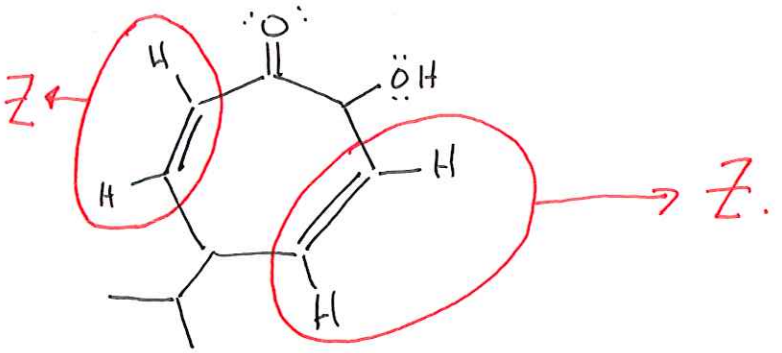
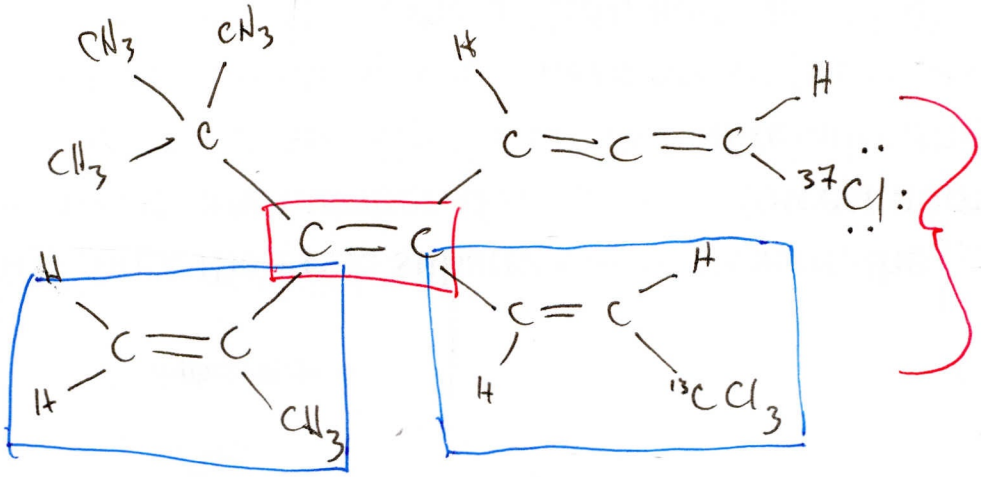
Chemistry 2500

Assignment # 9 – Stereochemistry – Answer Key.

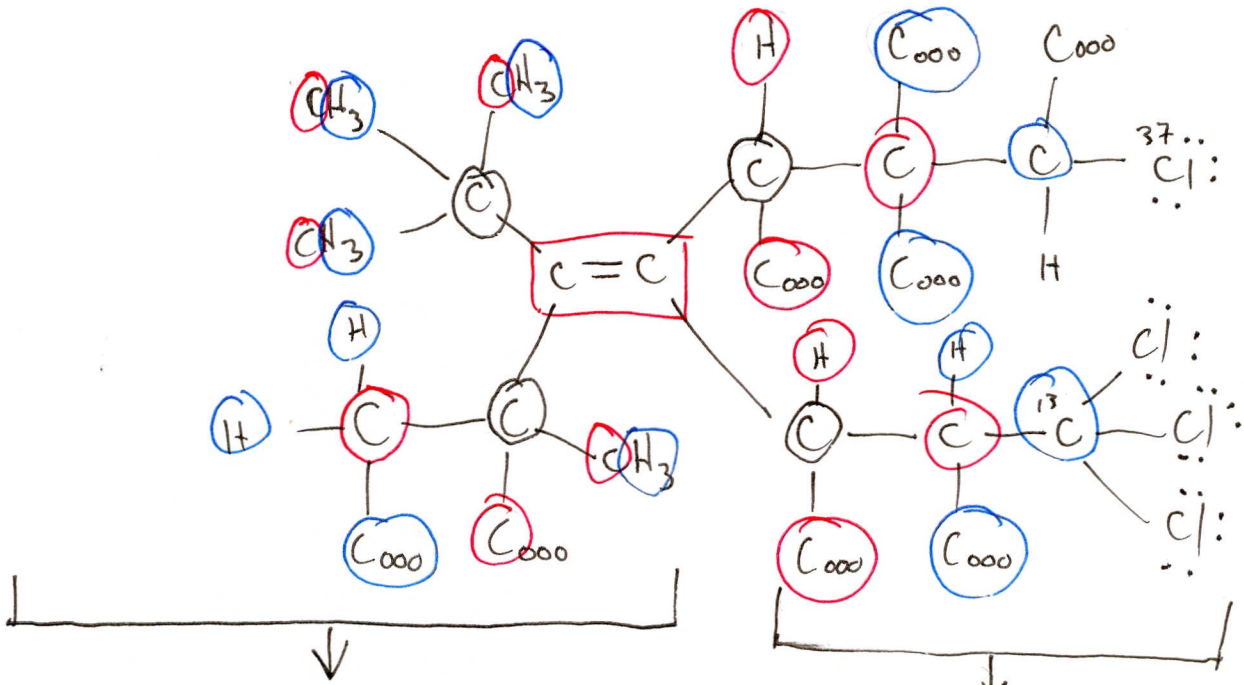
1a)



2.



expanded view ...



GEN 1: C vs C

GEN 2: C, C, C vs C, C, C

GEN 3: H, H, H, H, H, H, H, H, H

vs

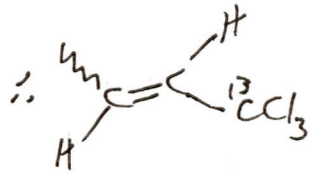
C, H H, H, H, H

$\therefore H_2C=C^{\cdots}_{CH_3}$ higher priority

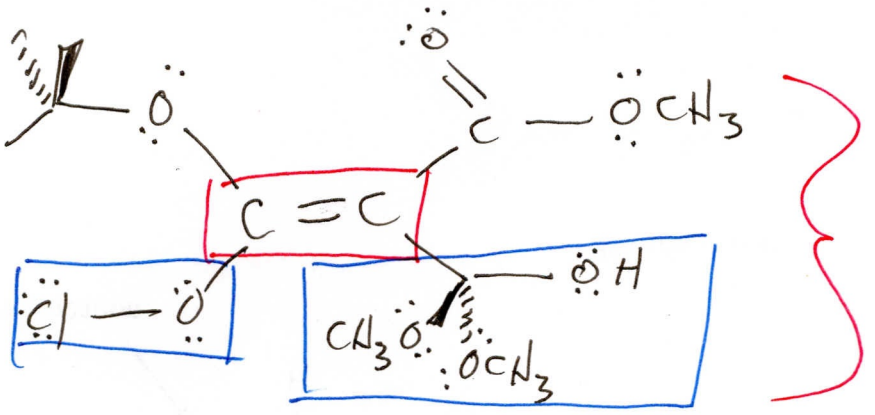
GEN 1: C vs C

GEN 2: C, C, H vs C, C, H

GEN 3: C, C, C vs ^{13}C, C, H

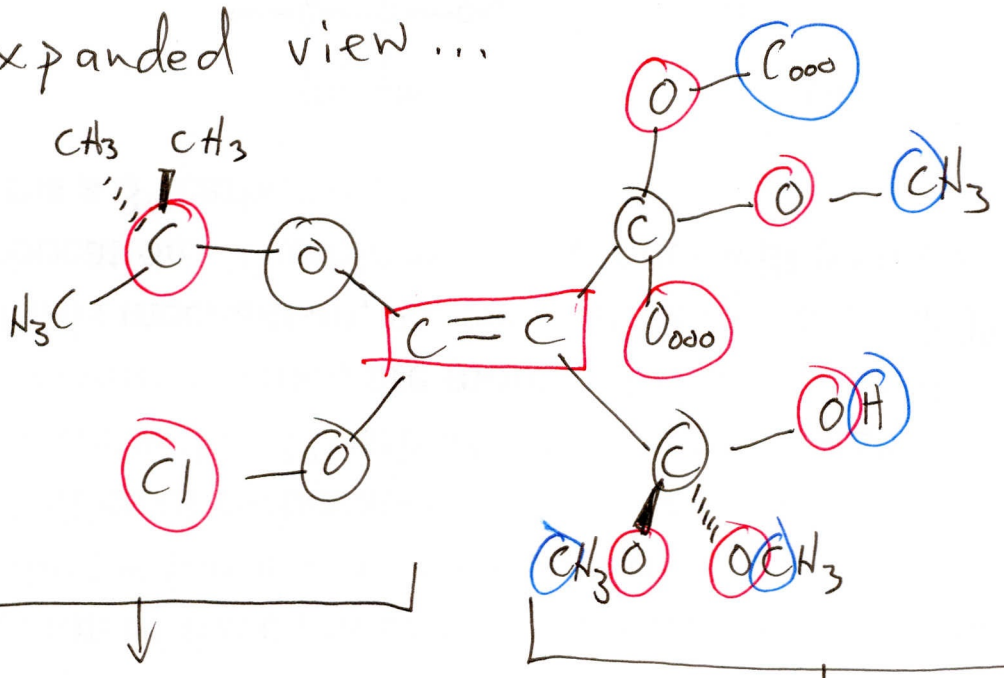
$\therefore$  higher priority

2.



Z isomer

expanded view ...



GEN 1: O vs O

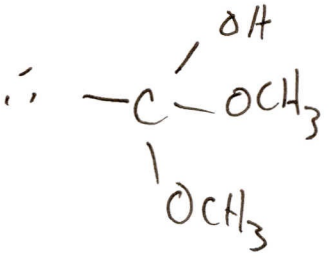
GEN 2: Cl vs C

∴ -OCl higher priority

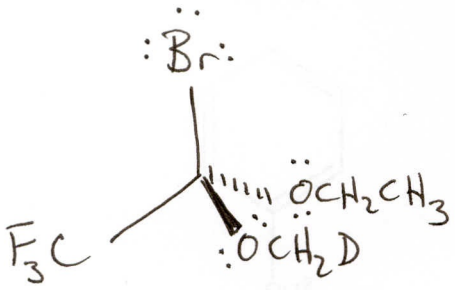
GEN 1: C vs C

GEN 2: O, O, O vs O, O, O

GEN 3: C, C vs C, C, H

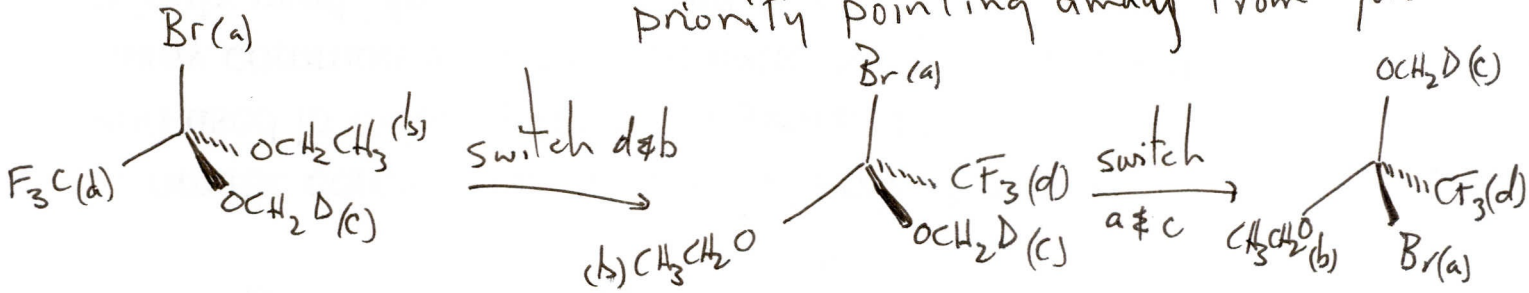
∴  higher priority

3.

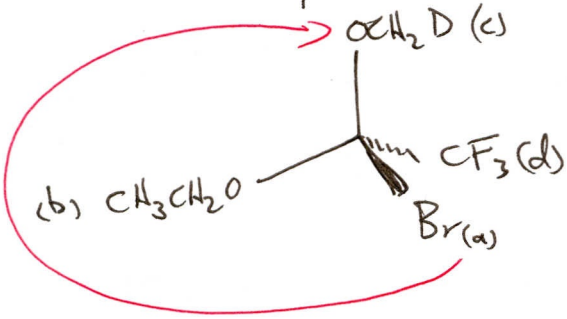


1) assign priorities

2. do 2 switches to place group of lowest priority pointing away from you.

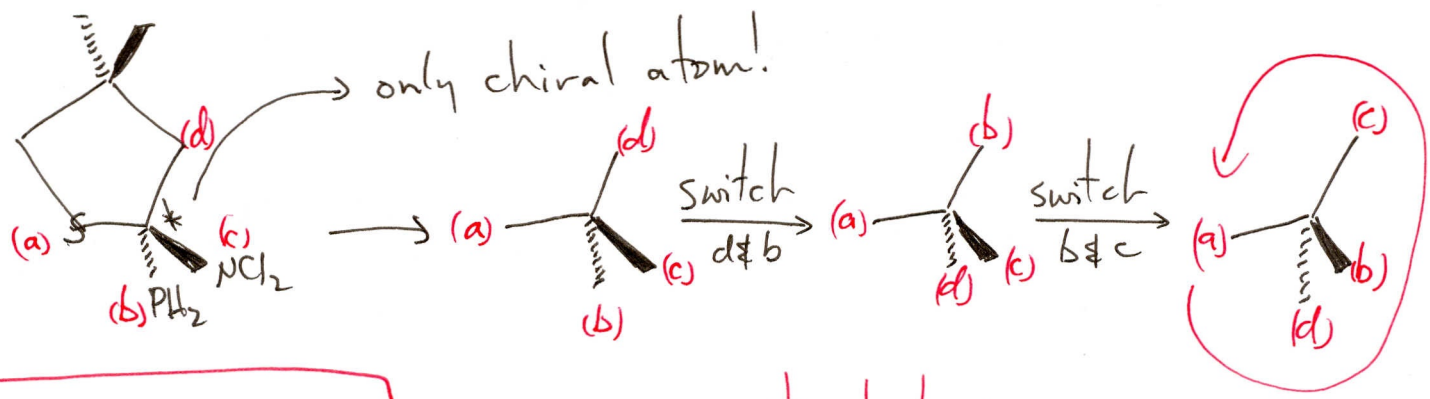


3. Trace path from a → b → c.



clockwise ∴ R.

or 3 4 1 2
↓ ↓ ↓ ↓
2+2+0+0=4 even ∴ R

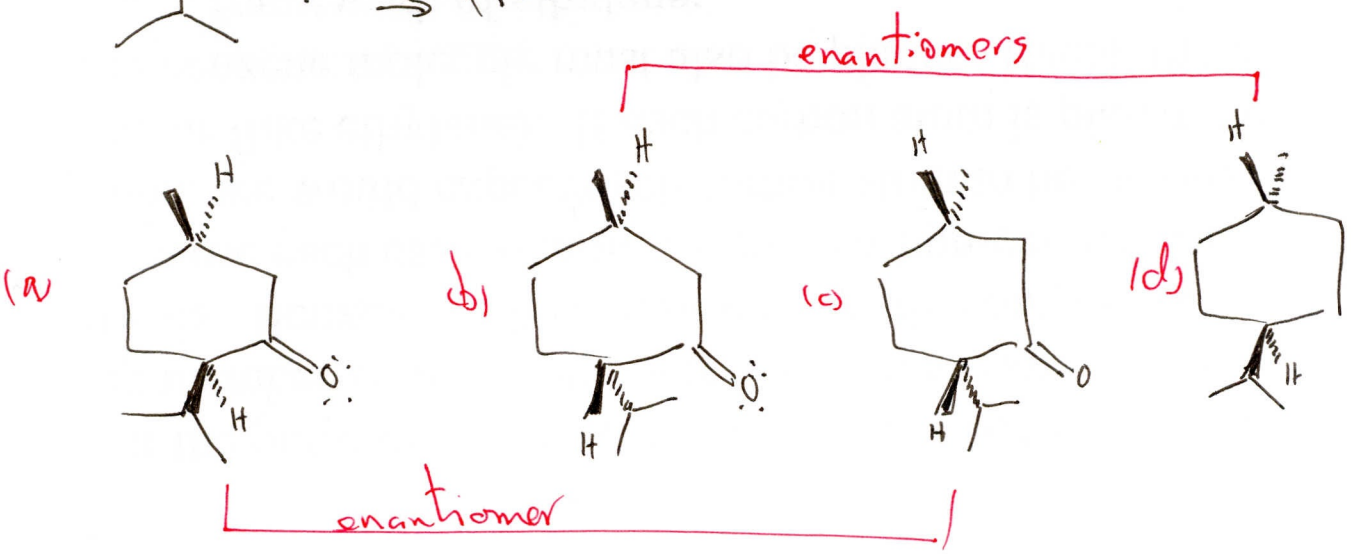


or 3 2 1 4
↓ ↓ ↓ ↓
2+1+0+0=3
odd ∴ S

counterclockwise
∴ S.

4.

→ identify all chiral atoms (marked with *)
→ draw all variations
→ assign R/S to chiral atoms
→ find relationship b/w molecules.



a & c
b & d
} enantiomers

a & b
a & d
b & c
c & d
} diastereomers.

Remember: for molecules with multiple chiral centers to be enantiomers all chiral centers have to invert e.g. RRS → SSR
SSS → RRR
etc...

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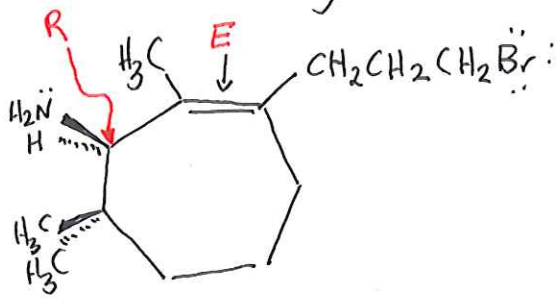
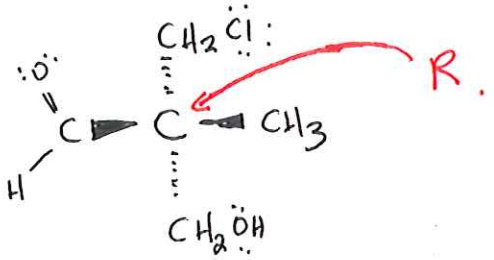
Assignment #9 – Stereochemistry – Answer Key

5.a)

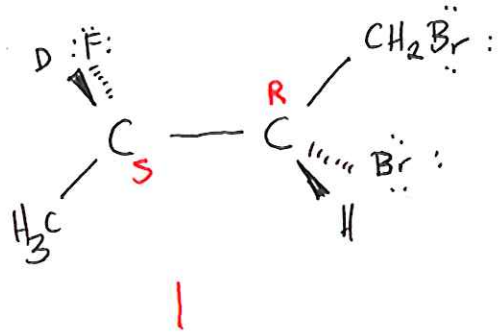


b)

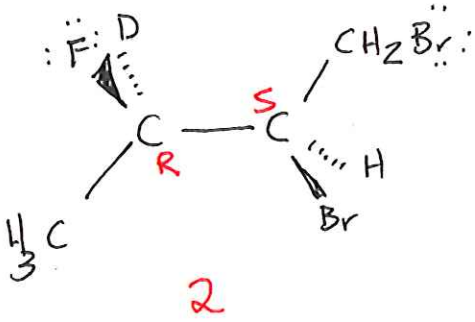


c)

6



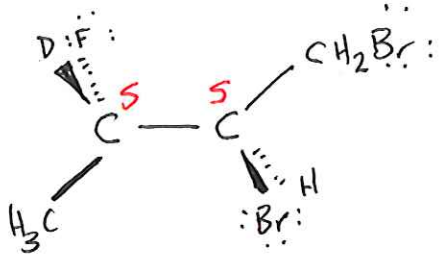
1



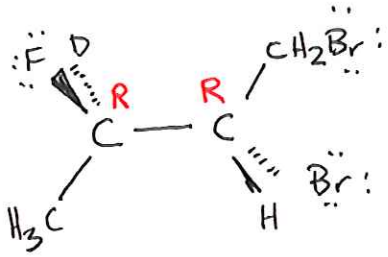
2

1 + 2 } enantiomers
3 + 4 }

1 + 3
1 + 4
2 + 3
2 + 4
} diastereomers



3



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Assignment #9 – Stereochemistry Answer key.

7. There are two possibilities:

1) Aldrich sent you a racemic mixture and should provide reimbursement.

2) The optical rotation is a multiple of 360° (e.g. 360, 720, 1080°, etc.) making it appear as though it is 0°.

Experiment: Dilute the solution by a suitable amount (e.g. 2:1) to see if a different optical rotation is observed. If so, then 2) is the answer and Aldrich should not reimburse. If the rotation still appears to be 0° then 1) is most likely and Aldrich should indeed reimburse.

Note: You may wish to do several different dilutions to be 100% sure of the answer.

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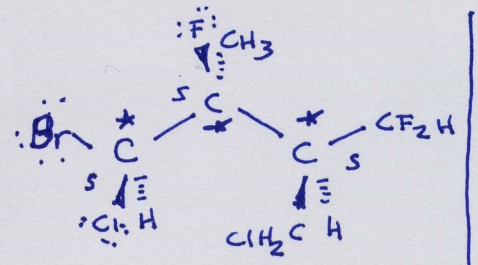
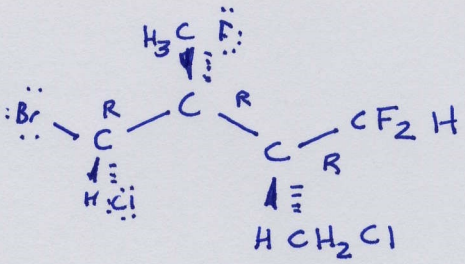
Assignment #9 - Stereochemistry - Answer Key

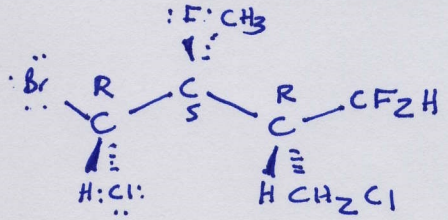
8.



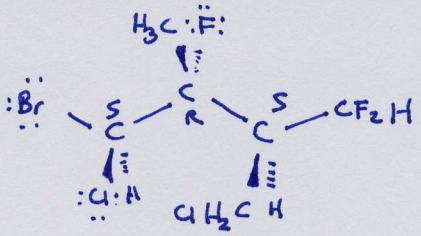
(1)



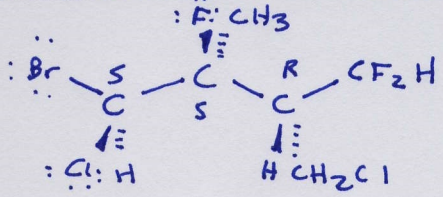
(2)



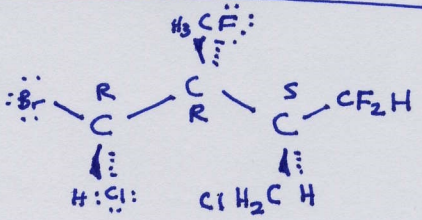
(3)



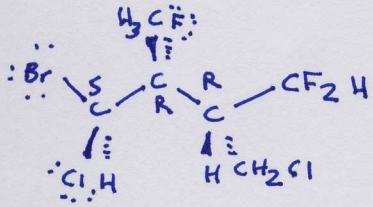
(4)



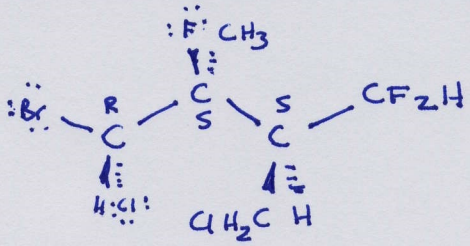
(5)



(6)



(7)



(8)

Enantiomers

1 & 2
3 & 4
5 & 6
7 & 8

Diastereomers

1 is a diastereomer w/ 3, 4, 5, 6, 7, 8
2 " " " w/ 3, 4, 5, 6, 7, 8
3 " " " w/ 1, 2, 5, 6, 7, 8
4 " " " w/ 1, 2, 5, 6, 7, 8
5 " " " w/ 1, 2, 3, 4, 7, 8
6 " " " w/ 1, 2, 3, 4, 7, 8
7 " " " w/ 1, 2, 3, 4, 5, 6
8 " " " w/ 1, 2, 3, 4, 5, 6

or in other words....

all other relationships

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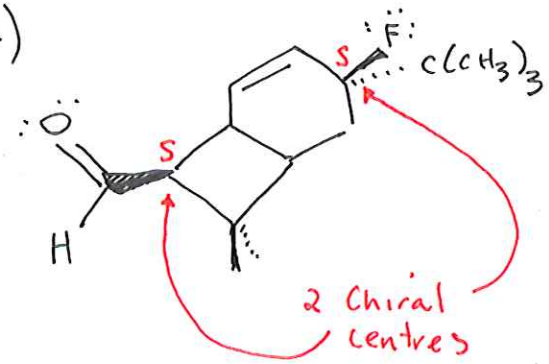
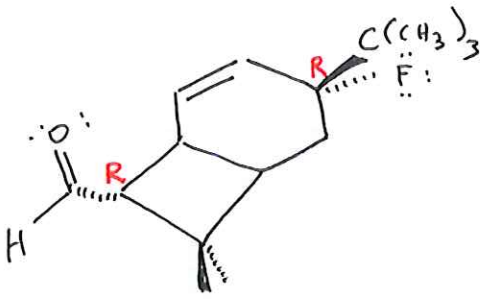
Assignment #9 — Stereochemistry Answer Key.

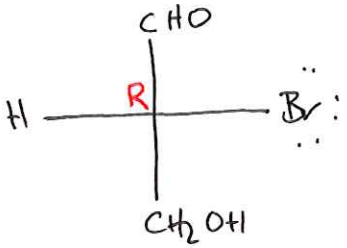
9a)



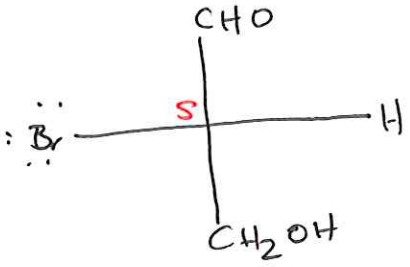
Enantiomer:



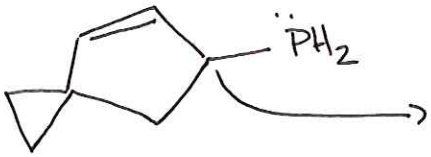
b)



Enantiomer:



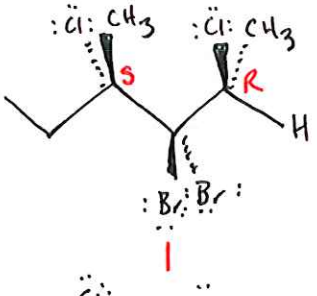
c)



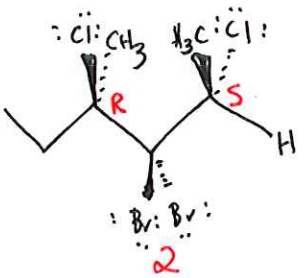
→ This is the only chiral centre, but stereochemical info not given ∴ cannot draw enantiomer because of insufficient information.

10a) chiral.

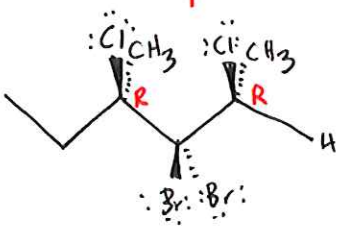
b)



1



2



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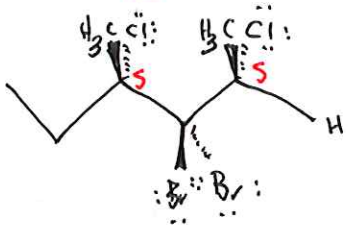

4

1 & 2, 3 & 4 } enantiomers

1 & 3, 1 & 4, 2 & 3, 2 & 4 } diastereomers

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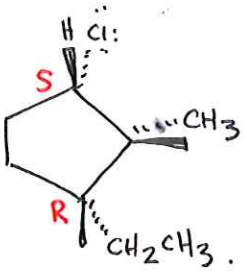
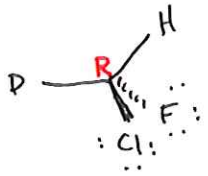
Assignment #9 — Stereochemistry Answer Key.

11. Z.

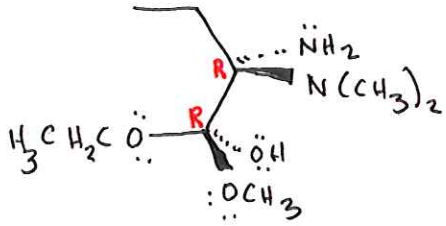
12a)



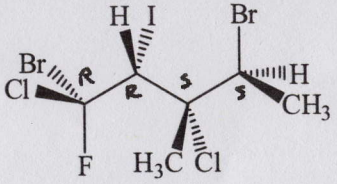
b)



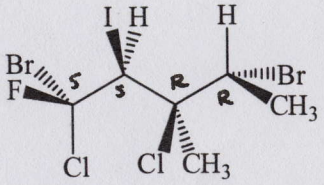
c)



13.



1



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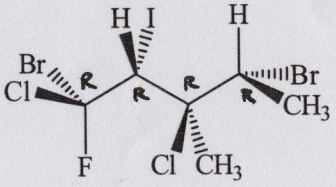

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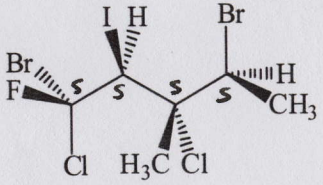

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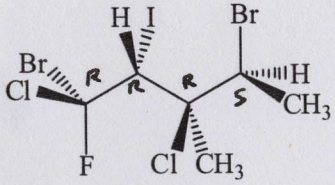

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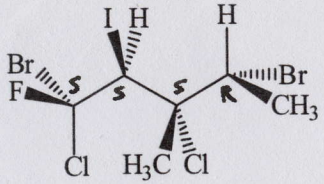

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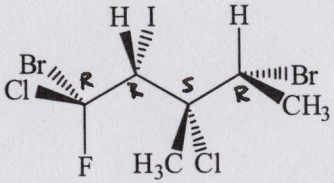

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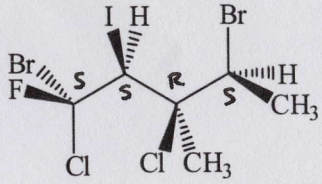

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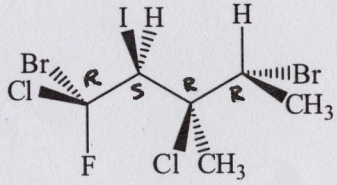

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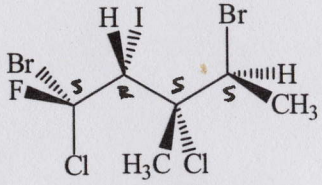

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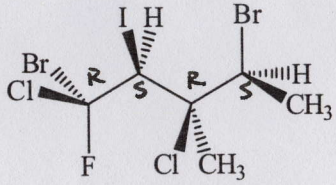

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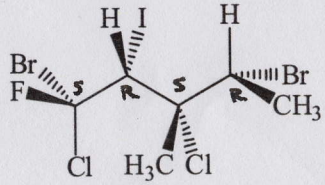
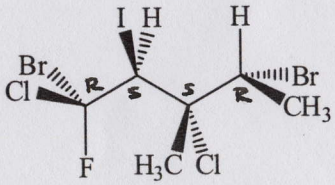
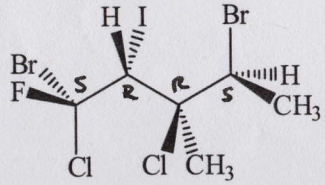


12



13



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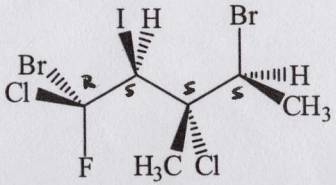

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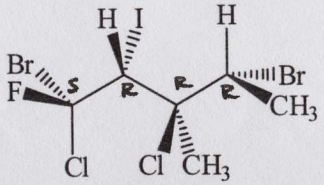

16

Enantiomers:

1&2
3&4
5&6
7&8
9&10
11&12
13&14
15&16

All other relationships = diastereomers

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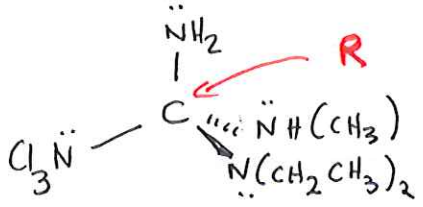
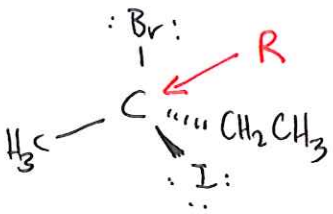
Assignment # 9 – Stereochemistry Answer Key.

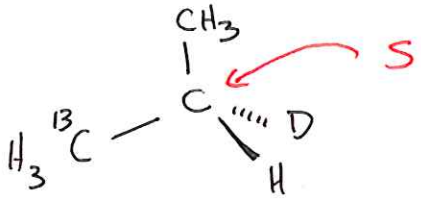
14a)



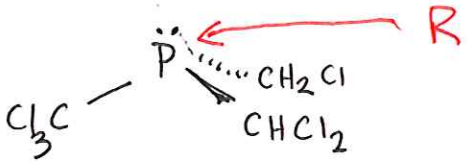
b)



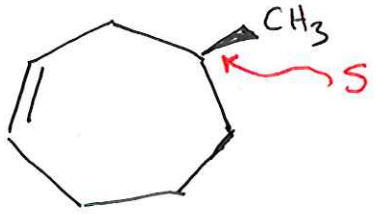
c)



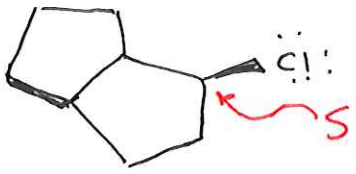
d)



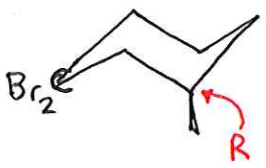
e)



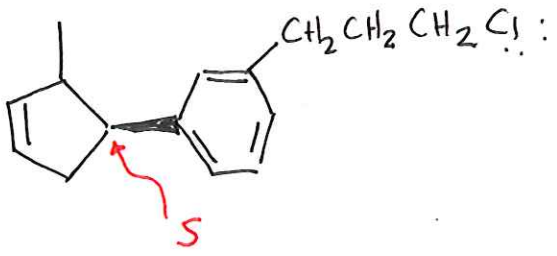
f)



g)



h)



Chemistry 2500
Assignment #9 – Stereochemistry Answer Key.

15a) Z
b) Z
c) E
d) Z
e) Z
f) neither
g) neither
h) E.

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16. $0.85 \times 161^\circ = 136.90^\circ$
$-0.15 \times 161^\circ = \underline{-24.15^\circ}$
$\boxed{+112.75^\circ}$

or

$(1-(0.15\times 2))(161^\circ)$
$= (1-0.30)(161^\circ)$
$= (0.70)(161^\circ)$
$\boxed{= +112.75^\circ.}$