**Covalent Bonds Notes Outline**

**A \_\_\_\_\_\_\_\_\_\_\_\_\_\_ bond is formed between \_\_\_\_\_\_\_\_\_\_\_\_\_ atoms. The nonmetals are connected by a \_\_\_\_\_\_\_\_\_\_\_\_\_ pair of valence electrons.** Remember, nonmetals want to \_\_\_\_\_\_\_\_\_\_valence electrons to reach a stable arrangement. If there are no metal atoms around to give them electrons, nonmetal atoms \_\_\_\_\_\_\_\_\_\_ their valence electrons with other \_\_\_\_\_\_\_\_\_\_\_ atoms. Since the two atoms are using the same electrons they are stuck to each other in a neutral particle called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_. **A \_\_\_\_\_\_\_\_\_\_\_\_\_ is a neutral particle of two or more atoms \_\_\_\_\_\_\_\_\_\_\_\_\_\_ to each other.** Molecules may contain atoms of the same element such as N2, O2, and Cl2 or they may contain atoms of different elements like H2O, NH3, or C6H12O6. Therefore, covalent bonding is found in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ elements and in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ compounds.

Covalent bonds are **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ forces**; that is, **they are \_\_\_\_\_\_\_\_\_\_\_\_\_\_the molecule and hold the atoms together to make the molecule**. Covalent bonds are \_\_\_\_\_\_\_\_\_ bonds and it is difficult and requires a lot of energy to \_\_\_\_\_\_\_\_\_\_\_ a molecule apart into its atoms. However, since molecules are neutral one molecule does not have a strong electrical attraction for another molecule. **The attractions between molecules are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ forces** and these are \_\_\_\_\_\_\_\_\_\_ forces.

Covalent substances have low \_\_\_\_\_\_\_\_\_\_\_\_\_ points and \_\_\_\_\_\_\_\_\_\_\_\_\_ points compared to ionic compounds or metals. At room temperature, covalent substances are \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_, or low melting point \_\_\_\_\_\_\_\_\_\_\_. They do NOT conduct electricity as \_\_\_\_\_\_\_\_\_ or when \_\_\_\_\_\_\_\_\_\_\_ and usually do NOT conduct when \_\_\_\_\_\_\_\_\_\_\_\_\_ in water.

1. Define the following terms:

a) covalent bond –

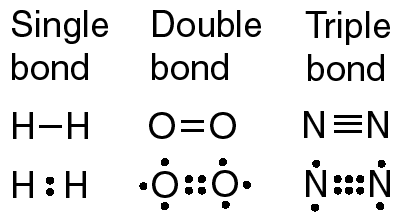
b) molecule –

c) intramolecular force–

d) intermolecular force–

1. List several properties of covalent compounds.

There are many types of covalent bonds. A \_\_\_\_\_\_\_\_\_\_\_\_covalent bond is when two atoms share one \_\_\_\_\_\_\_\_\_\_ of valence electrons (see figure). A **\_\_\_\_\_\_\_\_\_\_\_\_\_** covalent bond is when two atoms share \_\_\_\_\_\_\_\_\_\_ pairs of valence electrons. A **\_\_\_\_\_\_\_\_\_\_** covalent bond is when two atoms share \_\_\_\_\_\_\_\_ pairs of valence electrons.



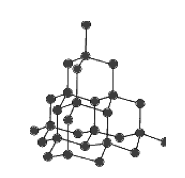
1. Define the following terms:

a) single covalent –

b) double covalent –

c) triple covalent –

There is one last type of covalent bonding—the bonding in **\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_(macromolecules)**. In this type of bonding, atoms \_\_\_\_\_\_\_\_\_ valence electrons but the atoms are arranged in a regular \_\_\_\_\_\_\_\_\_\_\_ pattern in which each atom is covalently bonded to its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in all directions. Therefore, you do not have a collection of small molecules that are easy to separate from each other; the whole system is one \_\_\_\_\_\_\_\_\_\_ molecule or a macromolecule held together by this network of strong \_\_\_\_\_\_\_\_\_\_\_\_bonds. Network solids are extremely \_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_ that do NOT conduct \_\_\_\_\_\_\_\_\_\_\_\_\_. Diamonds (a form of pure carbon (see figure)), carborundum (silicon carbide) and quartz (silicon dioxide) are examples of macromolecules.



1. What is a network solid?

1. What type of bonding exists in network solids?

1. What are some properties of network solids?

1. What are some examples of network solids?

**Covalent Bonds Notes Outline- KEY**

**A covalent bond is formed between nonmetal atoms. The nonmetals are connected by a shared pair of valence electrons.** Remember, nonmetals want to gain valence electrons to reach a stable arrangement. If there are no metal atoms around to give them electrons, nonmetal atoms share their valence electrons with other nonmetal atoms. Since the two atoms are using the same electrons they are stuck to each other in a neutral particle called a molecule. **A molecule is a neutral particle of two or more atoms bonded to each other.** Molecules may contain atoms of the same element such as N2, O2, and Cl2 or they may contain atoms of different elements like H2O, NH3, or C6H12O6. Therefore, covalent bonding is found in nonmetallic elements and in nonmetallic compounds.

Covalent bonds are **intramolecular forces**; that is, **they are inside the molecule and hold the atoms together to make the molecule**. Covalent bonds are strong bonds and it is difficult and requires a lot of energy to break a molecule apart into its atoms. However, since molecules are neutral one molecule does not have a strong electrical attraction for another molecule. **The attractions between molecules are called intermolecular forces** and these are weak forces.

Covalent substances have low melting points and boiling points compared to ionic compounds or metals. At room temperature, covalent substances are gases, liquids or low melting point solids. They do not conduct electricity as solids or when molten and usually do not conduct when dissolved in water.

1. Define the following terms:

a) covalent bond – **a bond formed between nonmetals and connected by pairs of shared electrons**

b) molecule – **a neutral particle of two or more atoms bonded to each other**

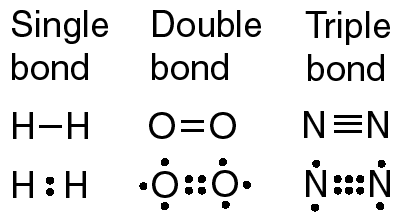
c) intramolecular force– **forces that** **are inside the molecule and hold the atoms together to make the molecule (strong forces)**

d) intermolecular force– **forces that are the attraction between molecules (weak forces)**

2.List several properties of covalent compounds.

* + **low melting points & boiling points**
  + **at room temperature they are either gases, liquids, or low MP solids**
  + **do not conduct electricity as solids or when molten**
  + **usually do not conduct when dissolved either**

There are many types of covalent bonds. A **single** covalent bond is when two atoms share one pair of valence electrons (see figure). A **double** covalent bond is when two atoms share two pairs of valence electrons. A **triple** covalent bond is when two atoms share three pairs of valence electrons.



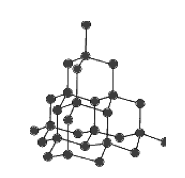
1. Define the following terms:

a) single covalent **– when two atoms share one pair of valence electrons**

b) double covalent – **when two atoms share two pairs of valence electrons.**

c) triple covalent – **when two atoms share three pairs of valence electrons.**

There is one last type of covalent bonding—the bonding in **network solids (macromolecules)**. In this type of bonding, atoms share valence electrons but the atoms are arranged in a regular crystalline pattern in which each atom is covalently bonded to its neighbors in all directions. Therefore, you do not have a collection of small molecules that are easy to separate from each other; the whole system is one giant molecule or a macromolecule held together by this network of strong covalent bonds. Network solids are extremely hard, brittle, solids that do not conduct electricity. Diamonds (a form of pure carbon (see figure)), carborundum (silicon carbide) and quartz (silicon dioxide) are examples of macromolecules.



1. What is a network solid?

**one giant molecule or a macromolecule held together by this network of strong covalent bonds**

1. What type of bonding exists in network solids?

**Covalent bonds – intramolecular forces**

1. What are some properties of network solids?
   * **extremely hard**
   * **brittle**
   * **solids**
   * **do not conduct electricity.**

1. What are some examples of network solids?
   * **diamonds**
   * **carborundum**
   * **quartz**