Atom Snap'em® Kits

Instructions for the following sets:
671-2005 Organic Introductory Set
671-2000 Organic Set I
671-2010 Organic Set (teacher)
671-2015 Organic Set II
671-2020 Organic-Inorganic Set

Introduction: Molecules, which are made of atoms, are everywhere. If they weren't, there would be no one to read these instructions. Aside from purely elemental substances, everything in existence is made up of combinations of atoms that we call compounds or molecules. In physics, any group of atoms is a molecule if it is stable and the atoms are joined by strong atomic bonds. These bonds are formed according to the electrons present in an atom. All electrons arrange their atoms in orbital levels, or electron shells. This is because electrons repel each other, limiting the amount that can be in close proximity. Close to the atom's nucleus, only two electrons can be present. At higher levels, there is more room for the electrons, so more can occupy that shell. No element has more than thirty-two electrons in its outer shell.

Only one group of atoms, the noble gases, has a completely filled outer shell. The rest have a number of electrons missing. Due to this, atoms will try to bond with other atoms in order to fill their electron shell. They can do this by borrowing or losing electrons to another atom, called an ionic bond, or by sharing electrons, called a covalent bond. The alkali metals have a single electron in their outer shells, making them able to bond to almost anything. The noble gases have full outer shells, making it almost impossible for them to bond to any other atom.

Elements are also grouped into columns on the periodic table. For example, all the elements in group one have similar properties, and have one electron in their outer shell. Group thirteen has three outer electrons, and group eighteen has none. A hint is to take the last digit of the group number and subtract it by eight. This will give you the number of open spaces in the outer electron shell.

The concept of the molecule was first postulated by the French philosopher Rene Descartes in 1620. The word comes from the French word meaning "extremely minute particle".

Description: Regardless of which set you may posses, they all share a number of characteristics. There are nine common atoms, and three connectors representing bonds. The atoms are as follows:

White with one connection: Hydrogen. Hydrogen composes 90% of the universe's matter. It is essential for life.
Green with one connection: a Halogen, such as Fluorine or Chlorine. These two are the most reactive elements.
Black with four connections: Carbon. Carbon is perhaps the most versatile element and essential for life. It can form extremely long chains of atoms and is the heart of most organic molecules.

Yellow with two connections: Sulfur. Also essential for life, it is found in two amino acids: cysteine and methionine.
Blue with three connections: Nitrogen. Another essential life element, and composes 70% of Earth's air. It is never found as a single atom in nature.
Red with two connections: Oxygen. It is the third most reactive element, and essential for life. It is utilized for energy production in most organisms.
Purple with four connections: Silicon. A relative of carbon, it is very useful and can form similar chains. There has been speculation on the possibility of life forms that use Silicon instead of Carbon.
Gray with two connections: a transition metal. Many atoms fall into this category, such as Iron.
Gray with one connection: an alkali metal, such as Lithium. These are relatives of Hydrogen.

The atoms are not limited to the above list. If you prefer, they can correspond to any atom sharing similar atomic properties.

There are also three connectors in your set: the long gray connector represents a covalent bond. The medium white represents ionic bonds, and the short white represents Hydrogen bonds. Hydrogen bonds are intermolecular bonds involving Hydrogen bonded with Oxygen, Nitrogen, or Fluorine. They impart many interesting qualities, such as the high boiling point of water.

Note: group numbers refer to the groups on the periodic table, 1-18. Transition metals, lanthanides, and actinides are not included in these groups.

671-2005 contains: 20 hydrogen, 6 halogens, 12 carbons, 7 oxygen, 2 nitrogen, and 1 sulfur.
671-2000 contains: 40 hydrogen, 8 halogens, 2 alkali metals, 24 carbons, 6 black nitrogen, 2 black group 16, 12 oxygen, 4 silicon, 1 yellow group 14, 4 blue group 14 and 1 transition metal.
671-2010 contains: 12 hydrogen, 2 white alkaline earth metals, 8 halogens, 4 alkali metals, 14 carbons, 6 black group 13, 6 blue group 14, 12 oxygen, 1 yellow group 14, 1 yellow group 16, 4 silicon and 1 transition metal. Set also contain 18 pear shaped connectors representing ions.
671-2015 contains: 20 hydrogen, 4 halogens, 1 alkali metal, 12 carbon, 6 oxygen, 2 blue group 14, 2 nitrogen, 1 yellow group 14, 1 yellow group 2, and 1 silicon.
671-2020 contains: 14 hydrogen, 6 halogens, 2 alkali metals, 6 carbon, 1 beige group 15, 1 nitrogen, 2 blue group 14, 6 oxygen, 1 red group 14, 1 sulfur, 1 yellow group 2, 3 transition metals, 1 gray group 15, 1 gray group 14, 1 gray group 2, 1 beige group 14, 1 beige group 13, 1 beige group 2. Set also contains 5 purple connectors and 3 pear shaped assemblies representing ions.

Uses: These kits are essential for visibly demonstrating the structure of molecules. For example, you can construct the "Mickey-Mouse" shaped water molecule. Put four hydrogen atoms and one carbon atom together to create methane. For the more adventurous, try assembling DNA or the 60 carbon atom Buckminster Fullerene. Whatever the molecule you wish to describe is, our kits will make it happen.

Warranty and Parts:
We replace all defective or missing parts free of charge. Additional replacement parts may be ordered toll-free. We accept MasterCard, Visa, checks and School P.O.s. All products warranted to be free from defect for 90 days. Does not apply to accident, misuse or normal wear and tear. Intended for children 13 years of age and up. This item is not a toy. It may contain small parts that can be choking hazards. Adult supervision is required.

Grades 9 – 12 **The Physical Setting**	**4D/ H2**	"The number of protons in the nucleus determines what an atom's electron configuration can be and so defines the element. An atom's electron configuration, particularly the outermost electrons, determines how the atom can interact with other atoms. Atoms form bonds to other atoms by transferring or sharing electrons..."	Grades 9-12 **Physical Science Content Standard B.2** – Structure and properties of matter	"The physical properties of compounds. Reflect the nature of the interactions among its molecules. These interactions are determined by the structure of the molecule, including the constituent atoms and the distances and angles between them." (p. 178)

Other Science First Items:

652-1010 Anemometer: This colorful working model is sensitive to breezes as slight as 2 mph. Since it rotates at speeds 1/6 that of the wind velocity, wind speeds can be determined quantitatively by counting the rotations. Consists of: Four (4) plastic molded cups, 3 black and 1 red for contrast, mounted on a low-friction axle and attached to a sturdy base. Instructions include sample questions, problem and wind speed chart.

673-0110 Mole Box: How to visualize what a mole of air really looks like? Use our custom-printed, die-cut cube... complete with mole! Many concepts in chemistry class are hard to grasp. (Plus we all need a good laugh.) This 6-sided cardboard box, each side 11.2" square, folds into a sturdy cube. Each side is imprinted with useful facts in large type that can be read easily across a classroom.

673-0115 Mole Specimen Set: Set of 4 metals; Al, Cu, Fe and Zn. Each has approximately one mole of particles. Clearly show how "1 mole" differs between different atoms.

611-2250 Hero's Fountain: This classic demonstration of fluid pressure spouts water into the air for some time. As water in the top enters the lower bulb, it forces the air in the bulb upward, compressing more air in the upper bulb. The water has nowhere to go but out the upper tube. 50cm high, with instructions.

611-1705 Gaussian Gun™ Linear Accelerator: What happens when you align powerful neodymium magnets on a linear rail and arrange steel balls in a sequence? A fun and intriguing demonstration of Newtonian physics. When properly arranged, a slow moving steel ball will be accelerated to 3-4 times its original speed by the pull of magnets and Newton's Third Law of Motion. How is this possible? As a ball approaches the powerful magnet, it is accelerated into that magnet, but on the other side of the magnet there are two balls in a row. The impact of that ball kicks off the farthest ball on the other side just like Newton's Cradle. The released ball however has the energy of the magnetic acceleration propelling it faster than the original ball. This is possible because it begins its journey already a ball away from the original magnet. When this motion happens four times in a row, there is enough velocity built up to shoot a ball across a room! The 40-165 comes with 4 neodymium magnets, 4 magnet holders which allow the user to move the magnets and reverse their polarity

towards one another. Ten 3/4" steel balls and a low friction track with an open end for launching the balls. This device can be used to teach magnetism, motion, Newton's Laws, and can be used as a fun ball launcher for other experiments and demonstrations.

665-0215 Copper Plating Set: This is a perfect kit for demonstrating the technique used for copper plating. Kit includes : Glass Battery Jar, Copper Anode, 2 Brass Connecting Posts, 2 Wire Connectors with Alligator Clips, 500g Copper Sulfate, MSDS, & Paper Clips.