

Name: \_\_\_\_\_

Box: \_\_\_\_\_

## Determining Intermolecular Forces from Boiling Point and Melting Point

**Purpose:** In this lab you will have the opportunity to practice with a spreadsheet program to graph both the boiling and melting points of various compounds. Using the data you collect, you will be asked to make some predictions about the relative strength of the intermolecular forces by molecule type.

Molecule	Molecular Formula	Type of Molecule	Boiling point [°C]	Meting Point [°C]	IMF Types
1-Butanol	C <sub>4</sub> H <sub>9</sub> OH	Polar			
1-Propanol	C <sub>3</sub> H <sub>7</sub> OH	Polar			
Butane	C <sub>4</sub> H <sub>10</sub>	Non-polar			
Calcium Chloride	CaCl <sub>2</sub>	Ionic			
Dichloromethane	CH <sub>2</sub> Cl <sub>2</sub>	Polar			
Ethane	C <sub>2</sub> H <sub>6</sub>	Non-polar			
Hydrogen sulfide	H <sub>2</sub> S	Polar			
Methane	CH <sub>4</sub>	Non-polar			
Methanol	CH <sub>3</sub> OH	Polar			
Phosphorus trichlorate	PCl <sub>3</sub>	Polar			
Propane	C <sub>3</sub> H <sub>8</sub>	Non-polar			

Sodium bromide	NaBr	Ionic			
Sodium chloride	NaCl	Ionic			
Sodium iodide	NaI	Ionic			

**Procedure:**

1. Fill out the above table by researching the boiling point and melting point of each molecule (Later we will assign IMF Types). **Due Block Day, Apr 29-30**
2. In the Google Drive spreadsheet program, enter the values exactly like the table.
3. Make two separate graphs. **Due Thursday, May 1.**
  - a. Graph 1 is titled "Boiling Point by Molecule"
    - i. Graph each molecule on the x-axis, and it's boiling point on the y-axis
    - ii. Label each axis (including units)
    - iii. Color ionic compounds red, polar compounds blue, and the non-polar compounds purple.
  - b. Graph 2 is titled "Melting Point by Molecule"
    - i. Graph each molecule on the x-axis, and it's melting point on the y-axis
    - ii. Label each axis (including units)
    - iii. Color ionic compounds red, polar compounds blue, and the non-polar compounds purple.
4. Answer the following questions using the "C.E.R." technique. **Due Friday, May 2.**
5. Determine the type of intermolecular forces present in each molecule by filling in the "IMF Types" column. **Due Monday, May 5.**

**Conclusion:**

*Which type of molecules has the highest melting point?*

Claim:

Evidence:

Reasoning:

*Which type of molecule has the highest boiling point?*

Claim:

Evidence:

Reasoning:

*From this data, rank the molecules by relative intermolecular force (lowest to highest).*

Claim:

Evidence:

Reasoning:

*What would you estimate the boiling point of ethanol ( $C_2H_5OH$ ) to be? Consider what types of molecule it is, and its structural similarity to other molecules on the table.*

Claim:

Evidence:

Reasoning: