

Names:

## Intermolecular Forces Lab

### Background

In today's lab we will examine the attractive forces that hold molecules together and the disruptive forces that break them apart. The forces between molecules that hold molecules together are called intermolecular forces (IMFs) and are comprised of London dispersion forces (LDFs), dipole-dipole forces, and hydrogen bonding. The forces that break molecules apart are related to the temperature of the substance. You will explore how the IMFs are related to physical properties such as melting point, state of matter, change of state, and viscosity of liquids. Each group will have about 12 minutes per station to perform the experiments and then rotate to the next station.

### Part A: Viscosity

1. Design an experiment where you quantitatively compare the viscosity of water to the viscosity of glycerin using the tubes containing each liquid and a glass bead. Use your phone as a timer. Make a data table and show your work. Which substance was more viscous? Why?

2. Which IMFs exist in water (demonstrate the IMFs with the models)?

3. Which IMFs exist in glycerin (demonstrate the IMFs with the models)?

### Part B: Evaporation

1. Design an experiment where you compare the rate of evaporation of water, acetone, and cyclohexane using a paper towel, dropper pipette, and a timer. Make a data table and show your work. Explain the results.

2. Which IMFs exist in acetone (demonstrate the IMFs with the models)?

3. Which IMFs exist in cyclohexane (demonstrate the IMFs with the models)?

#### Part C: Changes of State

1. Examine the vial of bromine. Examine the iodine crystals. Explain your observations.

2. Put the 100 mL beaker containing the iodine crystals on the hot plate set to 100 °C. Place a couple of ice cubes on the watch glass and set it on the beaker. Observe. Explain your observations.

3. Which IMFs exist in bromine (demonstrate the IMFs with the models)?

4. Which IMFs exist in iodine (demonstrate the IMFs with the models)?

#### Part D: Melting

1. Place a small spoonful of glucose on one watch glass; place a small spoonful of sodium chloride on a separate watch glass. Set both watch glasses on the hot plate set to 200 °C. Observe. Explain your observations.

2. Which IMFs exist in glucose (demonstrate the IMFs with the models)?

3. Does NaCl have IMFs? Explain.

