Name: _____ **Date:** _____

Shatter the Enigma of Carbon Bonds: Advanced 10th Grade Chemistry Quiz

Synthesize knowledge of isomerism and orbital hybridization to predict the behavior of complex organic structures and reaction mechanisms.

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1. Which of the following molecules exhibits geometric (cis-trans) isomerism due to restricted rotation and a lack of symmetry on each carbon of the double bond?

A. 1,1-dichloroethene
B. But-2-ene
C. Propene
D. Ethene

2. According to Valence Shell Electron Pair Repulsion (VSEPR) theory and hybridization rules, a carbon atom involved in a triple bond with nitrogen (a nitrile group) exhibits _____ hybridization.

A. sp3
B. sp2
C. sp
D. dsp2

3. Enantiomers are a type of stereoisomer that are non-superimposable mirror images of each other, typically occurring at a chiral center.

A. True
B. False

4. In the electrophilic addition of hydrogen bromide (HBr) to an asymmetric alkene like 2-methyl-propene, which intermediate is favored to ensure the major product according to Markovnikov's Rule?

A. Primary carbocation
B. Secondary carbocation
C. Tertiary carbocation
D. Pentavalent transition state

5. The systematic IUPAC name for the four-carbon ketone commonly referred to as methyl ethyl ketone is _____.

A. Butanal
B. Butan-2-one
C. Propanoic acid
D. But-1-ene

6. Phenols are generally more acidic than aliphatic alcohols because the resulting phenoxide ion is stabilized by resonance within the aromatic ring.

A. True

B. False

7. Which reagent and conditions would effectively synthesize an ester through the process of Fischer esterification?

A. Carboxylic acid + Alcohol with an acid catalyst
B. Alkane + Halogen under UV light
C. Aldehyde + Hydrogen with a nickel catalyst
D. Alkene + Water with a base catalyst

8. Compounds with the same molecular formula but different connectivity in their carbon skeletons are known as _____ isomers.

A. Stereo
B. Structural
C. Optical
D. Geometric

9. In a Nucleophilic Substitution (SN2) reaction, the rate of reaction depends only on the concentration of the substrate and is independent of the nucleophile concentration.

A. True
B. False

10. The secondary structure of proteins, such as alpha-helices and beta-pleated sheets, is primarily stabilized by which type of interaction between organic functional groups?

A. Ionic bonding
B. Covalent disulfide bridges
C. Hydrogen bonding
D. Van der Waals forces