**Evaporation & Intermolecular Attractions Lab Report Abstract**

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To regulate body temperature when we exercise, we produce sweat and the evaporation of that sweat is what cools us down – a phenomenon known as evaporative cooling. By examining data obtained from various alkanes and alcohols in shifting temperatures, we tested the correlation between temperature changes and the strengths of two intermolecular forces (IMFs) – hydrogen bonding and London forces – while taking a deeper look into how this mechanism works. This lab allowed us to test our hypothesis that alkanes will evaporate faster due to their lack of hydrogen bonds. Two temperature probes were connected to a single LabQuest and were then submerged into their respective chemical samples. This process was done with two samples at a time until all seven were tested. The probes were then taken out simultaneously after 30 seconds and secured onto the side of the table, after which the LabQuests began collecting data for the remaining 210 seconds while the samples began to evaporate at room temperature. Temperature variations were analysed - using a displayed graph which plotted the temperatures of the liquids against time - to determine the original and final temperatures as well as the changes in temperature for each liquid. Finally, after obtaining the data for all seven samples, we compared their graphs while making inferences about what factors - such as the IMFs at play - could be influencing the results. As a result of evaporation, n-pentane had the greatest drop in temperature due to evaporation (22.1ºC), followed by n-hexane (20.1ºC), methanol (14.5ºC), isopropyl (10.4ºC), ethanol (9.5ºC), 1-propanol (4.7ºC), and 1-butanol (4.2ºC). These results are ultimately contingent on the presence of hydrogen bonds and London forces in the molecules, with the existence of more of these IMFs yielding a lower change in temperature as demonstrated particularly by 1-butanol. Our laboratory results provided evidence that the alkanes experienced greater drops in temperature compared to the alcohols within the 240 second time period, meaning that they evaporated at a higher rate and more easily. This is due to the

presence of hydrogen bonds in the alcohol molecules which take more energy to split, as they are stronger than the bonds in the alkanes that only contain the weaker van der Waals dispersion forces. These findings can deepen our understanding of how different quantities and types of IMFs in various substances can affect their physio-chemical properties, tying into how structure dictates function.

## ***Abstract Breakdown:***

Background/Purpose

When we exercise our bodies over heat to regulate body temperature, sweat is produced and the evaporation of that sweat is what cools us down. By examining data obtained from various alkanes and alcohols in shifting temperatures, we tested the correlation between temperature changes and the strengths of two intermolecular forces (IMFs) of attraction – hydrogen bonding and London forces – while taking a deeper look into how the mechanism of evaporative cooling works. This lab allowed us to test our hypothesis that the alkanes will evaporate faster at room temperature due to their lack of hydrogen bonds.

Procedure

Two temperature probes were connected to a single LabQuest and were then submerged into their respective chemical samples. This process was done with two chemical samples at a time, until all seven were done. Probes were taken out simultaneously after 30 seconds. Once the probes were taken out and placed on the side of the table, the LabQuests began collecting data for 210 seconds while the samples started to evaporate at room temperature. Temperature variations were analysed - with the help of a displayed graph which plotted the temperatures of the liquids against time - to determine the original & final temperatures and the changes in temperatures for each liquid. Finally, after obtaining the data of all seven samples, we examined the differences in their graphs while making inferences about what factors – such as the IMFs at play – could be influencing the results.

Results

As a result of evaporation, n-pentane had the greatest drop in temperature as a result of evaporation (22.1ºC), followed by n-hexane (20.1ºC), methanol (14.5ºC), isopropyl (10.4ºC), ethanol (9.5ºC), 1-propanol (4.7ºC), and 1-butanol (4.2ºC). These results are ultimately contingent on the hydrogen bonding and London forces that are present in the molecules, with the existence of more of these IMFs yielding a lower change in temperature as demonstrated particularly by 1-butanol.

## Conclusion

Our laboratory results showed that the alkanes experienced a greater drop in temperature compared to the alcohols within the 240 second time period, meaning that they evaporated faster and more easily. This is due to the presence of hydrogen bonds in the alcohol molecules which take more energy to split than the bonds in the alkanes (only containing the weaker van der Waals dispersion forces). These findings can deepen our understanding of how the different quantities and types of IMFs in various substances can affect their physio-chemical properties.

**This document is only intended to demonstrate the different components of a typical lab report abstract based on a Chemistry experiment investigating intermolecular forces, and is not a complete, formal laboratory report.*