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Lab 10 Report

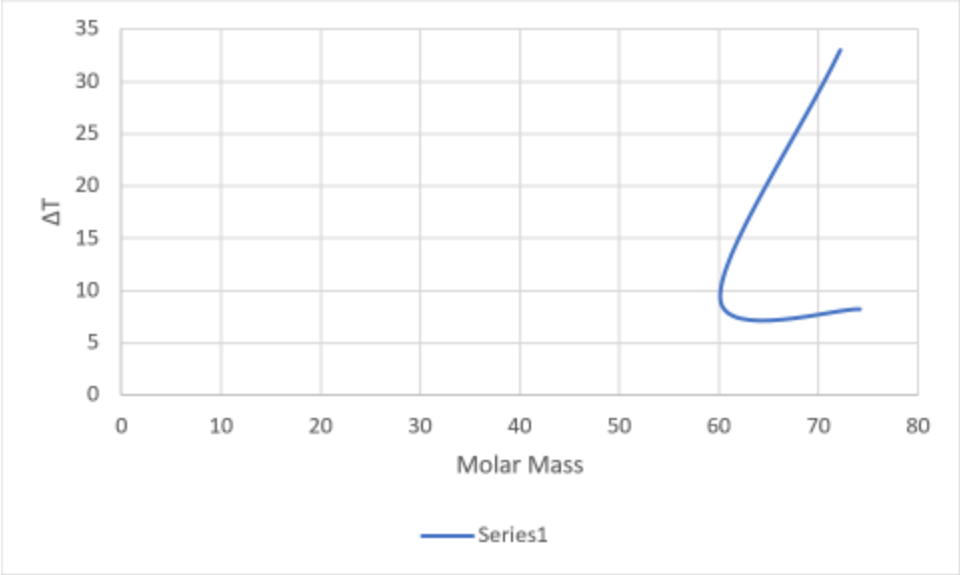
The temperatures of 5 different alcohols and alkanes were recorded on a temperature probe with filter paper wrapped around the end. The temperature before and after the alcohol evaporated was recorded. The change in temperature was also recorded. Every alcohol/alkane had a negative change in temperature. N-Pentane had the largest change in temperature meaning it had the strongest intermolecular forces acting on it.

This lab was designed to explore the different strengths of intermolecular forces acting on different molecules. 5 different types of alcohols/alkanes were used to compare the strengths of these intermolecular forces. Some IMF's include London Dispersion Forces, dipole-dipole forces, and hydrogen bonding forces. Everything has London Dispersion Forces. Hydrogen bonding is greater than dipole dipole forces which is greater than London Dispersion Forces in terms of molecular weight. As molar mass increases, the boiling point increases. Dipole-dipole is the strongest force. Only the elements F, N, and O can make hydrogen bonds. Atoms always pull towards the most electronegative atom.

5 different alcohols were tested for the strength of IMF's during evaporation. A temperature probe was wrapped in filter paper and dipped into each fluid until the temperature stabilized (approx. 30 sec.). The probe was then taken out of the fluid and taped to the edge of the table until the temperature reached an absolute minimum. This was done for each fluid and the change in temperature was recorded.

All fluids had a negative ΔT. Because n-pentane had the largest ΔT, it had the strongest IMF's of attraction out of the other fluids. The stronger the IMFs present, the higher the boiling point will be.

Substance	Formula	ΔT (C)	Molar mass g/mol	Boiling point (C)	IMF's
n-pentane	C_5H_{12}	-33.0	72.15	36.1	LD
1-propanol	C_3H_7OH	-9.2	60.09	97.0	Hydrogen Bonds
1-butanol	C_4H_9OH	-8.2	74.12	117.7	LD, dipole, Hydrogen
1-pentanol	$C_5H_{11}OH$	-2.3	88.15	138.0	Hydrogen
2-pentanone	$C_5H_{10}O$	-11.0	86.13	101.0	dipole-dipole



The difference in ΔT between n-pentane and 1-butanol is due to the difference in IMFs. Alkanes have weaker IMFs than Alkanes and only have London Dispersion Forces. The magnitude of the temperature decrease is related to the forces of intermolecular attraction. Therefore, n-pentane experiences the greatest IMFs while 1-pentanol experiences the weakest IMFs. The predicted ΔT value for Methanol (molar mass 32.04 g/mol) based on the graph and curve of best fit is -94.05 degrees celsius. Meaning the temperature decreased by 94 degrees. The predicted ΔT value for Hexanol (molar mass 102.16 g/mol) is -37.53 degrees celsius. This means the temperature dropped by 37.53 degrees. The strengths of IMFs present in an evaporation reaction is related to the magnitude of temperature decrease. Therefore the strengths of IMFs in n-pentane, 1-pentanol, and 2-pentanone are as follows. 1-pentanol<2-pentanone<n-pentane.