

Organic Chemistry Worksheet: Chirality & Stereochemistry

Name: _____ Date: _____

PART A – FILL IN THE BLANK (10 questions)

1. A molecule is **chiral** if it is not _____ on its mirror image.
 2. A chiral center is typically a _____ carbon atom bonded to four different groups.
 3. Molecules that are mirror images but not identical are called _____.
 4. A carbon with four different substituents is also called a _____ carbon.
 5. A molecule that can be superimposed on its mirror image is _____.
 6. Chirality often results from a _____ center in the molecule.
 7. Enantiomers have identical physical properties except for _____ activity.
 8. A molecule with two identical substituents on a carbon is _____.
 9. A tetrahedral carbon bonded to four different groups is _____ hybridized.
 10. A mixture containing equal amounts of enantiomers is called a _____ mixture.
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PART B – MULTIPLE CHOICE (10 questions)

Circle the correct answer.

11. Which of the following is required for a carbon to be chiral?
 - A. Double bond
 - B. Four identical groups
 - C. Four different groups
 - D. Two lone pairs

12. Which molecule is chiral?

- A. CH_4
- B. CH_3Cl
- C. CH_2Cl_2
- D. CHBrClF

13. Which term describes mirror-image molecules that are not superimposable?

- A. Isomers
- B. Enantiomers
- C. Polymers
- D. Alkanes

14. Which of the following is NOT a chiral center?

- A. sp^3 carbon with four different groups
- B. Carbon with two identical groups
- C. Carbon bonded to H, Cl, Br, CH_3
- D. Carbon bonded to four different substituents

15. What type of isomers are enantiomers?

- A. Structural
- B. Functional
- C. Stereoisomers
- D. Chain

16. A molecule with one chiral center is:

- A. Always achiral
- B. Always chiral
- C. Sometimes ionic
- D. Always planar

17. What property do enantiomers differ in?

- A. Mass

- B. Density
 - C. Optical rotation
 - D. Boiling point
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18. Which geometry is required for a chiral carbon?

- A. Linear
 - B. Trigonal planar
 - C. Tetrahedral
 - D. Bent
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19. A molecule with a plane of symmetry is:

- A. Chiral
 - B. Achiral
 - C. Reactive
 - D. Aromatic
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20. Which of the following atoms is most commonly a stereocenter in organic chemistry?

- A. Oxygen
 - B. Nitrogen
 - C. Carbon
 - D. Hydrogen
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PART C – TRUE OR FALSE (5 questions)

Write **T** or **F**.

- 21. ____ All chiral molecules contain at least one stereocenter.
 - 22. ____ A molecule with identical substituents can still be chiral.
 - 23. ____ Enantiomers have identical chemical properties in non-chiral environments.
 - 24. ____ A trigonal planar carbon can be a chiral center.
 - 25. ____ Chirality is sometimes described as “handedness.”
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PART D – DRAWING & DIAGRAMS (5 questions)

26. Draw a tetrahedral carbon with four different substituents and label:

- chiral center
 - substituents
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27. Draw a molecule and its mirror image.

Label:

- original molecule
 - mirror image
 - whether they are superimposable or not
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28. Draw and label an achiral molecule with a plane of symmetry.

29. Draw a chiral molecule and label the stereocenter.

30. Draw two enantiomers and label:

- left-handed form
- right-handed form