

Changing Phase

Name _____

Intro

Today you will be working with butane (C_4H_{10}). Its condensation/boiling point is just below room temperature. It is also highly flammable, so take extra precautions to avoid sources of heat. There should be **absolutely no flames** during this exploration. You will also be working with dry ice. Only handle dry ice with metal tongs. **Do not touch it** with your fingers or put it in your mouth.

Part A - rainstorm in a bag (maybe more of a slight shower)

- 1) Obtain a ziplock bag and remove all of the air.
- 2) Seal the ziplock except for a small opening in the top.
- 3) Immediately after receiving a small quantity of butane complete the seal and feel the liquid butane with your fingers. Note what happens when you do this.
- 4) Using metal tongs obtain a piece of dry ice. Place and hold some dry ice on top of the bag.

Questions:

- 1) Explain what happens to the butane just after it is sprayed into the bag and why. What observations did you make? Be sure to discuss this at the molecular level.
- 2) After placing the dry ice on the butane, describe the cycle that occurs. Again, discuss this at the molecular level.
- 3) Refrigeration is made possible through a process similar to what we have been observing. However, instead of using dry ice to condense the gas, a compressor is used. A compressor will push the gas molecules closer together. If you continue to increase the pressure on a gas as we did in the syringe, you would reach some point at which the molecules are close enough together to allow intermolecular forces to strongly attract the molecules, forming a liquid. Can you think of a way to design a refrigerator to take advantage of the properties of substances with low boiling points (like butane). (**Note:** what will happen to the temperature of a gas as it is compressed? You must consider this in your refrigerator design.)