

Misuses of water



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Arnooon April 30 2009 Published by admin at 3: 58 am under Example Essays Introduction Water is an essential ingredient for the existence of life as we know it. Biochemical processes occur in aqueous environments, many of which use water. Water also plays a significant role in the process of photosynthesis ($6\text{CO}_2 + 6\text{H}_2\text{O} + 672\text{kcal} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$).

Photosynthesis is the most basic and significant chemical reaction on earth, providing the primary nutrients, directly or indirectly, for all living organisms and is the primary source of atmospheric oxygen.

Without water and its nique and unusual properties, life as we know it on earth would not exist. Water is the only substance naturally present on the earth that exists in three distinct states - solid, liquid, and gas. Many of the unique properties in the take for granted include the three physical phases, transparency, universal solvents, density behavior and temperature, high specific heat, high heat of vaporization, viscosity, surface tension and low compressibility.

To understand why these properties exist in water and why they are essential to life on earth it is important to look at the shape and bonding atterns of the molecule because the uniqueness of water is a direct result of its shape and bonding patterns. The shape of the water molecule In the water molecule the oxygen atom is the central atom. It has four pairs of valence electrons surrounding it. Two of these pairs are shared which form the shared pairs form covalent bonds with the hydrogen atoms.

The remaining two pairs are unshared and have a greater repulsive effect than the shared pairs. The combined repulsive effect of the two unshared

electron pairs produces an H-O-H bond angle that is smaller than the H-C-H bond angle (109.47 degrees) in methane or the H-N-H bond angle (107 degrees) in ammonia. Actual measurement of the bond angle in water is 104.5. If the two hydrogen nuclei were as far apart as possible the angle would be 109.47. The unique bond angle in water is only 104.5 degrees.

The resulting shape of the molecule is referred to as "bent" or "angular". Traditionally the VSEPR model theory is used to predict molecular shape. See appendix A. Chemical bonding To understand the unusual properties of water as well as what causes them we need to have a basic understanding of the chemical bonding and the structure of the water molecule. The shape of the water molecule is determined in part by the chemical bonding that occurs. For a brief review of chemical bonding see appendix B.

The water molecule consists of the elements hydrogen and oxygen. The chemical bonds in the water molecule are covalent bonds since the hydrogen atoms combine with the oxygen atoms in shared electron pairs. The oxygen atoms exerts a relatively strong pull on the shared electron pairs which causes the hydrogen atom to become electropositive regions and the oxygen atoms to become an electronegative region. The water molecule is considered a polar molecule because the positive and negative