

## 14: Chemical Bonding Theories

### Key Chemistry Terms

- Ionic Bond:** Bond formed from electrostatic attraction between ions (charged atoms)—formed from metals with nonmetals.
- Covalent Bond:** A bond formed between two nonmetals that involves shared electrons.
- Polar covalent bond:** Bond formed between two nonmetals—uneven sharing of electrons.
- Metallic bond:** Formed between metal atoms—electrons are pooled between the network of atoms.
- Polar bond:** Bond between two atoms with a great difference in electronegativities—uneven sharing of electrons resulting in a slightly positive region and a slightly negative region of the bond.
- Electronegativity:** An atom's "pull" on electrons shared with another atom.
- Polar molecules:** Molecule where the polar bonds do not cancel each other out in 3D orientation.
- Isomers:** Molecules with the same chemical formula, but different bonding structure.
- Resonance:** Two compounds with multiple bonds in different locations.
- Valence Bond Theory:** Overlap of atomic orbitals form bond.
- Sigma ( $\sigma$ ) bonds:** First bond between two atoms formed from head on overlap of orbitals.
- Pi ( $\pi$ ) bonds:** 2<sup>nd</sup> or 3<sup>rd</sup> bond between two atoms formed from overlap of parallel p orbitals.
- Hybridization:** Atomic orbitals hybridize into orbitals of the same energy for all sigma bonds of the atom.

### Characteristics of bond types

Bond type	Happens between	Electrons are
Ionic	Metal & non-metal	Transferred
Covalent	Non-metals	Shared
Polar Covalent	Non-metals	Shared unevenly
Metallic	Metals	pooled

#### Common characteristics:

- Ionic:** High melting points, most dissolve in water, conduct electricity when dissolved in water, brittle.
- Covalent:** Low melting points, most do not dissolve in water, do not conduct electricity when dissolved in water.
- Polar covalent:** Medium melting points, some dissolve in water, do not conduct electricity when dissolved in water.
- Metallic:** Soft, conduct heat and electricity, do not dissolve in water.

### Bond Polarity

When non-metals bond covalently with a large difference in electronegativity.

- Absolute value of differences:
  - 0 - 0.4 = covalent
  - 0.5 - 1.4 = polar covalent
  - 1.5 - 4 = ionic

Symbolized with an arrow pointing towards the more electronegative element and a crossed tail by the less electronegative element.

Example:

C - N Electronegativity difference of 0.5 = polar bond



### Isomers and Resonance

Isomer examples:



Resonance examples:



### Sigma and Pi bonds

How many sigma and pi bonds are in the following?



6 sigma bonds & 3 pi bonds

### Hybridization

# of sigma bonds	Hybridization	Formed from
2	sp	1 s and 1 p
3	sp <sup>2</sup>	1 s and 2 p
4	sp <sup>3</sup>	1 s and 3 p

**How to Use This Cheat Sheet:** These are the keys related this topic. Try to read through it carefully twice then rewrite it out on a blank sheet of paper. Review it again before the exams.

# Molecular Structure And Bonding Cheat Sheet

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## **Molecular Structure And Bonding Cheat Sheet:**

**Organic Chemistry I For Dummies** Arthur Winter, 2016-05-13 Organic Chemistry I For Dummies 2nd Edition 9781119293378 was previously published as Organic Chemistry I For Dummies 2nd Edition 9781118828076 While this version features a new Dummies cover and design the content is the same as the prior release and should not be considered a new or updated product The easy way to take the confusion out of organic chemistry Organic chemistry has a long standing reputation as a difficult course Organic Chemistry I For Dummies takes a simple approach to the topic allowing you to grasp concepts at your own pace This fun easy to understand guide explains the basic principles of organic chemistry in simple terms providing insight into the language of organic chemists the major classes of compounds and top trouble spots You ll also get the nuts and bolts of tackling organic chemistry problems from knowing where to start to spotting sneaky tricks that professors like to incorporate Refreshed example equations New explanations and practical examples that reflect today s teaching methods Fully worked out organic chemistry problems Baffled by benzines Confused by carboxylic acids Here s the help you need in plain English Roald Hoffmann on the Philosophy, Art, and Science of Chemistry Roald Hoffmann, 2012-01-23 In this book Kovac and Weisberg bring together twenty eight of Hoffmann s most philosophically significant and interesting pieces many of which are not easily found in print **GED Test** Stuart Donnelly, 2017-08-07 1 001 practice opportunities for passing the GED test Ready to take the GED test Get a head start on a high score with 1 001 GED Test Practice Questions For Dummies Inside you ll find 1 001 practice questions on all four sections of the GED test Mathematical Reasoning Science Social Studies and Reading Language Arts All of the question types and formats you ll encounter on the exam are here so you can study practice and increase your chances of scoring higher on the big day Earning a passing score on the GED test will boost your self esteem enable you to continue your education and qualify you for better paying jobs it s a win win If you re preparing for this important exam there are 1 001 opportunities in this guide to roll up your sleeves put your nose to the grindstone and get the confidence to perform your very best Includes free one year access to practice questions online Offers 1 001 GED test practice questions from easy to hard Lets you track your progress see where you need more help and create customized question sets Provides detailed step by step answers and explanations for every question Study with the book or study online or do a little of both and get ready to pass the GED test with flying colors MCAT General Chemistry Review 2023-2024 Kaplan Test Prep, 2022-08-02 Kaplan s MCAT General Chemistry Review 2023 2024 offers an expert study plan detailed subject review and hundreds of online and in book practice questions all authored by the experts behind the MCAT prep course that has helped more people get into medical school than all other major courses combined Prepping for the MCAT is a true challenge Kaplan can be your partner along the way offering guidance on where to focus your efforts and how to organize your review This book has been updated to match the AAMC s guidelines precisely no more worrying about whether your MCAT review is comprehensive The Most Practice More than 350

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**U.S. Government Research Reports**, 1962 *Chemical Bonding and the Geometry of Molecules* George E. Ryschkewitsch, 1963 **Bibliography of Scientific and Industrial Reports**, 1963 **Catalog of Copyright Entries. Third Series** Library of Congress. Copyright Office, 1967 Includes Part 1 Number 2 Books and Pamphlets Including Serials and Contributions to Periodicals July December *Books and Pamphlets, Including Serials and Contributions to Periodicals* Library of Congress. Copyright Office, 1964-07 *Technical Abstract Bulletin* Defense Documentation Center (U.S.), 1963 *Catalogue of Title-entries of Books and Other Articles Entered in the Office of the Librarian of Congress, at Washington, Under the Copyright Law ... Wherein the Copyright Has Been Completed by the Deposit of Two Copies in the Office* Library of Congress. Copyright Office, 1964-07 **Chemical Bonds** Harry B. Gray, 1994-12-05 This profusely illustrated book by a world renowned chemist and award winning chemistry teacher provides science students with an introduction to atomic and molecular structure and bonding This is a reprint of a book first published by Benjamin Cummings 1973 *Catalog of Copyright Entries. Third Series* Library of Congress. Copyright Office, 1964 **Molecular Structure and Bonding** Benjamin M. Gimarc, 1979 **Structure and Bonding** Jack Barrett, 2001 This book explains in non mathematical terms where possible the factors that govern covalent bond formation the lengths and strengths of bonds and molecular shapes

Lectures On Chemical Bonding And Quantum Chemistry Sambhu N Datta, 2019-02-25 The concept of a chemical bond evolved from a variety of experimental observations It became useful to understand at times even predict the molecular structure reactivity and mechanism of chemical reactions Every aspect of the concept of bonding received a quantitative interpretation from the advent of quantum mechanics and its application to chemistry In *Lectures on Chemical Bonding and Quantum Chemistry* the reader will find a comprehensive discourse on the basic interpretation of the chemical bond as well as current understanding in terms of a dancing molecule that not only travels rotates and pulsates around an equilibrium molecular structure but also interacts and collides with other molecules thereby transferring linear and angular momentum

characteristics and adjusting total energies One will also find a thorough survey of quantum mechanical methodologies for calculation of molecular characteristics in specific states and their changes under spectroscopic transitions tunneling electron and proton transfer phenomena and so on Guides to more advanced levels of theory are also provided

**The Nature of the Chemical Bond and the Structure of Molecules and Crystals** Linus Pauling, 1963      **Current Index to Journals in Education** ,1973      The Shape and Structure of Molecules Charles Alfred Coulson, 1973

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In a digital era where connections and knowledge reign supreme, the enchanting power of language has become much more apparent than ever. Its ability to stir emotions, provoke thought, and instigate transformation is actually remarkable. This extraordinary book, aptly titled "**Molecular Structure And Bonding Cheat Sheet**," published by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound effect on our existence. Throughout this critique, we shall delve into the book's central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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