Grade Level:
Elementary and Middle School

Introduction:
Do students know what our universe is made of? What are the building blocks of the world around us?

Lesson:
ATOMS
Atoms are building blocks of the world. A single atom is made of a nucleus that has protons and neutrons, and that nucleus is orbited by electrons. Protons, neutrons and electrons are called subatomic particles- particles that are smaller than an atom. This lesson will discuss neutral atoms, those with neither a positive nor a negative charge.

The number of protons in an atom defines which atom it is. Protons have a positive charge. An atom’s atomic number is the number of protons an atom has.

The number of neutrons an atom has is equal to the number of protons it has. Neutrons are neutral, they have no charge. Neutrons and protons make up the nucleus of an atom. The nucleus of an atom is in its center and is the heaviest part of the atom.

Electrons circle in an orbit around an atom’s nucleus, similar to how the moon orbits Earth. The number of electrons equals the number of protons. Electrons have a negative charge.
THE PERIODIC TABLE OF ELEMENTS
The Periodic Table of Elements displays all of the elements humans know about. Each element has a small box that contains information about its atom. This information can include the element’s atomic number, symbol, name, and atomic mass. Here is an example:

Atomic number: The number of protons. The atomic number defines the atom. The number of protons will never change.

Element symbol: The symbol that represents the atom’s name. First letter is capitalized, the second is not.

Element name: The name of the atom.

Atomic mass: The weight of the atom. The majority of mass is from the protons and neutrons. Electrons have little mass.

Examples:

<table>
<thead>
<tr>
<th>Atomic number</th>
<th>Element symbol</th>
<th>Name</th>
<th>Atomic mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Ca</td>
<td>Calcium</td>
<td>40.08</td>
</tr>
<tr>
<td>7</td>
<td>N</td>
<td>Nitrogen</td>
<td>14.01</td>
</tr>
</tbody>
</table>
**Real Life Application:**
Humans are made from atoms! From small picture to big picture: atoms combine to make molecules- molecules combine to make cells- cells combine to make tissue- tissue combines to make organs- organs combine to make organ systems- organ systems combine to make an organism. The world's smallest movie is made of atoms. Watch it here: [https://vimeo.com/65244953](https://vimeo.com/65244953).

**Activity:**
**Supplies needed:** The Build a Carbon Atom Kit, markers OR paint and paintbrush, glue.

**Step One:** This experiment makes a carbon atom, so 18 Styrofoam balls are needed (six protons, six electrons and six neutrons). Choose three different colors to represent each part of your atom: protons, neutrons and electrons, then paint them or color them with markers.

![Protons, Neutrons, Electrons](image)

**Step Two:** Glue the protons and neutrons together to make the nucleus of the atom.

![Glued Protons and Neutrons](image)
**Step Three:** Assemble your atom’s electron cloud using pipe cleaners and electrons. To thread the pipe cleaner through the electron, push an unfolded paperclip or a pin through the electron first. You might need one and a half to two pipe cleaners for length. You can twist them around one another to connect them together.

![Twist to connect](image1)

a.  
b.  
c.
Step Four: Using the string, tie a knot around the top part of your electron cloud to keep the pipe cleaners aligned.

Step Five: Tie one end of the string around the paperclip in order to attach your nucleus.
Step Six: Slide the pin or paperclip into the nucleus. This will allow it to float inside the electron orbit.

Step Seven: Show off your atom and be proud of what you made! Hang it in a place where everyone can see it and you can talk about it.
Optional Activity: Build an atom using the Build an Atom Template by gluing or drawing subatomic particles to the atom template. Dried nuts or fruits, beads, beans, small candies, stickers, pom-poms, or drawings can be used to complete the activity.
Name: __________________

Directions:  *First*, communicate what represents your electrons, protons and neutrons.

*Second*, give information about your atom in the box to the right.

*Third*, place your protons and neutrons in the nucleus of the atom, and place the electrons in the cloud of the atom.