

Up 'n Atom

MATERIALS

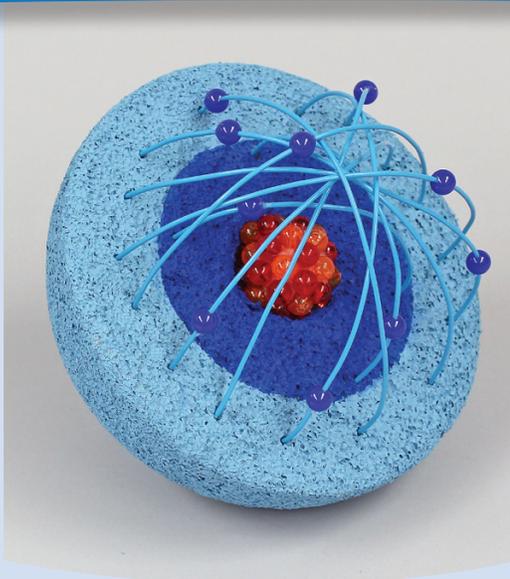
FOR STUDENT:

(one per group of two students unless otherwise noted)

- FloraCraft® Make It: Fun® Foam Ball, 6" and 1" diameter (one each, per two groups)
- Wire, plastic-coated, 18 gauge, blue, 7 feet
- Beads, plastic, 7 mm diameter: twelve each of red and orange; ten of royal blue
- Paintbrushes, two large
- Plastic cup, three (ideally with a 3 1/2" diameter rim)
- Pencil
- Ruler
- Thick white tacky glue
- Paper plates, small and large
- Paper towels, two
- Plastic bag, small
- Paint apron per student

FOR TEACHER:

- FloraCraft® Design It:® Wire Cutter
- Acrylic paint: True Blue and Salem Blue (lighter blue)
- Serrated knife
- Rubber band, medium
- Masking tape
- Ruler
- Pencil
- Glue gun (for teacher only)
- Old newspapers or plastic tablecloth (optional)
- Plastic-lined garbage can
- Paper towels
- Bucket of water
- Small empty squeeze bottle
- Wet wipes
- Drying area



SCIENCE

GRADE LEVEL
FOURTH – FIFTH

COMPLETION TIME

- 45 minute session (2 hours minimum drying time)
- 45 minute session



OBJECTIVES

Students:

- Understand that atoms are basic to all matter
- Learn the parts of an atom: Proton, Neutron, Nucleus, Electron, L & K Shells
- Are aware of how very small an atom is

STANDARDS

- All matter is made of atoms
- Matter made of only one type of atom is called an element
- Compounds are composed of two or more kinds of atoms, which are bound together in well-defined molecules or crystals

TEACHER PREPARATION

Note: Read through all the instructions first and check out the TIPS! Plan for two class sessions with drying time in between them. Have a glue gun plugged in and ready to use (ideally set on low temperature) but out of student reach. This can give you immediate adhesion when you're in a hurry to help students. It is also recommended that you make a model first, before preparing the materials for any others, since knowing the process might affect how you prepare.

[1] Use a serrated knife to cut the two foam balls in half (which will provide enough for two groups).

Optional: Create a cutting guide by wrapping a rubber band around the large ball so that one edge is in the middle. Rotate the foam ball to make it even all around. Then cut along that line, rotating the foam ball as you cut. Sand the cut surfaces by briskly rubbing them together over the garbage can until even.

Set the large ball-half on the table so that the flat surface is tipped back a little. Notice where the bottom would be and use the serrated knife to trim off a 2" diameter circle on this bottom. (Note: It should be about 1 1/2" away from the bottom front edge.) Check to be sure this allows the ball-half to be stable. Then, put a 1 1/2" piece

of masking tape on this area for students to later write their names.

Repeat for the remaining groups.

[2] Use a wire cutter to cut the plastic-coated wire into the following lengths for each group, two of each: 6", 8", 8 1/2", 9" and 9 1/2". (Keep the wire as smooth as possible.)

[3] Put the wires and the small ball-half into a bag. Put beads into plastic cups and prepare tacky glue bottles. Repeat for each group and set aside until after students have painted.

[4] At each group's place, set: Large and small plates, two paper towels, two paintbrushes, a pencil, the large ball-half and a plastic cup.



[1]



[2]



[3]



[4]



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INSTRUCTIONS

[1] Just before students arrive, squeeze light blue and dark blue paint onto opposite sides of the large plate.

When students arrive, have them wear their aprons and roll up their sleeves, explaining that this paint will not wash out of clothes.

But first, each group will need to draw a circle guideline for painting the two energy levels or shells: K (light blue) and L (dark blue). Have one student hold the ball-half while the other centers the cup (with the 3 1/2" diameter rim) onto the flat surface and traces around it with the pencil.

Also, ask them to write their names in pencil on the masking tape, on the bottom of their ball-half.



[2] Have one student paint the light blue starting by going around the outside of the pencil line circle. (This will allow it to dry some before the dark blue is painted next to it.) Then, the student can continue with the rest of the ball. When they get to the bottom, have them paint around the masking tape.

Then, the other student may carefully paint dark blue inside of the circle.

As students finish, collect the brushes and put them into the bucket of water (until after class when they can be washed out). Put the ball-halves on small plates in the drying area.



NEXT SESSION

[3] Distribute the materials that you prepared in Step 3 to the groups. Have students glue



the 1" ball-half to the center of the atom as a basis for the nucleus.

[4] Demonstrate and have students apply a generous amount of tacky glue all over the small ball-half. Then randomly arrange orange and red beads (protons and neutrons) all around the base of the ball-half. Add additional glue if needed and fill in the rest of the area with as many orange and red beads as will nestle into one another.



[5] Have students thread one blue bead (electron) onto the middle of each of the wires (orbits). Then, have them arrange the wires on the table according to length – from the two shortest up to the two longest.

Explain that the ends of the two shortest wires need to be inserted into the dark blue (L shell) area, with one wire overlapping the other. Have students insert each of those wires, close to the edge of the dark blue, going down about 1/2" into the foam. (Note: Wire should naturally curve to fit.)

Then explain that the remainder of the wires will go into the light blue (K shell) area, similarly overlapping one another, layer by layer, going from the shortest lengths up to the longest lengths. (Note: When finished the wires should be spaced about 3/4" apart in a circle, in the light blue.)

Students may move the beads to various places on the wire, representing the electrons orbiting around the nucleus.



MODIFICATIONS

To simplify project:

- Only paint the inside circle (the L shell).
- On a plastic bag, glue the nucleus beads onto a 1" ball-half and let it dry over night. Then, students can glue it to the center of the atom.

To expand project:

- Research and include more detail as well as labels for all of the parts included.
- Ask students to research and come up with an example of how large their model is compared to a real atom.

For multiple ages:

- Younger and older students can work side-by-side with younger students painting and the older ones working with the wire.
- Have older students research more on atoms in general – gathering interesting information to include.

ADDITIONAL IDEAS

- As a class or group, make a jumbo atom from a large foam ball and hang it from the center of the room. Then make large wire orbits, using 1" foam balls for the electrons.
- Make labels for various parts and use glue stick to attach.
- Use this technique for other cross sections of items that students are studying.



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TIPS

- Prepare the painting area, covering the tables if needed. Allow for plenty of space for each student. Have a large plastic-lined garbage can ready.
- Check the nozzles of the tacky glue bottles to be sure that they are clear. If not, bend open a paper clip. Remove the bottle cap and insert the paper clip wire into the nozzle (from the inside), forcing any dried glue out of the nozzle (not down into the glue bottle). Test it to be sure that it's clear.
- Before painting, show students how to compress the cut edge of the foam. Place the foam ball-half at an angle, on the table. Press the edge down, to round it, rocking it back and forth a little and rolling it all around to get an even, circular edge.
- To help hold the foam while painting, insert the point of the pencil into the bottom, next to the masking tape. Then, hold the pencil to finish painting.
- If the acrylic paint seems too thick, walk around with a squeeze bottle (not a squirt bottle) of water and put a few drops of water on each student's puddle of paint. Or, if you know it in advance, add a little water to the paint in the container and shake well, to thin the paint to the consistency of cream. This will go down into the pores of the foam more easily.

REFERENCES

Real Science –4-Kids Chemistry Level I by Dr. Rebecca W. Keller
The Elements by Dan Green
Adventures With Atoms And Molecules by Robert C. Mebane
The Nature Of Matter by National Geographic