using a pH meter can avoid this problem. A common and affordable method for testing pH that you may be familiar with is using color-dependent pH testing papers, but these won't work well with perfume substances. This is because the pH paper absorbs the color of the tincture or perfume, and thus does not give an accurate visual color reading of the pH of the substance that is being tested.

**How to Test the pH of your Accord, Perfume, or Tincture:** Obtain a pH meter from a laboratory supply house, pet store (where they are sold as aquarium pH meters), or an online source, such as eBay. The type, style, and cost of meters can vary according to design and manufacturer (see images, below). They will come with instructions for calibration and may include more assistance on their use from the seller.

**Special Caution:** Before you purchase a pH meter, confirm with the seller that the model you are interested in can withstand high-proof ethanol. For example, soil pH meters cannot.

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 <p>The aquarium box style pH meter consists of a yellow plastic housing with a black base and a black vertical strip on the front. A yellow probe with a silver tip is attached to the top.</p>	 <p>The wand style pH meter has a red plastic handle with a black probe. A small digital display on the handle shows the number 9.18.</p>
<p>The aquarium box style pH meter is approximately \$10-\$15 USD.</p>	<p>The wand style pH meter is approximately \$31 to \$40</p>

The pH meters that are shown above are meant only as an example of types of meters. There are many other styles and price ranges. You will also need two separate products: calibration solution and storage solution. They may cost an extra \$50, depending upon the amount and supplier.

Following the instructions that are specific to your meter, you can determine the pH of your perfume or tincture. If it is 6.5 or lower, you will need to raise it to 7.0.

**How Long Before Low pH Appears in an Accord, Perfume, or Tincture?** The time that it takes a low pH to become apparent can vary, depending on what is being made. For example, if there is an acid present in a tincture aromatic, such as lemon peels, then the acid pH level will be apparent almost as soon as the tincture is made.

If you're working with a powdered aromatic, such as orris root powder, it can take a matter of minutes for pH to change. The pH will change more gradually if you're using larger pieces, or if you're using fibrous or stemmy material, or chunks of resin or wood, because it takes time for the menstruum to penetrate the dried cells. Temperature can speed up the time it takes for the liquid to

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penetrate the dried cells. Sonic extraction will create friction between the molecules and shorten the time as well.

The goal is for your accord, perfume, or tincture to be as close as possible to neutral 7 on the pH scale. When it isn't, you will be able to titrate (adjust) the pH by creating and adding a buffering solution. Buffering with this solution allows you to maintain constant pH levels.

**Definition of Titration:** "Titration, also known as titrimetry, is a common laboratory method of quantitative chemical analysis that is used to determine the unknown concentration of an identified analyte. Because volume measurements play a key role in titration, it is also known as volumetric analysis. A reagent, called the titrant or titrator is prepared as a standard solution. A known concentration and volume of titrant reacts with a solution of analyte or titrand to determine concentration." from Wikipedia

**Definition of Esterification** "Esterification is the general name for a chemical reaction in which two reactants (typically an alcohol and an acid) form an ester as the reaction product. Esters are common in organic chemistry and biological materials, and often have a characteristic pleasant, fruity odor. This leads to their extensive use in the fragrance and flavor industry." from Wikipedia

**Definition of Esters:** "Esters are chemical compounds consisting of a carbonyl adjacent to an ether linkage. They are derived by reacting an oxoacid with a hydroxyl compound such as an alcohol or phenol. Esters are usually derived from an inorganic acid or organic acid in which at least one -OH (hydroxyl) group is replaced by an -O-alkyl (alkoxy) group, and most commonly from carboxylic acids and alcohols. **That is, esters are formed by condensing an acid with an alcohol.**" (NPI author's emphasis, highlighting the acid/alcohol reaction that perfumers may wish to avoid." from Wikipedia

Esters are ubiquitous. Most naturally occurring fats and oils are the fatty acid esters of glycerol. Esters with low molecular weight are commonly used as fragrances and are found in essential oils and pheromones. One abundant ester in the world of aromatics is linalyl acetate, which is found in jasmine, cardamom, helichrysum, birch, clove, ylang ylang, mandarin, lavender, clary sage, Roman chamomile and others.

Esters can be quite pleasant smelling, fruity and sweet, and you may actually want that effect in a perfume, but if you don't, it can ruin your perfume as it ages. Also, not all esters smell pleasant. Some can smell fatty, and even rancid. For example, orris root contains very high levels of myristic acid. When mixed with ethanol, over time, myristic acid will form the ester, ethyl tetradecanoate,

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also known as ethyl myristate. Ethyl myristate has a very waxy odor profile, with a slight violet note. This ester odor profile would be welcomed in an orris root tincture, although the heavy waxy note also dampens the overall odor of the orris tincture. However, there is also a high level of the same myristic acid in ambrette seeds, as well as many of the other fatty acids, which are responsible for the fatty/waxy odor that is often found in ambrette seed absolute. When tincturing ambrette seed, this waxy, violet odor from the ester would not be a desired note in the final tincture. Over time, the fatty acids in an ambrette seed tincture can esterify to the point of smelling rancid. Chill and precipitate out the fatty acids so that they aren't in the finished blend to esterify in the blend.

**How Long Before Esterification Occurs?** Esterification reactions are slow. Because aging tinctures is a common practice, esterification can, and will, occur. Depending on the ingredients that are being aged, esterification time can vary, based on temperature, and the strength of the pH. A substance with a pH of 4 will esterify faster than one with a 6.5 pH. Also, a substance with a pH of 4 at 80 degrees will esterify faster than a substance with a pH of 4 at 50 degrees.

**Why Buffering is Sometimes Needed:** Not all accords, perfumes or tinctures will need to be buffered. However, if an acidic pH is discovered – that is, if the pH level is lower than 7 - you must buffer the material to raise the pH, or it will not age properly. A lower pH level acts as a catalyst, and will speed up the esterification reaction time. Alcohol is hygroscopic which means that it attracts water. If the water or plant moisture is acidic, this will lower the pH to levels that expedite the esterification reaction.

**Making a Buffering Solution:** Sodium carbonate or calcium carbonate are good choices. Sodium carbonate, also known as soda ash, washing soda, or potash, can be purchased online at soap making sites and other sites, such as eBay and Amazon.com for around \$5 for 16 ounces. Calcium carbonate is limestone, which is used in agriculture and gardening to raise the pH of acidic soils. For your purposes, you will need to obtain food grade calcium carbonate from a laboratory supply store or an online source. It is relatively inexpensive; about \$4 for 16 ounces. Calcium carbonate is more potent than sodium carbonate, and is used more with the animal raw materials.

Make a 10% to 30% solution, by weight, with 190-proof ethanol (which is 95% alcohol). For example, to obtain a 10% solution, weigh 10 grams of buffering agent and add 90 grams of ethanol. Stir well to dissolve the buffering agent into the alcohol, and then store the solution in a tightly-stoppered bottle or jar. It will take a bit of shaking/stirring to get the material to dissolve, because it is only soluble in the water portion of the ethanol. It dissolves better if your alcohol is in the 80%-90% alcohol range, so add 10% water to your ethanol to make this happen.

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**Be very cautious with the solution:** Add just a few drops of buffering solution to your minimum amount of eight ounces of accord, perfume, or tincture. Shake it to mix well, and then test it for pH immediately, adding more buffer drop by drop until you get close to a pH of 7. For instance, if the pH reads 6.8, wait 24 hours, and then retest the pH to see if it crept up to 7. If the pH has not risen sufficiently, add a few drops more of the buffer. Wait again for at least 24 hours, and then retest. Continue doing this until the pH remains stable for 24 hours. After the pH is stable, do not add anything else to the tincture or blend, or you will need to re-check and re-titrate the pH. And finally, while it is possible to lower the pH if you get it too high, it's very tricky and not at all as simple as raising it, so this paper will not address that process.

We hope that the method and information given here in this paper will help you in the creation of your accords, perfumes, and tinctures as you work in your studio. The information that is given in this paper is given free of charge to the general public, in order to better the perfume production that is being carried out by artisan- and independent perfumers worldwide. Please share this information in any groups and forums to which you belong.