

# Lesson plan for *Build an Atom* : Introduction

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High school version

**Learning Objectives:** Students will be able to

1. Make atom models that show stable atoms or ions.
2. Use given information about subatomic particles to
  - Identify an element and its position on the periodic table
  - Draw models of atoms
  - Determine if the model is for a neutral atom or an ion.
3. Predict how addition or subtraction of a proton, neutron, or electron will change the element, the charge, and the mass of their atom or ion.
4. Describe all vocabulary words needed to meet the goals.
5. Use a periodic symbol to tell the number of protons, neutrons, and electrons in an atom or ion.
6. Draw the symbol for the element as you would see on the periodic table

## **Background:**

This lesson is for High School students who have some introduction to atomic particles, but could use a refresher or deeper understanding. A demonstration or short hands-on activity would be to have some toothpicks and marshmallows (or something like tinker toys or straws, gum drops ). I plan to do this as a hands-on activity, I put the supplies in baggies\* and have the questions in a power point. The power point is included in the activity.

1. Give the rule that the toothpick must have a mallow on each end and that each part must be used for these questions.
2. For each, have the students draw what could be built and give it a common name: (you may want to do the first one to get them thinking about geometry without telling them to use geometric shapes if you are going to pass out materials. If
  - 2 mallows and a toothpick (line segment would be a good answer or dumbbell )
  - 3 mallows and 3 toothpick (triangle)
  - 4 mallows and 4 toothpick (square)
3. Ask: How many mallows and how many sticks would you need to make a box? (8 and 12)
4. Discuss how following the rules made shapes for which we all know the common names and that if we know the name of an object, we could figure out what parts there are. Then introduce the sim by saying that there will be some atomic parts and you will try to figure out what some of the rules are and also what the names tell us about what parts are used.

\*Hint for quick setup of baggies: I let the marshmallows dry out a little so they can be used all day. Otherwise, they really get too squished; gum drops are a nice option because they last better throughout a day. I usually weigh out about 20 toothpicks in a bag and then about 20 marshmallows. Then it is easy to make several bags without having to count and if a few get lost throughout the day, there are still plenty of materials for each group.

## **Lesson for Build an Atom tips:**

Students should be able to work in pairs at a variety of paces using the **Student Directions for Build an Atom**. New vocabulary is introduced integrated into the lesson. Definitions are specifically not given at the beginning, but left for the students to explore and make their own

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sense of the new words. Then question 7 is designed as a group review where the students can check their understanding and make any corrections.

**On step number 1:** The teacher might need to tell the students not to write anything, but encourage talking and exploring the simulation.

**Some students may use the game to check their ideas.**

If you want to help students understand what happens when an atom is unstable, you could use these simulations and activities:

- [Alpha Decay Activity](#)
- [Beta Decay Activity](#)
- [Nuclear Fission Activity](#)
- [Radioactive Dating Game Activity](#)

**Post-Lesson:** I have included clicker questions in the power point. Students could be encouraged to use the game to as practice, but I did not include class time for the game.