

Bond Order

The bond order of a covalent bond is the total number of covalently bonded electron pairs between two atoms in a molecule. It can be found by drawing the **Lewis structure** of the molecule and counting the total number of electron pairs between the atoms in question.

- Single bonds have a bond order of 1.
- Double bonds have a bond order of 2.
- Triple bonds have a bond order of 3.

Note: If the bond order of a covalent bond is 0, the two atoms in question are not covalently bonded (no bond exists).

Examples

- The bond order of the carbon-hydrogen bond in C_2H_2 (ethyne/acetylene) is 1 and that of the carbon-carbon bond is 3.
- The bond order of the oxygen-oxygen bond in an O_2 molecule is 2.



In a carbon monoxide molecule the

- In a carbon monoxide molecule, the carbon-oxygen bond has a bond order of 3, as illustrated in the Lewis structure provided below.

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- Since the nitrate ion is stabilized by resonance, the bond order of the nitrogen-oxygen bond is $4/3$ or 1.33 . It is calculated by dividing the total number of nitrogen-oxygen bonds (4) by the total number of covalently bonded nitrogen-oxygen groups (3).

Bond Order as per the Molecular Orbital Theory

As per the **molecular orbital theory**, the bond order of a covalent bond is equal to half of the difference between the number of bonding and anti bonding electrons, as represented by the following formula:

Bond Order = $(\frac{1}{2}) \times (\text{total no. of bonding electrons} - \text{total no. of anti bonding electrons})$

