Report for Chem 101 Laboratory Exercise #4

Spectrophotometric Determination of Salicylic acid[1]

Using Microsoft Word, students are to insert responses in all yellow highlighted areas. It is recommended that the report be completed without changing font size, column width, row width, margins, and highlights. The completed report must be uploaded to the CHEM 101 Brightspace site as a .pdf file by the due date posted on Brightspace. All answers must be the student's own work without assistance from others. Only reports which are completed using the template will be marked.

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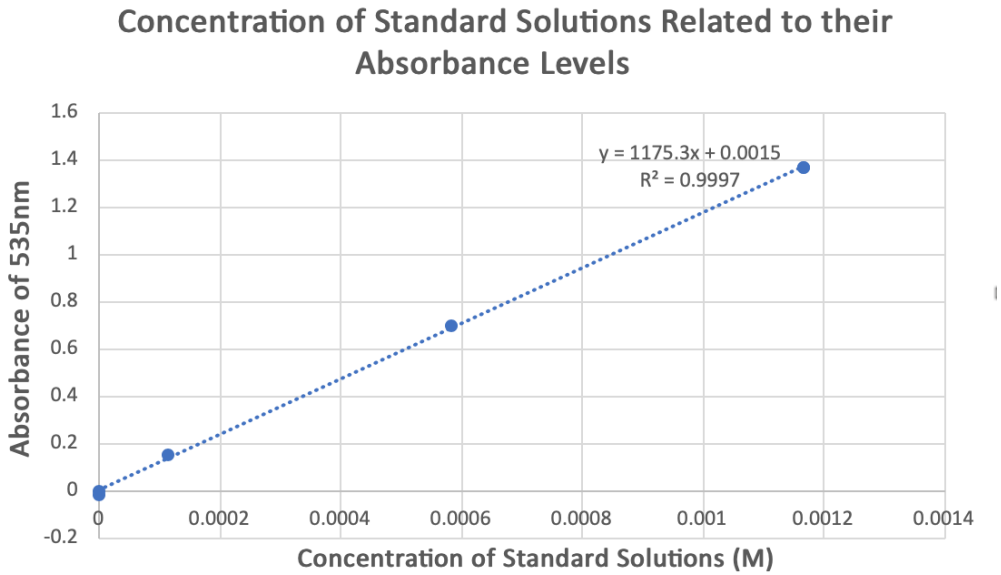
Abstract

The % mass of salicylic acid in an acne cleanser 0.5%, was determined to be .1790% by measurement of the absorbance that was determined from a calibration curve. This was found to be 35.80% of the advertised value.

Data/Results

Table 1. Experimentally measured absorbances (A) and calculated concentrations (conc) for the standard salicylic acid solutions. *The observed data inserted in this table must be consistent with the observed data written in your laboratory notebook with the correct units.*



	conc	
Stock salicylic solution	0.0029	

	18M	
	A	conc
standard solution #1	0.151	0.0001167M
standard solution #2	0.701	0.0005836M
standard solution #3	1.371, 1.367	0.001167M

Table 2. Determination of the amount of salicylic acid in the acne cleanser. *The observed data inserted in this table must be consistent with the observed data written in your laboratory .notebook with the correct units*

0.300mL		Volume of acne cleanser used in the analysis	
Acne cleanser aliquot #3	Acne cleanser aliquot #2	Acne cleanser aliquot #1	
0.5910	**0.5800**	**0.5900**	Absorbance
5.02 x 10^-4M	**4.92 x 10^-4M**	**5.01 x 10^-4M**	salicylic acid] from] curve
1.255 x 10^-5	**1.230 x 10^-5**	**1.252 x 10^-5**	Moles of salicylic acid in 25.00 mL
0.001733g	**0.001699g**	**0.001726g**	Mass of salicylic acid in 25.00 mL
0.9610g	**0.9610g**	**0.9610g**	Mass of salicylic acid in 1.00 mL of acne cleanser
0.180%	**0.177%**	**0.180%**	mass of salicylic % acid in acne cleanser

35.80%	comparison to % advertised value

Calibration curve for standard solution of salicylic acid *(cut and paste from Excel)* **and determination of the salicylic acid concentration in an acne cleanser by interpolation**

Figure 1: Calibration Curve for the concentration of Standard Solutions Determined at 535nm

Table 1: Concentration of Salicylic Acid by Interpolation at a Wavelength of 535nm

Concentration (m/L) Salicylic Acid	5.01x10^-4	4.92x10^-4	5.02x10^-4
Absorbance at 535nm	0.59	0.58	0.591

Algebraic Equations (see page 12 of the Chem 101 lab manual

Concentration of a standard solution = $(C1V1)/V2$

Moles of salicylic acid in 25.00mL = $(n_{HOC6H4COOH}/L) \times L$

Weight of salicylic acid in 25.00 mL = $n_{HOC6H4COOH} \times MW$

RSD of weight of salicylic acid in the acne cleanser = $(s/x_{avg}) \times 100$ %

Discussion *Respond to the following*:

Explain how the calibration curve was generated and then used to provide a value for the concentration of the salicylic acid solution that was placed in the spectrophotometer (max 4 lines).

The calibration curve was constructed by plotting standard solutions' concentrations against their absorbance at 535nm in Excel. To find the salicylic acid concentration, the equation of the trend line (y=mx+b) was employed, replacing the aliquot's absorbance (y) to determine its concentration (x). This method enabled accurate quantification.

Was the % comparison greater than or less than 100%? Include the actual value in your answer. Give a scientific explanation as to why the value was less than or greater than 100%. Do not give personal (lost some of the solution, hard to see the calibration mark) or that the company cheated us on the quantity but rather take a close look at the experiment and determine from a chemical point of view what could have contributed to the variance (max. 4 lines).

The % comparison value to the advertised value was 35.80%, which is less than 100%. This discrepancy is primarily due to the chemical degradation of salicylic acid when exposed to air over time, rather than a manufacturing issue. The opening of the bottle allows air to interact

with the solution, leading to a reduction in the salicylic acid concentration.

Conclusions

The % mass of salicylic acid in an acne cleanser, was determined to be .1790%. This was 35.80% .of the advertised value

References

Reimer, M. et al, *Laboratory Manual*, *Chemistry 101*, pp. 27-34. (University of Victoria: .1 .Victoria, B.C.). Fall **2023**

2. Clean & Clear essentials deep cleaning astringent. Johnson & Johnson Inc. Guelph, ON, N1K 1A5, 0039C.

.max	Feedback Summary
4	?**Pre-lab quiz:** Are all responses correct
1	**Laboratory Notebook:** Have all data, observations and procedures been ?recorded
3	?**Report:** Are all sections completed accurately and correctly
1	**Participation:** Did the student come prepared, was time used well in lab and was student engaged in the experiment? Did the students request the TA to check their drawers for completeness before they left the lab and show the TA the email ?of successful submission
1	**Performance evaluation:** Did student follow the safe practice guidelines ?throughout the whole lab period
10	**Total mark**