

Bubbleology



Bubbles are not only captivating, colorful, and fun to make, they are also excellent demonstrations of scientific phenomena. In this unit, students combine intense enjoyment with important concepts in chemistry and physics through imaginative experiments with soap bubbles. Bubble behavior has attracted and compelled observation by chemists, physicists, mathematicians, and engineers. The search for a deeper understanding about bubbles has yielded intriguing connections in many technical fields.

Course Objectives: Students will devise an ideal bubble-blowing instrument; test dishwashing brands to see which makes the biggest bubbles; determine the optimum amount of glycerin needed for the biggest bubbles; employ the Bernoulli principle to keep bubbles aloft and learn how planes fly; use color patterns to predict when a bubble will pop; and create bubbles that last for days. In the process, they learn about light and color, aerodynamics, chemical composition, surface tension, and even technology. *Bubble-ology, the study of bubbles*, is packed with solid scientific, technological, and mathematical content and learning.

Topics covered in a fun and exciting way are:

- Light and color
- Aerodynamics
- Chemical composition
- Surface tension
- Technology



Course Expectations:

- Attend all classes unless ill. No make-ups will occur
- Arrive on time and prepared with notebook and folder
- **Bring two pencils, Composition book or spiral notebook, folder for handouts (KEEP ORGANIZED AND BRING HANDOUTS FROM PREVIOUS WEEKS, SO WE CAN APPLY PREVIOUS LEARNING)**
- Be open to ideas and to work safely
- Complete assignments and an active learner
- Be willing to discuss and honestly evaluate progress

Lesson 1: Bubble Technology - Can you blow a bubble with a piece of paper or a rubber band? You will test and discover what objects can be used to blow bubbles, which make little bubbles, and which make large bubbles. Using this data you will then draw your own bubble maker for specialized uses. Discussion and experiments relating to surface tension, positive/negative charge molecules, chemical bonds as well as the composition of bubbles will be explored.

Lesson 2: Comparing Bubble Solutions - Compare bubble solutions to determine which brand of dishwashing liquid will make the biggest bubble. This activity presents you with a way to quantify how well the soap solution forms bubbles. Continued discussion

and exploration of surface tension, soap and water bonds, evaporation and what happens to the structures and how that relates to chemical bonds. The state of equilibrium between air pressure and surface tension will be discovered.

Lesson 3: Chemistry of Bigger Bubbles - The formation of bubbles depends on the chemical composition of a substance. You will be introduced to the properties of the bubbles. Surface tension will be observed and the amounts of glycerin will be determined on the size of the bubbles. Soap and water molecules will be explored relating it to surface tension and molecular bonding as well as evaporation. Glycerin is a hygroscopic substance and we will discuss and go into those properties.

Lesson 4: Bernoulli's Bubbles - Aerodynamics will challenge you to devise the best way to keep a bubble aloft. Bernoulli's principle will be taught and it will help explain how airplanes fly while exploring with bubbles. It will also lead into discussions on dynamic lift.

Lesson 5: Predict-A-Pop - You will predict when the bubble will pop based on the color of the bubble as the interaction between light and matter, called interference, shows this change. Light wavelengths will be reviewed to discuss the constructive interference as well as destructive interference.

Lesson 6: Longer Lasting Bubbles - How long will your bubble last? Throughout the day we will check to see which bubble made it to the end of the day. Application to the study of bubbles will be explored. Bubble festival centers set-up for a variety of bubble play and experimenting will occur after students demonstrate their knowledge of Bubbles.

Lesson 7: TBD