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

note - all problems can also be found [here](https://www.masterorganicchemistry.com)

**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) \( \text{F} \quad \text{Br} \)

b) \( \text{HS} \quad \text{CH}_2\text{CO} \quad \text{OH} \quad \text{Br} \)

c) 

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d) 

e) \( \text{F} \quad \text{CH}_3 \quad \text{HOOC} \quad \text{CH}_2\text{OH} \)

**B-2** Assign all chiral centers as R or S

a) 

b) 

c) 

d) 

e) 

**B-3** Assign R or S to all chiral centers

a) 

b) 

c) 

d) 

e) 

Stereochemistry Practice
Set - Beginner / Medium

[Master Organic Chemistry](https://www.masterorganicchemistry.com)
B-4 Assign R or S to the indicated chiral center in these Fischer projections

a)  
\[ \text{HO} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{CH}_2\text{OH} \]
\[ \text{HO} \quad \text{H} \quad \text{H} \quad \text{CH}_2\text{OH} \]
\[ \text{H} \quad \text{H} \quad \text{CH}_3 \]

b)  
\[ \text{CH}_2\text{OH} \quad \text{H} \quad \text{NH}_2 \]
\[ \text{H} \quad \text{CH}_3 \]

c)  
\[ \text{F} \quad \text{CH}_3 \]

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

a)  
\[ \text{H} \quad \text{OH} \quad \text{F} \]
\[ \text{H} \quad \text{COOH} \]
\[ \text{Br} \]

b)  
\[ \text{Cl} \quad \text{H} \quad \text{Br} \quad \text{OH} \]
\[ \text{Br} \quad \text{H} \quad \text{H} \]
\[ \text{H} \quad \text{CH}_3 \]

c)  
\[ \text{Br} \quad \text{H} \quad \text{OH} \quad \text{H} \]
\[ \text{F} \quad \text{HOOC} \]
\[ \text{H} \]

d)  
\[ \text{Br} \quad \text{H} \quad \text{CH}_3 \quad \text{H} \]
\[ \text{H} \quad \text{H} \quad \text{Br} \]
\[ \text{CH}_3 \]

e)  
\[ \text{H} \quad \text{CH}_3 \quad \text{H} \quad \text{H} \]
\[ \text{Br} \quad \text{CH}_3 \quad \text{OH} \]
\[ \text{H} \]

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

a)  
\[ \text{H}_3\text{C} \quad \text{Br} \quad \text{OH} \quad \text{H} \]
\[ \text{H} \quad \text{H} \quad \text{H} \quad \text{CH}_3 \]

b)  
\[ \text{H}_3\text{C} \quad \text{H} \quad \text{Ph} \]
\[ \text{H} \quad \text{D} \quad \text{Cl} \]

c)  
\[ \text{H}_3\text{C} \quad \text{H} \quad \text{OH} \quad \text{Br} \]
\[ \text{H} \quad \text{H} \quad \text{H} \]

d)  
\[ \text{H}_3\text{C} \quad \text{OH} \quad \text{Br} \]
\[ \text{H} \quad \text{H} \quad \text{H} \]

https://www.masterorganicchemistry.com
B-7 Assign R or S to the chiral centers in these cyclohexane chairs

a) Cl Cl
b) OH
c) HO

d) e) H3C

C-1 Are these chiral or achiral molecules?

a) Br Br
b) H3C Cl Cl

c) H

d) e) H3C

C-2 Another set. Chiral or achiral molecules?

a) Br Br
b) CH2OH OH OH OH

c) CH3

d) e) Cl
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.


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

https://bit.ly/3uh7JO0
E-2 Enantiomers, diastereomers, the same, or constitutional isomers?

a) \( \text{cyclohexane} \quad \text{cyclohexane} \)

b) \( \text{cyclohexanol} \quad \text{cyclohexanol} \)

c) \( \text{cyclohexane} \quad \text{cyclohexane} \)

d) \( \text{cyclohexane} \quad \text{cyclohexane} \)

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

a) \( \text{trichloroethane} \quad \text{trichloroethane} \)

b) \( \text{cyclohexane} \quad \text{cyclohexane} \)

c) \( \text{cyclohexanol} \quad \text{cyclohexanol} \)

d) \( \text{cyclohexane} \quad \text{cyclohexane} \)

E-4 Enantiomers, diastereomers, the same, or constitutional isomers?
https://bit.ly/3kLGZ58

a) \( \text{cyclohexanol} \quad \text{cyclohexanol} \)

b) \( \text{cyclohexane} \quad \text{cyclohexane} \)

c) \( \text{cyclohexanol} \quad \text{cyclohexanol} \)

d) \( \text{cyclohexane} \quad \text{cyclohexane} \)
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)

https://bit.ly/3m0tEoI

H-1 Convert each of these Newman projections to a Fischer projection.

https://bit.ly/2YbJIw1
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

https://bit.ly/3kM1Ox8

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.

https://bit.ly/3zTtu7E

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 \([\alpha]_D\) 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?

https://bit.ly/3zQaZBd