# Report for Chem 101 Laboratory Exercise #6
## Extraction of caffeine from Tea [4]

**Name:** Arfaz Hossain **Lab Section:** B12 **Quad:** 2 **Date:** December 1, 2023

## Abstract

This experiment focused on the extraction of caffeine from tea leaves using liquid-liquid extraction with isopropanol [1], followed by precipitation with ethanol. The obtained caffeine yield was 2.821%, and based on LD50 data for rats, an average 700g rat would need to consume approximately 2 tea bags [2] to reach a lethal dose, highlighting the potency of caffeine in tea. The procedure showcased practical applications of organic chemistry techniques in isolating bioactive compounds from natural sources.

## Data/Results

**Table 1.** Experimental data and calculated values

| Extraction and isolation | |
|---|---|
| Weight of tea leaves in one tea bag [2] | 2.79 grams |
| Weight of caffeine in one tea bag [2] | 0.0787 grams |
| Weight % caffeine in a tea bag [2] | 2.821% |
| Lethal dose of caffeine for a 700 g rat | 1.7078 ($\approx$2) tea bags |

## Algebraic Equation(s)

$$\text{Weight \% of Caffeine} = \frac{Weight\ (Mass)\ of\ Caffeine\ extracted \times\ 100\%}{Weight\ (Mass)\ of\ 1\ Tea\ Bag\ and\ it's\ Contents}$$

$$\text{Cups of Tea for LD50} = \frac{LD50\ for\ Rats}{Weight\ (Mass)\ of\ Rats} \times \frac{Weight\ (Mass)\ of\ Caffeine\ extracted}{Weight\ (Mass)\ of\ Caffeine\ per\ Teabag}$$

## Discussion

One potential shortcoming of this experiment is that the extraction process may not be completely efficient, leading to incomplete isolation of caffeine from the tea leaves. This could result in a lower measured percentage mass of caffeine in the sample, underestimating its actual content in the teabag [2].

## Conclusions

The experiment successfully demonstrated the extraction of caffeine from tea leaves using a combination of liquid-liquid extraction and precipitation methods, yielding a caffeine

content of 2.821%, emphasizing the practical application of organic chemistry techniques in isolating bioactive compounds.

## References

[1] Isopropyl, 111 Colonnade Road, Ottawa, ON K2E 7L6 LOT 204656
[2] Tea Bag, Unilever Canada, Toronto, Ontario, M4W 3R2
[3] Sodium Hydroxide $Ca(OH)_2$, FW 74.09
[4] Department of Chemistry, Faculty of Science, "Chem 101 Lab Manual Fall 2023,"

| Feedback Summary | max. |
|---|---|
| **Pre-lab quiz:** Are all responses correct? | 4 |
| **Laboratory Notebook:** Have ALL data, observations and procedures been recorded? | 1 |
| **Report:** Are all sections completed accurately? Is the abstract accurate and complete? Are responses in the Discussion correct? Does the conclusion only include the appropriate information? Are the References correctly formatted and cited? | 3 |
| **Participation:** Did the student come prepared, was time used well in lab and was student engaged in the experiment? Did the student show the email confirmation letter and request the TA to check their drawers for completeness before they left the lab? | 1 |
| **Performance evaluation:** Did student follow the safe practice guidelines throughout the whole lab period? | 1 |
| **Total mark** | 10 |