

**Title: Heavy Elements**

**Introduction:** On Earth, we have 92 naturally occurring elements. The atoms of each element are unique. Every gold atom has 79 protons in its nucleus. Every carbon atom has 6 protons. The number of protons gives each element its distinctive properties. Stars are the birthplace of all the different types of elements we find on Earth. Through the process of nuclear fusion (the nucleus of two atoms getting smashed together) atoms change and become heavier during every star cycle they go through. In this activity you will play a game to model the formation of heavy elements in the star cycle.

**Materials:** per group: one game board, 4 set of element cards (per group of 4), game pieces (small items you have) one paper dice

**Directions:**

1. Line your game pieces up on the nebula, the gas cloud where it all begins. Deal out 10 hydrogens to each player to start.
2. Roll to see who goes first.
3. Follow the directions on the game board. When you “fuse” atoms, turn in the fusing atoms for the new product. For example:  $H + H = He$ , you will turn in two hydrogen cards and get one helium.
4. You will have a set amount of time to play. Your teacher will tell you how much.
5. The winner has the largest atom at the end of the time. If you cross the “start” you collect another 10 hydrogens.

**Analysis:**

1. What creates the energy given off by stars?
2. Why do they expand and contract in size?
3. Why don't more heavy elements form in smaller stars like brown and white dwarves?
4. What does the presence of atoms as large as Mercury (80 protons) or Lead (82 protons) suggest about the star cycle?

**Conclusion:**