

First Test Homework notes:

Single, Double, Triple Bonds:

In a [single bond](#), two atoms share a pair of electrons. Sometimes, though, two atoms share more than one pair of electrons. In a [double bond](#), two atoms share two pairs. In a [triple bond](#), two atoms share three pairs of electrons.

1. What is ethane?

Ethane is found in natural gas ("cooking gas"). It's colorless, odorless, energy-rich, and highly flammable.

2. What is ethylene?

Plants make ethylene and use it as a hormone. It causes many fruits to ripen, and it causes plants to drop their leaves. Ethylene is a colorless, odorless gas that's rich in energy.

3. What is acetylene?

Acetylene is a highly flammable gas. Auto shops use acetylene torches to cut metal. In the dark tunnels of mines, old-time miners used small helmet-mounted acetylene torches for light.

Molecular Shape:

Each [atom](#) tends to make [bonds](#) at definite angles, as shown in the [molecule](#) above. These angles determine the shapes that a molecule can have. But molecules can vary in shape because groups of atoms can rotate around the axis of a bond.

1. Why study the shapes of molecules?

Life depends on the shapes of molecules. For example, muscle cells create motion by altering molecular shapes, and cells use hereditary information by matching molecular shapes. The receptor protein shown here depends on a matching of shapes to recognize a signal molecule, and its shape alters to cause a change inside the cell.

2. Why do bonds orient as they do?

Bond angles are set by repulsion between electrons. When fully bonded, each of these atoms has 4 pairs of electrons in its valence shell. Each pair pushes other pairs as far away as possible. This fixes the angle between any two orbitals at about 110° , making a tetrahedron. Depending on the atom, some orbitals take part in bonds but others do not.

Shape with Multiple Bonds:

[Single bonds](#) give molecules more freedom to change their shapes than [double bonds](#) or [triple bonds](#). Atoms can rotate around single bonds and project their remaining bonds in three dimensions. By contrast, double bonds limit atoms to a plane, and triple bonds further limit atoms to a line

Polar Covalent Bonds:

Most [covalent bonds](#) are [polar](#)—one atom is slightly positive and the other is slightly negative. The charges, symbolized as δ^+ and δ^- (delta plus and delta minus), are called [partial charges](#). [Polar covalent bonds](#) happen when a bond forms between two different atoms. One atom attracts electrons more than the other, so the electrons spend more time near that atom.

1. Why should we focus on polar covalent bonds?

If all the polar covalent bonds in the body were suddenly made nonpolar, the body would slump into a pool of slime. Polar covalent bonds cause molecules to stick to one another in orderly ways, making structures such as this cellular membrane. Learn this concept well! You'll see it often if you study life sciences.

2. Which atom attracts electrons more strongly: O or H?

In a polar covalent bond between oxygen and hydrogen, where do the electrons spend most of their time? Click the Pause button and observe whether each electron is closer to the H nucleus or the O nucleus.

Polar Attractions:

Neutral molecules attract one another if they have positive and negative regions. This happens when molecules have [polar covalent bonds](#), giving some atoms [partial charges](#). These molecules are polar, and the forces that pull them together are [polar attractions](#). They resemble [ionic bonds](#) but are weaker because the charges are smaller.

1. Why are hydrogen bonds stronger than other polar attractions?

Other polar attractions involve atoms with weaker partial charges. C and H are similar in electronegativity; a bond between them gives H only a small partial charge. O and H (or N and H) differ greatly in electronegativity, so a bond between them leaves H⁺ more exposed and creates stronger partial charges. Roll your mouse over each atom and attraction for more information.

Polarity of water:

Because of this unequal sharing of electrons, the oxygen atom in a water molecule actually has a slight negative charge and each hydrogen atom has a slight positive charge, even though the water molecule as a whole is neutral. Because of the unequal sharing of electrons and the resulting positive and negative poles, the bonds between oxygen and hydrogen are called [polar covalent bonds](#), and a water molecule is said to be polar.

The [polarity](#) of water [molecules](#) causes them to be attracted to each other. Since the positively charged atom involved in this special type of attraction is always a hydrogen atom, this kind of bond between molecules is called a [hydrogen bond](#). Each water molecule can hydrogen bond to four other water molecules. A hydrogen bond is weak and lasts only a tiny fraction of a second, but it takes a lot of energy to overcome the combined attraction of many hydrogen bonds. This explains water's great capacity to store heat, its high boiling point, [surface tension](#), and several other unusual properties.

Organizing effects of water:

Life relies on the properties of [water](#). Water organizes other kinds of [molecules](#) into structures that make [upcells](#). Water organizes molecules on the basis of their polarity. In this respect, molecules fall into three categories: [nonpolar](#), [polar](#), and [amphipathic](#). Water itself is highly polar.