**Close Encounters of the Polymer Kind Lesson –   
Close Encounters Lesson Handout for Students   
– Answer Key**

**Polymers**

**Weissenberg Effect**

**Entropy**

**Enthlapic Interactions**

**Assessment**

1. What did you observe in the Weissenberg Demo?

**The polymer *goes up* in the Weissenberg Demo.**

1. In your own words, describe what enthalpic and entropic *interactions* are?

***Entropic* interactions between objects are the inherent desire for *disorder in the system*.**

***Enthalpic* interactions are *attractive and repulsive interactions* between neighboring objects.**

1. Does nature want to maximize or minimize entropy?

**Entropy should be *maximized* in the Weissenberg Demo.**

**Barus (Die Swell) Effect**

**Assessment**

1. Which has more entropy available: a chain that is forced to be straight or a chain that can freely move?

**A chain that is *free to move* has *more entropy* available to them.**

1. Explain why water does not swell after exiting the die?

**Water is roughly linear and only bent slightly. Therefore its state of *entropy is roughly the same* in the die as out of the die so it *does not swell appreciably.***

**Kaye Effect**

Write down your observations of the Kaye effect, as seen in the lesson video.

**Answers will vary.**

**Shear Thinning and Shear Thickening**

**Assessment**

1. Explain shear thinning?

**When a polymer shear thins it *acts like a lubricant and shears or slips or skips off the surface*.**

1. Explain shear thickening?

**When solid particles in solution align under shear they give ordered structured that restricts the flow of fluid.**

**Real Life Example**

**Summary Assessment**

Answer the questions below in complete sentences.

1. In your own words, what are a thermoplastic and a thermoset? List one of each.

**A *thermoplastic* is a polymer system that consists of a collection of linear or nearly linear polymer chains thatcan be reshaped with sufficient heat.**

**A *thermoset* is a polymer that has been *cured (heated)* and *cannot be changed back* into its original form. The thermoset is set in its final form.**

1. Can you change the shape of a thermoset material?

**You *cannot change the shape* of a *thermoset* material as it is *set*.**

1. If you want a *flexible* thermoset do you need a few or many connections?

**A thermoset with *fewer connections* will be *more flexible*.**

1. If you want a *stiff* thermoset do you need a few or many connections?

**A thermoset with *more connections* will be *more stiff*.**

1. Are the crosslinks in thermosets physical entanglements or covalent bonds?

**Thermosets cross links are due to *covalent* bonds.**

1. When you have no loose ends, you have a ***stoichiometric*** ratio of functional groups.