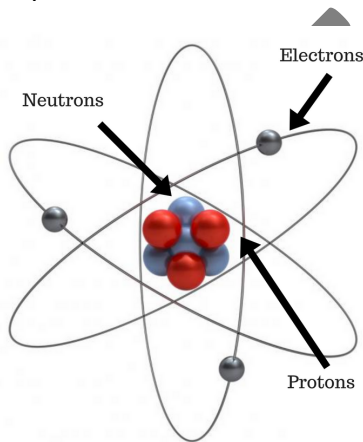


Stars: The Element Factories of the Universe

The universe began 13.7 billion years ago with the Big Bang, a massive expansion of space and time after which the entire universe was formed. This expansion of space and time created the three lightest elements: hydrogen, helium, and lithium. Hydrogen and helium are the two most common elements in the universe, making up over 98% of all matter.



It's important to take a step back and learn about elements before we continue. Atoms, which make up everything, are composed of protons, neutrons, and electrons. Protons are positively charged, neutrons carry no charge, and electrons have a negative charge. The element an atom is depends on the number of protons it contains. Hydrogen atoms contain one proton, helium



contains two, and lithium three. The number of protons is the element's "atomic number". Hydrogen is atomic number 1 on the periodic table, which lists all the known elements. Naturally occurring elements have up to 92 protons. Elements above atomic number 92 are created artificially in a lab and generally only exist for microseconds. Neutrons determine the isotope, or variant, of an element. Hydrogen-1, having no neutrons, one proton and a mass of one, is the base (most common) form of hydrogen. Hydrogen-2, called deuterium has one neutron and one proton, and hydrogen-3 has two neutrons and one proton. Both neutrons and protons are found in a central region called the nucleus and

add together to determine the atom's mass. Each neutron and proton are given a mass unit of one so if you have two neutrons and two protons, the atom's mass would be four. Electrons are the third subatomic particle and determine an atom's charge. They orbit around the nucleus and determine how an element behaves including how it interacts with other matter. Atoms that have the same numbers of protons as electrons are neutral, whereas atoms with more or fewer electrons are charged and will "stick" electrostatically to other charged surfaces.

The first known particles created following the Big Bang were protons. As the expanding universe began to cool, these protons bound to electrons, creating the lighter elements.

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Reading Comprehension Questions:

1. How old is the universe thought to be?
2. What
3. Create a
4. If
5. Which subatomic particle determines how an atom interacts with other atoms?
6. What temperature is needed to fuse silicon atoms into iron?
7. Why
8. Describe a
9. Describe the composition of humans.

Extension Questions

10. Describe what is meant by the following two quotes:

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