

Name:

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Intermolecular forces:

Why do some compounds and elements exist as a liquid at room temperature, while others are solids or gases? I think we have let go of the idea that gaseous forms of matter contain more "Caloric." Since this is my class, it's a good bet that my answer will come down to energy. Think back to earlier in the year when we talked about enthalpy and entropy and propose a hypothesis about phase transitions. What forces are involved?

Hypothesis: More massive molecules have higher boiling points.

To test my hypothesis, I would like you to make a graph of boiling point versus mass (X axis) versus boiling point (Y axis) of several compounds. You can use the computers to look up the boiling points (Wikipedia should have the boiling points of any of these). You might want to start filling in the table below:

Compound	Name	Mass	Boiling point
H ₂ O			
NH ₃			
CH ₄			
CCl ₄			
C ₂ H ₆			
C ₃ H ₈			
C ₄ H ₁₀	n-butane		
C ₄ H ₁₀	isobutane		
C ₅ H ₁₂			
C ₆ H ₁₄			
C ₇ H ₁₆			
C ₈ H ₁₈			
C ₉ H ₂₀			
C ₁₀ H ₂₂			
C ₁₁ H ₂₄			

Interpretation:

1. Is there any truth to my hypothesis that mass and boiling point are correlated?

2. Can you say that increase mass causes boiling point to increase? Why or why not?

3. You may note that the three molecules with the lowest mass seem to make up their own separate line. Draw the structures of those and propose why they show the trend they do.

4. Two molecules seem to drop below the main line significantly (have lower boiling points for their mass). Based on structure, what makes them different? (you may use wikipedia to help with the structures. Draw out butane and compare it to isobutane, including a prediction of bond angles around each carbon.)

5. Propose any ideas you might have to explain these the trend, and the two molecules that diverge from the trend.