**Mrs. Magorium’s Wonder Emporium: The Science of Toys**

**Teacher notes**

* **Time needed to complete lab:** Approximately 3 hours
* **Target grade level**: middle school, but could be adapted for older students.
* **Objectives:** Students will learn that toys are based on several scientific concepts.
* **Major concepts**: Surface tension of water: water is a polar substance and likes to ‘stick’ to itself. Soap will disrupt the ionic bonds between the water molecules. Physical change: an object can change its shape or form but not its chemical structure (dissolving is a physical change). Chemical change: a new substance is formed; energy is given off as heat or light or sound. Polymers: long flexible chains of hydrocarbons that are flexible and resistant to breakage.
* **Preparation:**
* Unpoppable Bubbles: prepare the bubble solution ahead of time. Use 8 mL of Dawn dish detergent, 86 mL of water and 6 mL of glycerin. Stir these together to make a longer lasting bubble solution.
* Glow Stick Reaction: be sure to measure out the fluorescent dye into small weigh boats ahead of time. Also, add the 3mL of 30% hydrogen peroxide to scintillation vials ahead of time.
* Disappearing Ink: you will need to cut up a white cotton shirt into 6” squares
* Sunprint Paper: you will need to prepare the ‘Solution A’ and ‘Solution B’ for the Sunprint paper ahead of time. Be sure to store the two solutions in light-proof bottles.

Solution A: Add 20 g Ferric Ammonium Citrate to a 100 mL volumetric. Add distilled water to make 100 mL.

Solution B: Add 16 g Potassium Ferricyanide to a 100 mL volumetric. Add distilled water to make 100 mL.

* **Typical results or sample data:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Toy | Chemical Reaction | Physical Change/Property | Polymer | Surface Tension |
| Disappearing Ink | X |  |  |  |
| Dissolving Alien | X |  |  |  |
| Fortune Teller Fish |  | X |  |  |
| Glow Stick Reaction | X |  |  |  |
| Happy/Unhappy Balls |  |  | X |  |
| Instant Snow |  |  | X |  |
| Latex Rubber Ball |  |  | X |  |
| Magic Sand |  |  | X |  |
| Memory Wire |  | X |  |  |
| Spy Paper |  | X |  |  |
| Sunprint Paper | X |  |  |  |
| Swimming Fish |  |  |  | X |
| Unpoppable Bubbles |  |  | X |  |