Basic Organic Chemistry: Overview of Stereochemistry

This article introduces the basic research objects of stereochemistry, sorting out the hierarchical relationship between the composition, structure, configuration and conformation of molecules, and sorting out the basic judgment methods of molecular collinearity and coplanarity from the aspects of bond length, bond angle, central atom hybridization and lone pair of electrons.

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Introduction

How to "identify" a molecule?

Is it enough to use the molecular formula $C_3H_6OCl_2$? Obviously not, one molecular formula can correspond to several isomers.

The same molecular formula can produce different isomers through different bonding methods.

With the same bonding method, different isomers can be obtained through different ordering of groups.

With the same order, different isomers can be obtained through single bond rotation.

Summary:

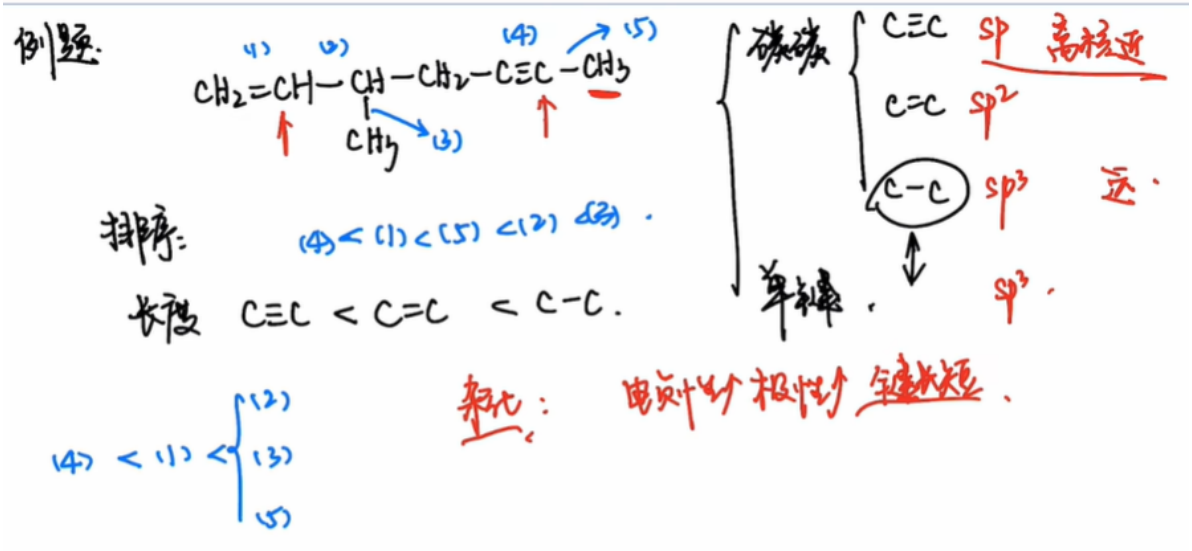
- Different atoms ** make up ** molecules and determine the unique molecular formula
- Same molecular formula, different **structure**
- Same structure, different **configuration**
- Same configuration, different **conformations**
- Scale: composition>structure>configuration>conformation The levels studied in stereochemistry are **configuration** and **conformation**

Preparation: key parameters

Bond parameters studied in stereochemistry:

- bond length
- bond angle

Key length

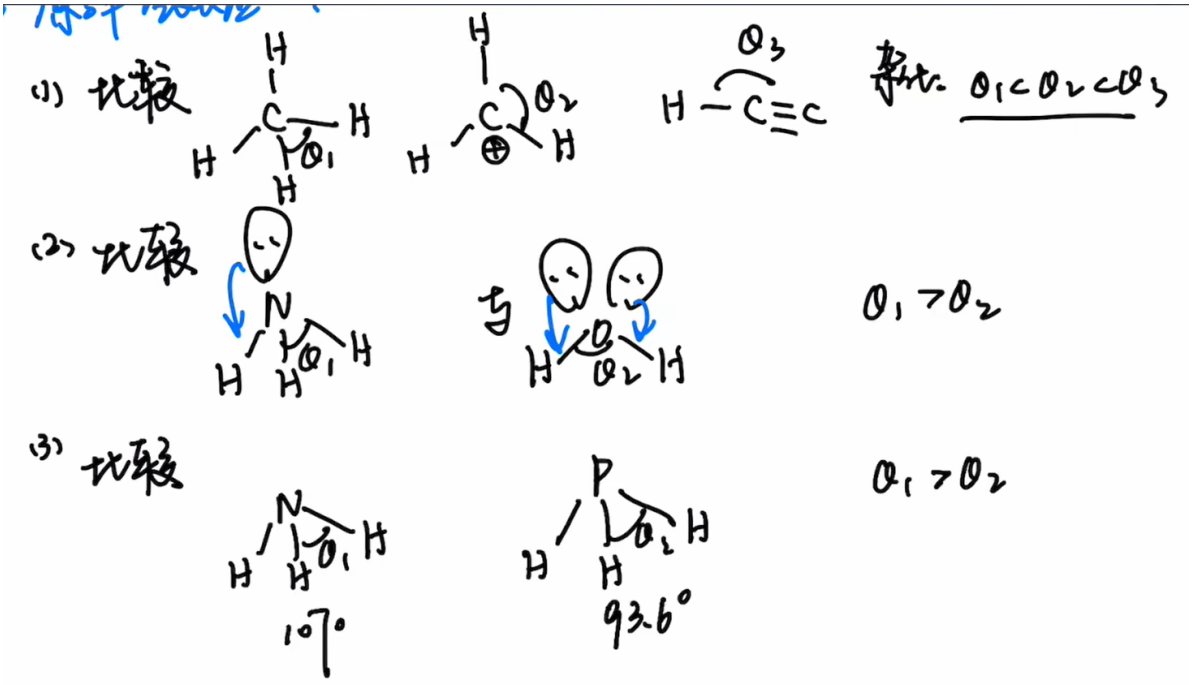


Combined assessment of electronegativity and hybridization

Conclusion

1. The greater the electronegativity, the greater the polarity of the bond and the shorter the bond length.
2. Corresponding bond lengths for different hybridizations: $sp < sp^2 < sp^3$
3. Atomic radius is positively related to bond length

bond angle



Compare priorities:

1. Central atom hybridization
2. Lone pair electrons
3. Central atom electronegativity

Questions about the collinearity and coplanarity of atoms in molecules