

Chem I Lab: Evaporation and Intermolecular Forces

In this experiment, you will place temperature probes in various liquids and then remove the probes to allow evaporation to occur. Evaporation is an endothermic process that results in a temperature decrease. The temperature changes caused by the evaporation of these liquids can be related to the strength of intermolecular attractive forces.

Name	Functional Group	Draw Structure (include all H's and lone pairs)	Formula	Molecular Weight (amu)	Intermolecular Force	Max(Initial) Temp °C	Min(Final) Temp °C	ΔT °C
ethanol								8.0°C
propanone (acetone)								13.1°C
1-propanol								3.3°C
n-pentane								23.7°C
1-butanol								1.0°C
n-hexane								18.3°C

1. Explain why the temperature probe cooled down after the probe was removed from the liquid. Include the term "exothermic" or "endothermic" (whichever is relevant)

2. Fill in the blanks with "high" or "low".

If a liquid has strong intermolecular forces (IMF), then the liquid will have a relatively _____ boiling point.

If a liquid has strong IMF, then the evaporating liquid will have a relatively _____ value for ΔT.

If a liquid has strong IMF, then the evaporating liquid will have a relatively _____ rate of evaporation.

3. Based on the ΔT values, which one of the liquids you studied in this lab had the strongest intermolecular forces? _____

Which one had the weakest? _____

4. Within a given class of compounds (alcohols, alkanes, ketones, etc.), Do the intermolecular forces become stronger or weaker (which one) as the molecular weight increases? _____
Explain how you know, using specific references to your data (numbers!)

5. Butanol and Pentane have similar molecular weights.
a. Based on your lab data, which compound has the stronger intermolecular forces? _____
b. Explain why this compound has the stronger forces. Refer to the formula/bonds of both compounds and the types of IMF.

6. Propanone (acetone) and 1-propanol have similar molecular weights.
a. Based on your lab data, which compound has the stronger intermolecular forces? _____
b. Explain why this compound has the stronger forces. Refer to the formula/bonds of both compounds and the types of IMF.

7. In this lab, we did not find the ΔT of methanol.
a. Draw a picture showing two methanol molecules, lined up so that they can hydrogen-bond with each other.

b. Which liquids in this lab have the same intermolecular force as methanol?
(list them here) _____
c. Would you expect methanol to have a larger or smaller ΔT than these liquids (in b)? _____
d. Would you expect methanol to have a higher or lower boiling point than these liquids (in b)? _____