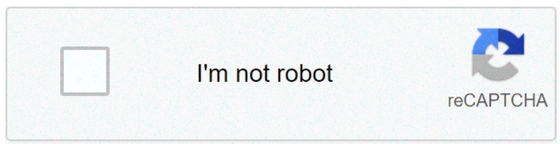

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How does a covalent bond hold two atoms together

By Mike, Facty StaffUpdated: Feb 21, 2019Have you ever wondered what makes the universe stick together? Here is a hint: it's not a industrial sized jar of cosmic super glue. No, the secret to keeping things together is a chemical bonding process known as valent bonding - where the electrons in the outer shells of atoms bond with each other to form molecules. Covalent bonds are some of the most powerful bonds in the universe. The world of chemical science was introduced to the principle of covalence in 1919. Future Nobel Prize-winning chemist Irving Langmuir coined the term to describe the molecular bonds formed by electrons in the outermost shell or valence of atoms. The term "covalent bond" first came into use in 1939. An American chemist, Irving Langmuir was born in Brooklyn, New York, on January 31, 1881, as the third of four sons to Charles Langmuir and Sadie Comings. Langmuir graduated as a metallurgical engineer from the School of Mines at Columbia University in 1903 and earned his M. A. and Ph.D. in chemistry in 1906. His work in surface chemistry would be rewarded with the Nobel Prize in Chemistry, in 1932. Put simply, without atoms the universe would not exist. This is because atoms are the basic building blocks of matter. What exactly is meant by matter? In the physical and chemical sciences, "matter" is defined as that which occupies space and possesses rest mass, especially as distinct from energy. So in a universal nutshell, "matter" is everything. Atoms are made up of three basic subatomic particles: protons, neutrons, and electrons. Protons are subatomic particles that maintain a positive electrical charge. Neutrons are subatomic particles that have neither a positive nor a negative electrical charge, i.e. neutral. Protons and neutrons combine to make up an atom's nucleus. Electrons, the final subatomic particle type, maintain a negative electrical charge and orbit the atomic nucleus like a cloud. So then what are molecules? Molecules are nothing more or less than atoms that are attracted to other atoms enough to form a bond. A valence bond. When atoms bond to each other to form molecules, the process can occur in a few different ways. The main way that atoms will bond is known as covalent. The term covalent refers to the fact that the bond involves the sharing of one or more pairs of electrons. There are also other ways that atoms can form valent bonds, including: Ionic bonds or bonds formed when one atom gives up one or more electrons to another atom.Metallic bonds, the type of chemical bonding that holds the atoms of metals together. Metallic bondings are the forced attraction between valence electrons and the metal atoms. As valent attractions between atoms occur they form molecular bonds or substances that are either compounds or elements. Although molecular compounds and molecular elements occur as a result of covalent bonding there is also an important difference between the two. The difference between a molecule of a compound and a molecule of an element is that in a molecule of an element, all the atoms are the same. For example, in a molecule of water (a compound), there is one oxygen atom and two hydrogen atoms. But in a molecule of oxygen (an element), both of the atoms are oxygen. There are many examples of compounds having covalent bonds, including the gases in our atmosphere, common fuels and most of the compounds in our body. Here are three examples.Methane molecule (CH4)The electronic configuration of carbon is 2,4. It needs 4 more electrons in its outer shell to be like the noble gas neon. To do this one carbon atom shares four electrons with the single electrons from four hydrogen atoms. The methane molecule has four C-H single bonds. Water molecule (H2O)One oxygen atom joins with two hydrogen atoms. The water molecule has two O-H single bonds. Carbon dioxide (CO2)One carbon atom joins with two oxygen atoms. The carbon dioxide molecule has two C=O bonds. When like atoms form covalent molecular bonds, the results are covalent elements. The nonmetal covalent elements found in the periodic table include: hydrogencarbonnitrogenphosphorusoxygensulfur and selenium. Additionally, all of the halogen elements, including: fluorinechlorinebromineiodine and astatine, are all covalent nonmetal elements. Unlike ionic bonds, covalent bonds often form between atoms where one of the atoms cannot easily attain a noble gas electron shell configuration through the loss or gain of one or two electrons. ... Therefore atoms that bond covalently shares their electrons to complete their valence shell. The greater the electronegativity difference, the more ionic the bond is. Bonds that are partly ionic are polar covalent bonds. Nonpolar covalent bonds, with equal sharing of the bond electrons, arise when the electronegativities of the two atoms are equal. In a polar covalent bond, the electrons shared by the atoms spend a greater amount of time, on the average, closer to the Oxygen nucleus than the Hydrogen nucleus. This is because of the geometry of the molecule and the great electronegativity difference between the Hydrogen atom and the Oxygen atom. A water molecule, abbreviated as H2O, is an example of a polar covalent bond. The electrons are unequally shared, with the oxygen atom spending more time with electrons than the hydrogen atoms. Since electrons spend more time with the oxygen atom, it carries a partial negative charge. Non-polar molecules are less likely to be able to dissolve in water. A non- polar substance is one without a dipole, meaning that it has an equitable distribution of electrons in its molecular structure. Examples include carbon dioxide, vegetable oils, and petroleum products. An example of a nonpolar covalent bond is the bond between two hydrogen atoms because they equally share the electrons. Another example of a nonpolar covalent bond is the bond between two chlorine atoms because they also equally share the electrons. Here are a few key takeaways to help you to remember what you've just learned about covalent bonds: Valence and covalent bonds link together atoms to make molecules.Atoms can bond in three main ways: covalent bonds, ionic bonds, and metallic bonds.The term covalent bond describes the bonds in compounds that result from the sharing of one or more pairs of electrons.Ionic bonds, where electrons transfer between atoms, occur when atoms with just a few electrons in their outer shell give the electrons to atoms with just a few missing from their outer shell.In metallic bonds, huge numbers of atoms lose their electrons. They are held together in a lattice by the attraction between ‘free’ electrons and positive nuclei.An atom that loses an electron becomes positively charged; an atom that gains an electron becomes negatively charged so the two atoms are drawn together by the electrical attraction of opposites.Because they are negatively charged, the shared electrons are drawn equally to the positive nucleus of both atoms involved. The atoms are held together by the attraction between each nucleus and the shared electrons. 1 Why Is Friday the 13th Considered Unlucky? 2 What Are Some Examples of Geographical Features? 3 What Does "MD PA" Stand For? 4 What Weighs 50 Pounds? 5 6 Science Podcasts You Should Download Today 1 What Are Some Things That Weigh an Ounce? 2 Need a Job During the Pandemic? 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An atom is the defining structure of an element, which cannot be broken by any chemical means. A typical atom consists of a nucleus of positively-charged protons and electrically neutral neutrons with negatively-charged electrons orbiting this nucleus. However, an atom can consist of a single proton (i.e., the protium isotope of hydrogen) as a nucleus. The number of protons defines the identity of an atom or its element. The size of an atom depends on how many protons and neutrons it has, as well as whether or not it has electrons. A typical atom size is around 100 picometers or about one ten-billionth of a meter. Most of the volume is empty space, with regions in which electrons may be found. Small atoms tend to be spherically symmetrical, but this is not always true of larger atoms. Contrary to most diagrams of atoms, electrons do not always orbit the nucleus in circles. Atoms can range in mass from 1.67 x 10-27 kg (for hydrogen) to 4.52 x 10-25 kg for superheavy radioactive nuclei. The mass is almost entirely due to protons and neutrons, as electrons contribute negligible mass to an atom. An atom that has an equal number of protons and electrons has no net electrical charge. An imbalance in the numbers of protons and electrons forms an atomic ion. So, atoms may be neutral, positive, or negative. The concept that matter might be made of small units has been around since ancient Greece and India. In fact, the word "atom" was coined in Ancient Greece. However, the existence of atoms was not proven until John Dalton's experiments in the early 1800s. In the 20th century, it became possible to "see" individual atoms with the use of scanning tunneling microscopy. While it's believed electrons formed in the very early stages of the Big Bang formation of the universe, atomic nuclei did not form until perhaps three minutes after the explosion. At present, the most common type of atom in the universe is hydrogen, although over time, increasing amounts of helium and oxygen will exist, likely overtaking hydrogen in abundance. Most of the matter encountered in the universe is made from atoms with positive protons, neutral neutrons, and negative electrons. However, there exists an antimatter particle for electrons and protons with opposite electrical charges. Positrons are positive electrons, while antiprotons are negative protons. Theoretically, antimatter atoms might exist or be made. The antimatter equivalent to a hydrogen atom (antihydrogen) was produced at CERN, the European Organization for Nuclear Research, in Geneva in 1996. If a regular atom and an anti-atom were to encounter each other, they would annihilate one another, while releasing considerable energy. Exotic atoms are also possible, in which a proton, neutron, or electron is replaced by another particle. For example, an electron could be replaced with a muon to form a muonic atom. These types of atoms have not been observed in nature, yet may be produced in a laboratory. hydrogen carbon-14 zinc cesium tritium Cl- (a substance can be an atom and an isotope or ion at the same time) Examples of substances that are not atoms include water (H2O), table salt (NaCl), and ozone (O3). Basically, any material with a composition that includes more than one element symbol or that has a subscript following an element symbol is a molecule or compound rather than an atom.

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