

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

Polymers

Weissenberg Effect

Entropy

Enthalpic Interactions

Assessment

1. What did you observe in the Weissenberg Demo?

The polymer goes up in the Weissenberg Demo.

2. 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.

3. 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.

2. 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.

2. Explain shear thickening?

When solid particles in solution align under shear they give ordered structure 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 that can 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.***
2. Can you change the shape of a thermoset material?
You cannot change the shape of a thermoset material as it is set.
3. If you want a *flexible* thermoset do you need a few or many connections?
A thermoset with fewer connections will be more flexible.
4. If you want a *stiff* thermoset do you need a few or many connections?
A thermoset with more connections will be more stiff.
5. Are the crosslinks in thermosets physical entanglements or covalent bonds?
Thermosets cross links are due to covalent bonds.
6. When you have no loose ends, you have a stoichiometric ratio of functional groups.