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

- Interpret the atomic model and locate the nucleus, protons, neutrons and electrons
- Build atoms given a number of protons, neutrons and electrons
- Determine the atom's or ion's identity, mass and charge
- Draw models of atoms using a given number of protons, neutrons and electrons.

Background:

- Students should have a **basic understanding of a model**. Since an atom cannot be seen and physical experiments are difficult for them to do, it is a good idea if they understand that in science, when something is too big or small, or too far away, we need a model to help us think about it. I use the *FOSS Models and Designs Module/Black Boxes* activity to start this.
- It is useful to **introduce the Periodic Table of Elements!** I do this by having students create their own personal element card with their first and last initial of their name - but no doubles with another student and they cannot use one already on the table. I have them choose some "properties" that describe them - favorite color (I restrict the choices to 5 major color areas), favorite food, and how they react when thrown in water. They design this on a notecard and then we play with grouping them - trying to find the best organization. This is where I talk about Mendeleev and others in their quest to organize the elements. We have a class discussion about the periods and groups; for example: the "party animal group one elements who cannot even play in water or air" and the snobby gases on the "other end of town". I also like to use a pyrotechnics link where they can click on different elements involved in the making of fireworks. <http://www.pbs.org/wgbh/nova/physics/periodic-table.html>
- **Build an Atom** simulation comes next for a general understanding of atoms being filled with even smaller particles known as protons, neutrons and electrons.
- After the simulation I **go back to the history of the atom** teach how the atomic theory came about through technological advances, over long periods of time, which allowed scientists to conduct new experiments and make new discoveries.

Teacher notes:

indicates students write a response



indicates students will discuss with partner



Indicates students should check in with teacher

- Students must have a pretty good understanding about the atom to play the game. I tell them they have to complete the activity and check the box at the end before they are ready to go on to the game. Looking at their papers gives me a chance to assess their level of understanding. Without the appropriate level of understanding of atomic number and reading the periodic table they will struggle a bit. With partners it works better because they will keep trying different things. Depending on a teacher's goal, more teaching can be done specifically to this topic or, revisit the game again later.
- **"Frames"** are added to help students frame an answer to the question. I use them because I have a large range of learners including many English language learners, and in the first half of the year they are hesitant to put their thoughts in writing for me.
-  I use this symbol on tests and activities to indicate extra challenge- I call it code red. Students are encouraged to try it, but I evaluate it separately and with comments only.