# **Chemistry Experiments Discussion Guide (for use during or after reading)**

1. Describe three things scientists should do and three things they should not do when trying to experiment safely. (Experiment Safety, p. 6-7)
   1. Students’ answers will vary. They are likely to include wearing protective equipment such as goggles, reviewing procedures ahead of time, using a dry surface, protecting their workspace, and cleaning up afterwards as things scientists should do. Students will also likely highlight that they should not use fire or heat without adult supervision, not eat or ingest anything involved in the experiment, avoid touching their face and eyes with chemicals, and not leave a work area until everything is put away.
2. Describe the chemical reaction that took place between the baking soda and the vinegar in the first experiment. (Experiment 1: What Out for the Hand!, p. 8-13)
   1. The first experiment involves a chemical reaction between baking soda and vinegar. When these reactants combine, they undergo a chemical reaction, and their molecules rearrange. One byproduct of this reaction is carbon dioxide gas. In the experiment, a glove with baking soda was placed over a cup of vinegar. When the chemical reaction occurred, the newly produced carbon dioxide gas molecules began to move, pushing against the sides of the glove and causing it to inflate.
3. In the second experiment, why is it important to soak the hard-boiled egg in vinegar for at least twenty-four hours before continuing the experiment? (Experiment 2: The Astonishing, Bouncing Egg, p. 14-19)
   1. In the second experiment, Atom advised soaking the hard-boiled egg in vinegar for at least twenty-four hours before continuing. Vinegar is a weak acid that reacts with other substances and wears them away. Atom likely advised soaking the egg in vinegar for at least twenty-four hours so the acid had enough time to wear away the calcium carbonate eggshell.
4. Describe the chemical reaction that took place in the second experiment. (Experiment 2: The Astonishing, Bouncing Egg, p. 14-19)
   1. In the second experiment, a hard-boiled egg is soaked in vinegar for twenty-four hours, turning it into a soft, bouncy egg. This is because of a chemical reaction that occurs between the calcium carbonate eggshell and the acidic vinegar. Acids tend to wear away at the substances with which they come in contact. Because vinegar is a weak acid, it wears away at the eggshell slowly.
5. Explain how the mixture of ooblek can act as a liquid as well as a solid. (Experiment 3: Do-It-Yourself Quicksand, p. 20-25)
   1. Ooblek is a special kind of mixture that can have the properties of a liquid as well as a solid, depending on how it is handled. In general, ooblek is a mixture of water and corn starch. Each starch particle is surrounded by water particles that act as lubricants, helping them slide and glide past each other. This allows the ooblek mixture to flow like a liquid. However, putting pressure on the mixture causes the starch particles to squeeze together, making it act more like a solid.
6. Why is ooblek considered a mixture? (Experiment 3: Do-It-Yourself Quicksand, p. 20-25)
   1. A mixture consists of two or more substances comingled together, but not chemically combined. Ooblek is considered a mixture because it is a combination of water and corn starch mixed together, but not completely. The water molecules and the starch molecules do not combine chemically, rather the water particles surround the starch molecules, helping the mixture act as both a liquid and a solid.
7. Describe the chemical reaction that took place in the fourth experiment. (Experiment 4: The Hidden Message, p. 26-31)
   1. The fourth experiment shows a chemical reaction between lemon juice, an acid, and heat. Heat is a driver of many chemical reactions because it is a source of energy. In this experiment, lemon juice was used to write an invisible message. Adding heat to the juice caused its invisible compounds to break down and released the element carbon. When carbon reacts with oxygen found in air, it produces compounds that are dark in color, making the invisible ink visible!
8. Explain the role of heat in chemical reactions. (Experiment 4: The Hidden Message, p. 26-31)
   1. Heat plays an important role in many chemical reactions as it is a form of energy. Some chemical reactions require heat to jumpstart their process. Adding heat (or taking away heat) can change the chemical composition of substances, causing chemical reactions to occur.
9. Describe what happened in the chemical reaction detailed in the final experiment. (Experiment 5: Soda Pop Splash!, p. 32-39)
   1. In the final experiment, Atom uses diet cola and mint candies to cause an explosion and distract the “magical” thief. Soda contains fizz that comes from carbon dioxide gas. This gas is held in a solution, but the balance is quite delicate. When Atom dropped the mints with rough surfaces into the diet cola, the balance was disturbed. This released the carbon dioxide bubbles upward until they eventually exploded out of the soda bottle, creating the perfect distraction.
10. Of all the experiments detailed in this book, which would you like to try and why? (General)
    1. Students’ answers will vary. Encourage discussion about *why* that experiment is interesting to them.