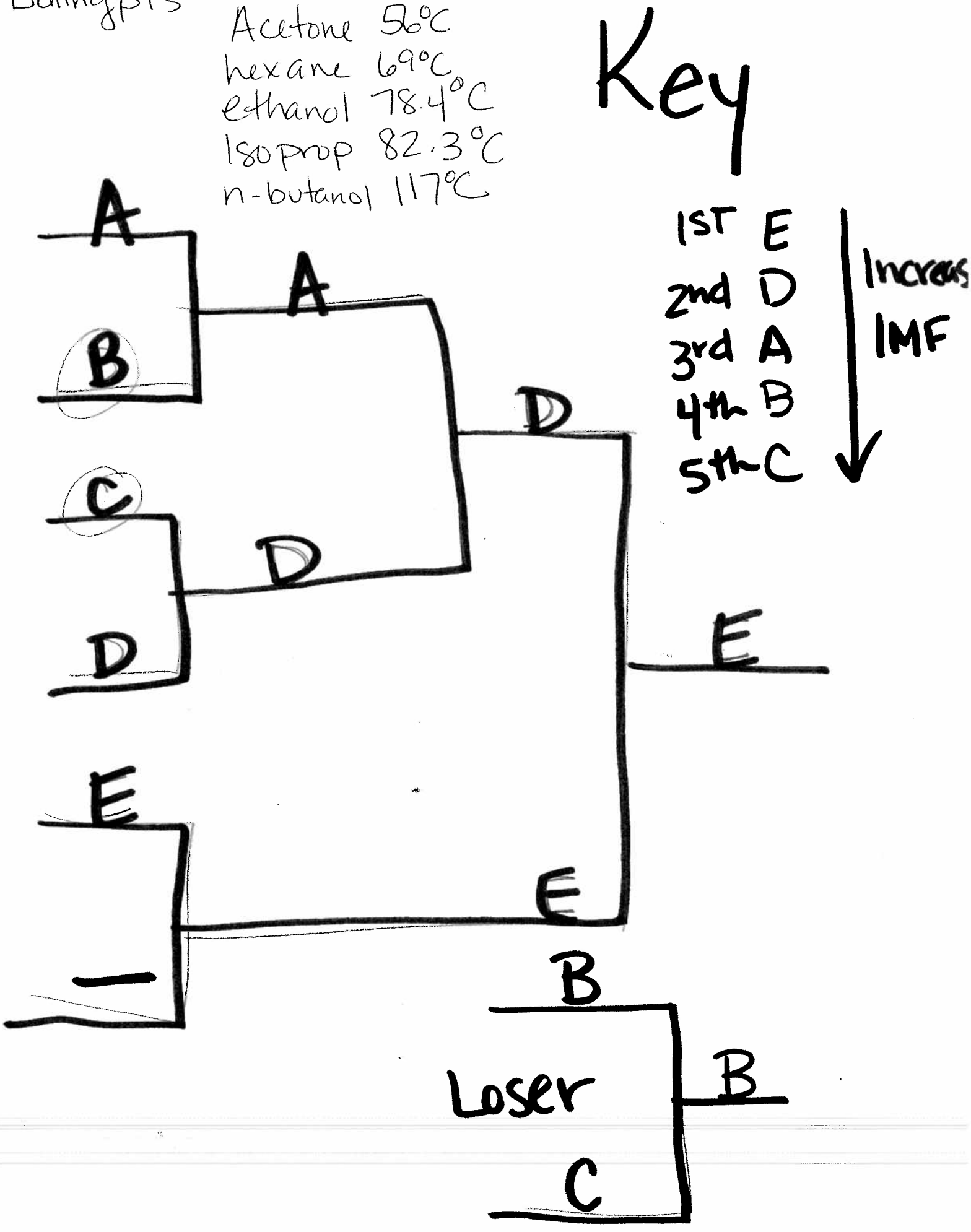
boilingpts

Acetone 56°C
hexane 69°C
ethanol 78.4°C
Isoprop 82.3°C
n-butanol 117°C



PNHS Chemistry
Criteria: CE

IMF racetrack lab

Codes: 4.3.1

2005-2006
Hours 2

GOAL:
The goal of this lab investigation is to practically investigate the properties of 6 different liquids through evaporation and molecular structure to identify them.

Prelab:
Intermolecular forces (IMF) hold molecules together in the liquid phase. If there is a minimal amount of intermolecular force, the boiling point is very low. If the IMF is high, then so is the boiling point. Also, mass plays a role in boiling point. Since the molecule must be moving at a particular velocity in order to change into a gas, then if the molecule weighs a lot, then it requires more energy to boil. The third factor that plays a role is the geometry of the molecule. If a molecule can "fit together" then it can exhibit more effective IMF. These three factors, IMF, mass, and geometry, affect the boiling point (or evaporative rate).

1. **Predict IMF (Dispersion, dipole, Hydrogen bonding) for each substance in the data table.**
2. **Rank which substance will evaporate fastest (1 fastest – 6 slowest) based on IMF predictions.**

Materials:
Six unknown liquids labeled A through F
Cotton swabs
Model kits

Procedure:
1. Dip the cotton swab into a liquid, dip another swab into another liquid.
2. Streak the cotton swabs along the table at the same time.
3. Observe and determine which liquid evaporated faster.
4. Repeat for all six liquids until you have built a chart of the fastest to the slowest liquid.
5. Clean up.
6. Obtain a model kit and build a model of each molecule listed in the data section. This is to visually help you in determining geometry and how the molecules interact.
7. Draw the Lewis dot structure for each molecule in the lab notebook.
8. Circle and identify the IMF regions on each molecule.
9. Rank the molecules from least to most IMF.
10. Use critical thinking skills and knowledge of IMF strengths to identify each liquid based on the molecular model and the rate of evaporation.

Liquids:

Compound Name	Chemical Formula	Predict types of IMF	Pre-IMF Ranking	Post-IMF Ranking
Ethanol	CH_3CH_2OH	D, P, H		3
Isopropanol	$(CH_3)_2CHOH$	D, slightly polar, H		4
n-butanol	$CH_3CH_2CH_2CH_2OH$	D, P, H		5
Hexane	$CH_3CH_2CH_2CH_2CH_2CH_3$	D,		2
Acetone	CH_3COCH_3 (Oxygen is double bonded to central carbon)	D, slightly polar		1
water	H_2O	D, P, H		