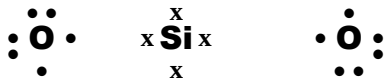
Chemistry 20

Lesson 10 – Double and Triple Bonds

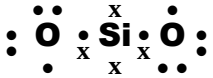
I. Formation of multiple bonds

In Lesson 9 we learned how atoms share electrons to form a shared or bonded electron pair. The bond is called a **single** bond. Atoms which have two or more bonding electrons may share one, two or three of these bonding electrons with the same atom. If two electron pairs are shared between two atoms, the bond is called a **double** bond. If three electron pairs are shared between two atoms, the bond is called a **triple** bond.

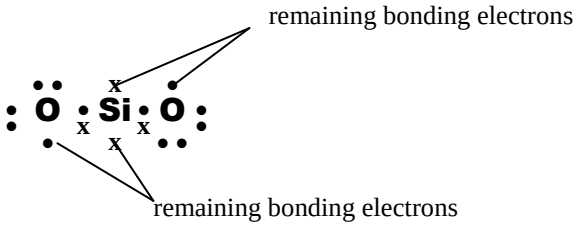
For example, in silicon dioxide (the mineral quartz) we have one silicon atom (4 bonding sites) and two oxygen atoms (2 bonding sites each).



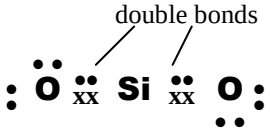
When the oxygen atoms form a bond with silicon we have the following initial result:



Note that bonding electrons remain on the silicon and oxygen atoms



When extra bonding electrons exist, they form another bond. In other words, the remaining bonding electrons for silicon form bonds with the remaining bonding electrons around the oxygens. The result is a double bond between the atoms.



If there were more bonding electrons available, a triple bond would form. In the resulting Lewis diagrams all electrons must be paired and each atom except hydrogen must be surrounded by an octet of electrons.

In structural diagrams single, double and triple bonds are represented by the following:

single —

double ═

triple ≡

O═Si═O

II. Assignment – part A

Try the following example molecules and, if necessary, ask your kind and benevolent teacher to show you how they are done.

Molecular Substance	Molecular Formula	Lewis Diagram of Molecule	Structural Formula
methanal (formaldehyde)	HCHO		
ethyne (acetylene)	C_2H_2		
nitrogen	N_2		
hydrogen cyanide	HCN		

III. Assignment – part B

Draw appropriate Lewis diagrams and structural diagrams for the indicated molecules.

Molecular Formula	Lewis Diagram of Molecule	Structural Formula
O_2		
P_4		
NP		
C_2Cl_4		
C_3H_6		
C_2Cl_2		
C_2BrI		
C_3H_5OH		
CH_3COOH		
CO_2		
CO_3^{2-}		