Valence Bond Theory - Study Guide

*sections 8.1 and 8.2 in OpenStax*

**Sigma and Pi Bonds (section 8.1)**

When orbitals overlap end to end a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ bond is formed.

All single bonds are \_\_\_\_\_\_\_\_\_\_\_\_\_\_ bonds.

Sketch an example of a **sigma bond** between each of the pairs of atomic orbitals listed below.

|  |  |  |
| --- | --- | --- |
| s & s orbitals | s & p orbitals | p & p orbitals |
|  |  |  |

When \_\_\_\_\_\_ orbitals overlap side to side a \_\_\_\_\_\_\_\_\_\_ bond is formed.

A double bond consists of \_\_\_\_\_ sigma bond and \_\_\_\_\_ pi bond(s).

A triple bond consists of \_\_\_\_\_\_ sigma bond and \_\_\_\_\_ pi bond(s).

Sketch an example of a **pi bond** between each of the pairs of atomic orbitals listed below.

|  |  |
| --- | --- |
| p & p orbitals | p & d orbitals |
|  |  |

**Hybrid Atomic Orbitals (section 8.2)**

When we mix an “s” obital and a “p” orbital we get two \_\_\_\_\_\_\_ hybrid orbitals.

When we mix an “s” obital and two “p” orbitals we get three \_\_\_\_\_\_\_ hybrid orbitals.

When we mix an “s” obital and three “p” orbitals we get four \_\_\_\_\_\_\_ hybrid orbitals.

Use Figure 8.21 to fill in the following chart:

|  |  |  |  |
| --- | --- | --- | --- |
| example | Regions of electron density | Arrangement  (electron domain geometry) | hybridization |
| CO2 | 2 |  |  |
| BCl3 | 3 |  |  |
| NH4+ | 4 |  |  |
| H2O | 4 |  |  |
| SF4 | 5 |  |  |
| XeF4 | 6 |  |  |

**End of Chapter 8 Practice Problems**

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For detailed solutions to these problems, go to the [OpenStax website](https://openstaxcollege.org/textbooks/chemistry/resources) and download the “Student Answer and Solution Guide.”