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|  | The formation and function of molecules depend on \_\_\_\_\_\_\_\_\_bonding between atoms  Atoms can interact with each other by sharing or transferring \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_. Under what conditions does this occur?  Three Types of Chemical Bonds |
| When does a ***covalent bond*** form?  Examples:  H2  Two or more atoms held together by covalent bonds constitute a **\_\_\_\_\_\_\_\_\_\_\_\_\_** .   |  |  |  |  | | --- | --- | --- | --- | | Name | Molecular Formula | Structural Formula | Lewis Dot Structure | |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |  | |
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|  | Every atom has a characteristic total number of covalent bonds that it can form, equal to:  This bonding capacity is called the atom’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  The valence of:  Hydrogen is:  Oxygen is:  Nitrogen is:  Carbon is:  Phosphorus is a little weird: |
| Covalent bonds can form between atoms of the same element (forming pure elements) or atoms of *different* elements (forming \_\_\_\_\_\_\_\_\_\_\_).  How are the covalent bonds between water and methane different?  The attraction of the shared electrons of a covalent bond is called its:  Strongly electronegative atoms strongly \_\_\_\_\_\_\_\_ the shared electrons toward \_\_\_\_\_\_\_\_.  When two atoms that differ in electronegativity bond, they \_\_\_\_\_\_\_\_\_\_\_\_\_ share the electron pair equally, and they form a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ covalent bond**.  Compounds with a polar covalent bond have regions of partial \_\_\_\_\_\_\_\_\_ charge (–) near the strongly electronegative atom and regions of partial \_\_\_\_\_\_\_\_\_ charge (+)near the weakly electronegative atom.  Electrons in a covalent bond are shared equally in a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ covalent bond**. |
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|  | An **\_\_\_\_\_\_\_\_\_\_\_ bond** can form if two atoms are so unequal in their attraction for valence electrons that one atom strips an electron completely from the other.  After the transfer, both atoms are no longer neutral but have charges and are called **\_\_\_\_\_\_\_**.  Atoms with positive charges are **\_\_\_\_\_\_\_\_**.  Atoms with negative charges are **\_\_\_\_\_\_\_\_**.  The strength of ionic bonds depends on environmental conditions, such as \_\_\_\_\_\_\_\_\_\_\_. |
| Weak chemical bonds play important roles in the chemistry of life.  Within a cell, weak, brief bonds between molecules are important to a variety of processes. Why would the reversibility of weak bonding be an advantage?  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is when a hydrogen atom that is already covalently bonded to one electronegative atom is attracted to another electronegative atom.    In cells, the electronegative partners are typically \_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_.  For example, ammonia molecules and water molecules interact with weak hydrogen bonds.  Even molecules with nonpolar covalent bonds can have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ regions of partial negative and positive charge.  When Molecules or atoms in close proximity can be attracted by fleeting charge differences, it’s called: |
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|  | A molecule’s biological function is related to its shape.  The shape of a molecule is determined by the positions of the electron orbitals that are shared by the atoms involved in the bond.  In a water molecule, \_\_\_ of oxygen’s \_\_\_\_\_\_ hybrid orbitals are shared with hydrogen atoms.  The water molecule is shaped like a \_\_\_\_\_\_\_\_\_\_\_\_, with its two covalent bonds spread apart  at an angle of \_\_\_\_\_\_\_\_\_\_\_\_.  In a methane molecule (CH4), the carbon atom shares all \_\_\_\_\_ of its hybrid orbitals with H.  The methane molecule is shaped like a \_\_\_\_\_\_\_\_\_\_\_\_, with its four covalent bonds spread  Apart at an angle of \_\_\_\_\_\_\_\_\_\_\_\_.  Molecules with similar shapes can have similar biological effects.  Examples: |
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|  | Chemical reactions make and break chemical bonds  In **chemical reactions**, chemical bonds are \_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_, leading to new arrangements of atoms.  Hydrogen + Oxygen 🡪 Water  All chemical reactions are \_\_\_\_\_\_\_\_\_\_\_\_, with the products in the forward reaction becoming the reactants in the reverse reaction.  Photosynthesis is an important chemical reaction. |
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1) How many protons, electrons, and neutrons does Ca2+ have, respectively?

Protons \_\_\_\_\_\_\_ Neutrons \_\_\_\_\_\_\_ Electrons\_\_\_\_\_\_\_

2) How many valence electrons does Nitrogen have? Draw the Lewis Dot structure for one atom.

3) Which of the following molecule(s) is(are) incapable of forming intramolecular hydrogen bonds with itself?

a.  b.  c.  d. 

Explain the reason behind your choice.

4) List the four types of chemical bonds we discussed in class in order of strength from weakest to strongest, in a biological system.

1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_