Lab: Sweet Model of the Atom

FOR THE TEACHER

Summary
In this lesson, students will use different candies to represent electrons, protons, and neutrons to gain a better understanding of atoms, ions, and isotopes.

Grade Level
High or middle school

Objectives
By the end of this lesson, students should be able to
- Identify the difference between atom, ion, and isotope.
- Recognize that ions are because of a change in electrons and therefore are charged.
- Recognize that isotopes are because of a change in neutrons.

Chemistry Topics
This lesson supports students’ understanding of
- Atomic structure
- Ions
- Isotopes
- Model of the atom

Time
Teacher Preparation: 30 minutes
Lesson: 1 class period

Materials
- Skittles
- M&M’s
- Nerds

Safety
- Food should never be consumed in a lab setting, so if students are permitted to eat their subatomic particles after the lab, make sure the activity is carried out not in a lab setting.

Teacher Notes
- Other candy may be substituted, but I chose to use Skittles and M&M’s as protons and neutrons because they are similarly sized. Reese’s Pieces could be used as a substitute, but make sure you are aware of peanut food allergies. I’ve also used mini-M&M’s instead of Nerds.

FOR THE STUDENT
Student Activity Sheet: Sweet Model of the Atom

Lesson

Purpose
The purpose of this lab is to visually see how atoms, isotopes and ions are put together.

Materials
Do not eat any of your materials until you are instructed to do so.
M&M’s Skittles Nerds

Procedure
1. Establish which subatomic particle each type of candy represents.
   - Electrons:
   - Protons:
   - Neutrons:
2. You need a piece of loose leaf paper to carry out the lab.
3. For the following examples, be sure to make them using your candies. When you have made the model with your candy, draw the atom on your paper.
4. Be sure to answer the questions as you complete the activity.

ATOMS

\[
\begin{array}{c}
\text{Si} \\
\circ \quad \circ \\
\circ \quad \circ \\
\circ \quad \circ \\
\circ \quad \circ \\
text{Ne} \\
\circ \quad \circ \\
\circ \quad \circ \\
\circ \quad \circ \\
\circ \quad \circ \\
\end{array}
\]

Which of the two atoms above do you think is “happiest” (in scientific terms that means more stable)? Why?
(Hint: think about which element has a FULL shell – do you think this is a good situation for an atom?)

ISOTOPES

The most common isotope of S is... A less common isotope of S could be...

\[
\begin{array}{c}
e^- \\
p^+ \\
n^0 \\
e^- \\
p^+ \\
n^0 \\
\end{array}
\]

Explain how you determined the most common isotope.

IONS
A positive ion (cation) is made by __________________________. A negative ion (anion) is made by __________________________.
Make the following atom and its most stable ion...

- P
  - e⁻
  - p⁺
  - n⁰
- Al
  - e⁻
  - p⁺
  - n⁰

- P— (fill in the charge)
  - e⁻
  - p⁺
  - n⁰
- Al— (fill in the charge)
  - e⁻
  - p⁺
  - n⁰

How many electrons prefer to be in the outer most shell?

This is called the *octet* rule.

**Analysis**

For these ions, you do not have to make the atoms with your candies unless you get stumped. Answer the following questions:

1. Explain how each of the following ions are made from their neutral atom.
   - Mg²⁺
   - S²⁺
   - B⁻
   - N⁵⁻

2. From the ions in question 1, which is (as in ONLY ONE) the most stable? Why?

3. What are the two most stable ions magnesium can make?

4. From your answer to question 3, which ion does magnesium prefer to make? Explain.

**Conclusion**

What did you learn from the lab? Write at least three sentences on a separate sheet.