Stereochemistry Exam Preparation Pack
24 Key Problem Types - Beginner / Intermediate

Section A: Assigning relationships

Decide if these molecules are enantiomers or diastereomers based on the name alone.

1) \((R)\)-Butan-2-ol and \((S)\)-Butan-2-ol

2) \((2R,3R)\)-2-Bromo-3-chlorobutane and \((2S,3S)\)-2-Bromo-3-chlorobutane

3) \((R,R)\)-Tartaric acid and \((R,S)\)-Tartaric acid

4) \((2R,4R)\)-2,3,4-Pentanetriol and \((2S,4S)\)-2,3,4-Pentanetriol


6) \((E)\)-Hex-3-ene and \((Z)\)-Hex-3-ene

7) \((R,E)\)-4-Hexen-2-ol and \((S,Z)\)-4-Hexen-2-ol

8) \((R,E)\)-4-Hexen-2-ol and \((R,Z)\)-4-Hexen-2-ol

9) \((R,E)\)-4-Hexen-2-ol and \((S,E)\)-4-Hexen-2-ol

10) \((1R,2S)\)-1,2-Dimethylcyclohexane and \((1S, 2R)\)-1,2-Dimethylcyclohexane

11) \(cis\)-1,2-Dimethylcyclohexane and \(trans\)-1,3-Dimethylcyclohexane

12) \((R,S)\)-2,3-Dichlorobutane and \((S,R)\)-2,3-Dichlorobutane
Section B: Assigning R/S

B-1 Assign all chiral centers as R or S

a) \[
\begin{array}{c}
\text{F} \\
\text{Br}
\end{array}
\]

b) \[
\begin{array}{c}
\text{H} \\
\text{N} \\
\text{C} \\
\text{H} \\
\text{O}
\end{array}
\]

c) \[
\begin{array}{c}
\text{OH}
\end{array}
\]

d) \[
\begin{array}{c}
\text{CH}_3
\end{array}
\]

e) \[
\begin{array}{c}
\text{F} \\
\text{CH}_3
\end{array}
\]

B-2 Assign all chiral centers as R or S


a) \[
\begin{array}{c}
\text{Br} \\
\text{H} \\
\text{CH}_3 \\
\text{Cl}
\end{array}
\]

b) \[
\begin{array}{c}
\text{D}
\end{array}
\]

c) \[
\begin{array}{c}
\text{H} \\
\text{CH}_3
\end{array}
\]

d) \[
\begin{array}{c}
\text{H} \\
\text{N} \\
\text{CH}_2
\end{array}
\]

e) \[
\begin{array}{c}
\text{O}
\end{array}
\]

B-3 Assign R or S to all chiral centers


a) \[
\begin{array}{c}
\text{H} \\
\text{Br}
\end{array}
\]

b) \[
\begin{array}{c}
\text{H}_3
\end{array}
\]

c) \[
\begin{array}{c}
\text{H}
\end{array}
\]

d) \[
\begin{array}{c}
\text{CH}_2
\end{array}
\]

e) \[
\begin{array}{c}
\text{H}_3
\end{array}
\]

B-4 Assign R or S to the indicated chiral center in these Fischer projections

a) ![Fischer projection a](http://bit.ly/Stereochem-EI-MOC-5)

b) ![Fischer projection b](http://bit.ly/Stereochem-EI-MOC-5)

c) ![Fischer projection c](http://bit.ly/Stereochem-EI-MOC-5)

d) ![Fischer projection d](http://bit.ly/Stereochem-EI-MOC-5)

e) ![Fischer projection e](http://bit.ly/Stereochem-EI-MOC-5)

B-5 Assign R or S to the chiral centers in these Sawhorse projections

a) ![Sawhorse projection a](http://bit.ly/Stereochem-EI-MOC-6)

b) ![Sawhorse projection b](http://bit.ly/Stereochem-EI-MOC-6)

c) ![Sawhorse projection c](http://bit.ly/Stereochem-EI-MOC-6)

d) ![Sawhorse projection d](http://bit.ly/Stereochem-EI-MOC-6)

e) ![Sawhorse projection e](http://bit.ly/Stereochem-EI-MOC-6)

B-6 Assign R or S to the chiral centers in these Newman projections

a) ![Newman projection a](http://bit.ly/Stereochem-EI-MOC-7)

b) ![Newman projection b](http://bit.ly/Stereochem-EI-MOC-7)

c) ![Newman projection c](http://bit.ly/Stereochem-EI-MOC-7)


e) ![Newman projection e](http://bit.ly/Stereochem-EI-MOC-7)
B-7 Assign R or S to the chiral centers in these cyclohexane chairs

a) Cl          b) OH          c)                 
\[\text{Cl} \quad \text{OH} \quad \text{HO-} \]

\[\text{Cl} \quad \text{OH} \quad \text{HO-} \]

d) H₃C       e) H₃C
\[\text{H₃C} \quad \text{H₃C} \]

C-1 Are these chiral or achiral molecules?

a) Br Br      b) H₃C H₃C H₃C
\[\text{Br} \quad \text{Br} \quad \text{H₃C} \quad \text{H₃C} \quad \text{H₃C} \]

d) H₃C        e) Cl-\text{CHCl}
\[\text{H₃C} \quad \text{Cl-\text{CHCl}} \]

C-2 Another set. Chiral or achiral molecules?

a) Br Br      b) CH₂OH H OH H OH CH₂OH
\[\text{Br} \quad \text{Br} \quad \text{CH₂OH} \quad \text{H OH H OH CH₂OH} \]

d)        e) CH₃ H Et
\[\text{CH₃} \quad \text{H Et} \]


D-1 Decide if a molecule has chiral centers and if so, how many stereoisomers each has. If there is a meso compound, draw the structure using wedge/dash.

a) ![Structure A](image1)
b) ![Structure B](image2)
c) ![Structure C](image3)
d) ![Structure D](image4)
e) ![Structure E](image5)


E-1 Decide if these molecules are enantiomers, diastereomers, the same, or constitutional isomers. *Pssst - this is a very common class of exam problem!*

a) ![Structure F](image6)
b) ![Structure G](image7)
c) ![Structure H](image8)
d) ![Structure I](image9)

E-2 Enantiomers, diastereomers, the same, or constitutional isomers?


E-3 Enantiomers, diastereomers, the same, or constitutional isomers?


E-4 Enantiomers, diastereomers, the same, or constitutional isomers?

F-1 Convert each of these line drawings ("perspective" drawings) to a Fischer projection.  

G-1 Convert each of these Fischer projections to line drawings (use the template below)  

H-1 Convert each of these Newman projections to a Fischer projection.  
I-1 Given these names, draw the following molecules:

- (S)-2-Chlorobutane
- (2R,3R)-3-Chloropentan-2-ol
- (1R,2S)-2-Amino-1-phenylpropan-1-ol

J-1 The structure below is one enantiomer of the molecule Fucitol.

Draw the enantiomer of this molecule, which also goes by the name D-Fuc-ol.

J-2 The structure below goes by the name Thebacon. How many chiral centers does Thebacon have? For bonus points draw the enantiomer using the template on the right.
J-3 The molecule below is known as Moronic acid. How many chiral centers does it have? Try drawing the enantiomer using the template on the right.

![Moronic acid structure](http://bit.ly/Stereochem-EI-MOC-22)

K-1 Optical rotation questions.

a) If the specific rotation of (+)-Fucitol is +50°, and the rotation of a sample of Fucitol is measured to be −10°, what is the per-cent composition of (+)-Fucitol and (−)-Fucitol in the sample?

b) A 5.0 mg sample of Thebacon is dissolved in 1.0 mL of methanol and the solution placed in a cell with a 2.0 cm path length. The observed rotation was +0.105°. What is the [α]_D for Thebacon?

L-1 [Assumes you have covered free-radical reactions of alkanes]

How many different monochlorinated isomers (including stereoiso-

mers) are possible for each of these molecules?

![Hexane isomers](https://www.masterorganicchemistry.com)