

## Lesson plan for [Isotopes and Atomic Mass](#):

What is an isotope? What does the mass on the periodic table mean?

<http://phet.colorado.edu>

### **Learning Goals:**

Students will be able to:

- Define “isotope” using mass number, atomic number, number of protons, neutrons and electrons
- Compare and contrast: element, atom, isotope
- Given the number of protons, neutrons and electrons, find the mass and name of an isotope
- Given the name of an element and the number of neutrons, find the mass of an isotope
- Give evidence to support or dispute: “In nature, the chance of finding one isotope of an element is the same for all elements.”
- Find the average atomic mass of an element given the abundance and mass of its isotopes

**Background:** This activity is inquiry based and in my class would follow using the [Build an Atom](#) sim. I have not written a HS lesson yet, but it will be based on the MS lesson that the PhET team developed, [Build an Atom Introduction](#)

### ***Isotope and Atomic Mass Introduction:***

Students should not need an introduction to this sim, but there are some things from the [Teaching Tips](#) that might be useful.

### **Pre-Lesson: (*I have included some slides that could be used in a Power Point presentation*)**

Have white eggs of different grades (or apples or something that is called by the same noun and has similar characteristics, but has variation in mass). I like eggs because all eggs are chemically and physically the same, but if you want to do this as a hands-on activity, you might want to think of something that wouldn't have the potential for a mess. I use nuts and bolts for a hands-on lab about molecular mass from *Merrill Chemistry* Robert C. Smoot , Richard G. Smith , Jack Price McGraw-Hill/Glencoe 1998. p 807 earlier in the unit to help students understand that substances can be made up of basic parts combined differently.

1. As a demo, put several different in a container and mass; don't use all the eggs, save some for #3. Count the number of eggs and ask students working in pairs or table groups (depends on the room arrangement) to collaborate to calculate the average mass of the eggs. I would ask a student to come to the front to show their work.
2. Then, mass one of each egg type and have a class discussion about the difference between: “Individual” versus “Average” Mass.
3. Calculate, before the activity, an average mass that is achievable with the eggs you have different from #1. Challenge the student groups to design a mixture of eggs that will give the average you provide. (I have not done this activity yet, but I hope that I can design this so there is more than one solution.) I also think I will have a variety of masses and assign different groups different masses. I have seniors in HS, so I think this will be good.
4. Have groups take turns trying their proposals by coming up to the front of the room. If this is a course in which you have already addressed “precision”, this is a good opportunity to review, because the eggs will have some variation even if they have the

Lesson plan for *Isotopes and Atomic Mass*:

What is an isotope? What does the mass on the periodic table mean?

<http://phet.colorado.edu>

same grade. If you want to keep it simple, just make sure you record the mass with less precision.

**Lesson:** Have the students work in pairs or at home to complete the Student Directions.

**Post-Lesson:** Use the clicker questions to facilitate class discussion. (*see the Power Point that is included with this activity*)