Transcript

Title: **Titration of lemon juice (Chemistry Laboratory Previews)**

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OK today we're going to be investigating the concentration of citric acid found in lemon juice and we're going to be doing that via acid based titration.

Learning the technique of titration will expose us to a variety of very important analytical skills, essential skills required for chemists.

First of all taking a look at our lemon juice we can see it's full of pith and pips. It needs to be filtered. We're going to be doing that by vacuum filtration. Take a piece of vacuum hosing (that we've labelled with yellow tape), attach one arm carefully to the side arm of your vacuum flask and the other to the side arm on the water tap. Place your funnel in the top of your vacuum flask and then place a sheet of filter paper in the top of your funnel.

Turn the tap on. This will create a vacuum inside the vacuum flask and pour a small amount of your lemon juice under the filter paper. Just a little bit of liquid. Make sure you wet the filter paper first that will get the vacuum started then you can pour the rest of your lemon juice in. And you will end up with filtered lemon juice. Detach the sidearm before you turn off the tap. That is most importantly you detach it before turning off the water. And you'll then have your lemon juice ready for you to analyse.

We'll start by taking a 20 ml aliquot of our sample and we'll be diluting it to 200 mls. Make sure when you take that 20 ml aliquot that you rinse your pipette with a small amount of the lemon juice first. And then once you've completed that rinse, proceed to take your 20 ml aliquot using all the good techniques that we've discussed up past the mark. Clean off the outside with paper towel. Drain back down to the mark into a waste beaker. And then do your delivery into your standard flask. Once you've done that, we then complete the dilution by adding distilled water. Add 20 or 30

ml portions at a time and give your flask a swirl during additions in order to make sure that the sample is well mixed throughout.

As you get close to filling you can use your wash bottle to get you close to the mark. And for the last small amount make sure you use a dropper a path to a pipette where those last few drops so you have the bottom of the meniscus sitting on top of the line. We then mix the stander fast by inversion like so and you should do this at least 40 times before proceeding. Now we're ready to complete our acid-base titration. Pour a fresh portion of your diluted lemon juice into a clean dry beaker. And then using your 20 ml pipette make sure you rinse thoroughly first. Very important. And then take 20 ml aliquot and deliver it into a conical flask or a titration flask. You should do this four times and then to each flask add two or three drops of phenolphthalein indicator. That will tell us when the reaction is complete. Now we're ready to tritate.

Fill your burette with approximately 0.1 molar sodium hydroxide. Make sure you remove the funnel from the top. Make sure there are no air bubbles in the bottom and then take your initial burette reading to two decimal places as best you can. Once you've taken your initial reading you can then start titrating. You can start adding your sodium hydroxide to your sample. You can start by doing this in a rapid drop bias fashion. As you start seeing flashes of pink developing your lemon juice, you'll slow down the speed of your additions. Just add a drop at a time and what's the solution. Again those flashes of pink will get brighter and brighter as you get close to the end. The goal is for you to add a half drop. Get half a drop sitting on the tip of your burette and then tap it against the side of your conical flask. Take your wash bottle and then wash down the walls of your flask.

Wash all of your titrant down into your reaction. And if your titration has gone strictly to plan, it will be half a drop that takes you from not quite being at the end point to still having a clear and colourless solution, to having a faint light pink throughout your solution. Once you reach this point you can stop your titration. Take your reading to two decimal places and you'll know the exact volume of sodium hydroxide required to react with 20 mils of your dilute lemon juice. And today I see three concordant results. Three results within point zero five mils. If you're not sure, ask your demonstrator. If you've got time they certainly won't mind if you try one or two more samples before you go. Once you've got those three concordant results, you can put your results in a computer and I'll produce a set of class results which you can use as part of your report. Just finally before we talk about your report, I often see this colour around the lab. This bright fluorescent pink is not the colour you're looking for. If you see that in your sample, you have overshot the endpoint.

Regarding your practical write-up, there are a few things to keep in mind. First of all, today's experiment revolves around a chemical reaction between the citric acid and the sodium hydroxide.

You're using a known substance your sodium hydroxide to find out about an unknown substance. The citric acid in your lemon juice. You can use stoichiometry and your three-step plan along with all the tools in your tool belt to help you navigate through the calculations and determine the concentration of citric acid. An extra tip to help you along the way. When we're after the percentage weight volume of citric acid in the lemon juice, all that really means is the number of grams of citric acid per 100 mils of lemon juice.

Once you think you've got your result, you can compare that with the class results. If it compares closely, chances are you're on the right track.

Good luck!

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