RED OR WHITE? SWEET OR DRY?

Acidity of Wine

Before you go to laboratory

Bring one bottle of white wine and one bottle of red wine for 15 students. Open the wine and before coming to laboratory, taste 5 mL of each wine: roll the wine in mouth, think of the taste and split it out (!). Eat a piece of bread before tasting the second wine. Write down your observations.

	Sample 1	Sample 2
Name of wine, producer, year		
Sweet (1-5 max)		
Acidity (1-5 max)		
Taste overall		
note		

The wine is a product that consists of several components, most of which is water (91 %). Besides water, ethanol (9-14 %), residual sugar, dyes and tannins, there are present also acids. There are more acids, but the most represented is tartaric acid, then malic, citric and lactic acid. The proportion of the acids' amount is a reason of characteristic taste and bitterness of each wine. Low content of acid results in insipid taste of wine, so the determination of total acidity is an important controlled item.
The total acidity of wine is about 5-7 g/L and it is determined as an amount of tartaric acid in one liter of the wine.

You have tasted samples of wine and assessed the degree of sweetness and acidity. Determine the acidity experimentally and compare it to average value and your assessment. Does the measured value correspond to your observation?

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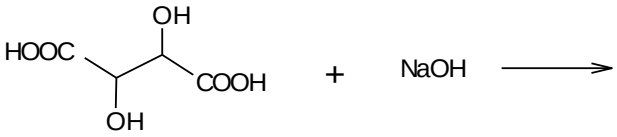
What you might need to know

1. The acidity of wine will be determined with titration of tartaric acid in sample (2,3-dihydroxybutanedioic acid). As a chemical reagent will be used sodium hydroxide. Write the reaction products and do not forget to check the stoichiometry.



2. During the activity the sodium hydroxide will be added to the sample of wine containing acids (for determination tartaric acid will be considered only). Estimate the change of pH during the addition of hydroxide into solution. Put down your hypothesis in a graph below:

3. Preparing the measurement:

The total acidity of wine will be determined by pH measurement. The solution of NaOH (c = 0,2 mol/L) will be added into solution and the changes in pH will be recorded into graph. You will use pH electrode and in computer the changing values will be recorded in programme LoggerLite. First you must set the parametres:

a) Connect the electrode to computer using GoLink and run the programme. (If everything is made correct, green diode is seen on link).

b) Set the measurement parametres: Menu – Experiment/Collection of data. Change the *time measurement into events with entry*. Add new variable *volume (V,* units *mL)* and confirm. Axis x should be now set as volume. If not, choose with mouse the item *volume* when mouse is on the name of axis. Note: green button *Collect* changed into double button *Collect-Keep*.

c) Check the electrode is ready to be used: put off the cover, rinse the sensor with distilled water and dry it gently with cellulose wedding or filter paper. Immerse the electrode in buffer 4 and check if the actual measured value corresponds to value 4 (! The electrode must be dry, otherwise it dilutes the buffer). Afterwards do the same measurement with buffer 10 (rinse and dry the electrode).

Buffer pH 4 – measured value: _____

Buffer pH 10 – measured value: _____

In case the value differs more than 1,5 unit, the electrode needs to be calibrated. Ask your teacher for help.

Try measuring with sensor: run the measurement, immerse the sensor into water for example and watch the actual value of pH – the value is not put into graph by now. Click on *Keep* button and in the pop up window shall be written the volume of added hydroxide. Nothing was added, therefore write 0. Add to beaker about 1 mL of hydroxide, stir the solution and click on *Keep* again. Now write 1 in the window, as there is now about 1 mL of hydroxide in the solution. You will see these two values in graph.

Delete the measured data: menu – Data/Clear all data.

Explore the world around: measure the data

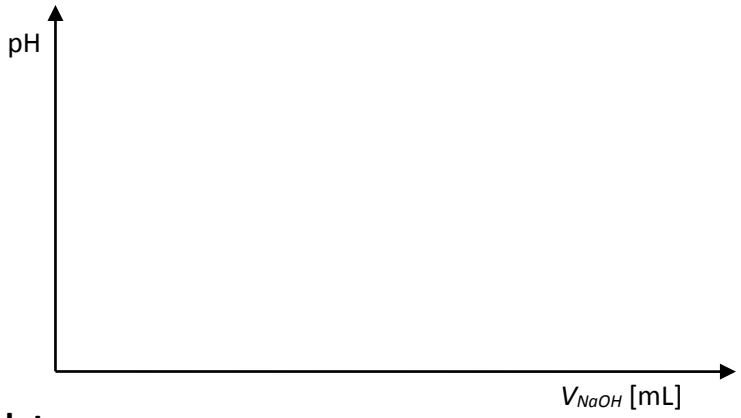
1. Fill the burette with NaOH solution.

2. Pipette 25 mL of wine sample into beaker, put it on magnetic stirrer, immerse stir bar and pH sensor. Add distilled water so that the sensor is immersed sufficiently.

3. Start measurement: you will be adding one by one 1 mL of NaOH to solution in beaker. First value, which is diluted sample, will have the volume 0 mL NaOH. Add 1 mL of NaOH from burette, let it mix with sample, then click on *Keep* and write the actual total amount of NaOH in beaker. Continue adding the hydroxide until pH cca 10-11.

Observe the colour of solution during the titration: _____

Put down measured curve and mark important points and their values. Which points are meant?



Evaluate your data

You have to count the concentration of acid by using the stoichiometric ratio of reactants (equation needed). For finding out the volume of hydroxide click in menu on button Examine and then find the needed point with mouse:

V_{NaOH} = _____ mL (the measured consumption)

c_{NaOH} = _____ mol/L

$V_{wine,\ acid}$ = 25 mL

C_{acid} = ? g/L

Conclusion:

_____

_____

Show your results

Write a short report to your friends where you compare the experimental results and results gained in gustative test before laboratory activity.

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