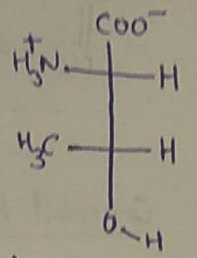
ABA Assignment 10

20161172 Pratik Mandlecha.

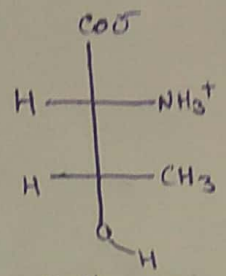
1

Threonine → $(C_4H_9NO_3)$.

(a) Stereoisomers

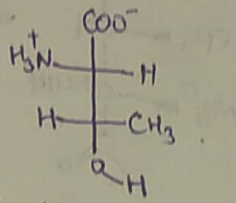


L- threonine

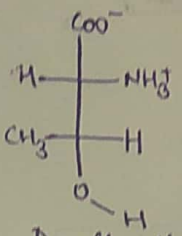


D-threonine.

R → clockwise
S → anticlockwise.



L-allo-threonine



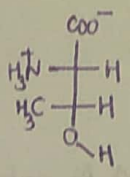
D- allo-threonine.

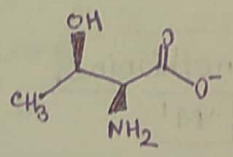
(b) (i) L-threonine → 2S, 3R
(ii) D-threonine → 2R, 3S.
(iii) L-allo-threonine → 2S, 3S
(iv) D-allo-threonine → 2R, 3R.

Enantiomeric pairs ⇒ {(i, ii) ; (iii, iv)}

Diastereomeric pairs ⇒ {(i, iii); (i, iv); (ii, iii); (ii, iv)}

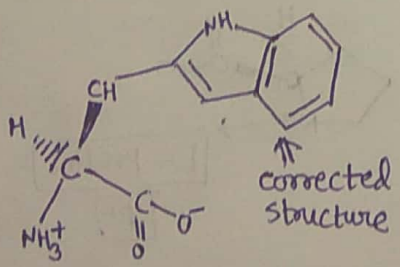
(c) (2S, 3R) → L-threonine.





IUPAC name ⇒ (2S, 3R) - 2-amino-3-hydroxybutanoic acid.

2 (i)

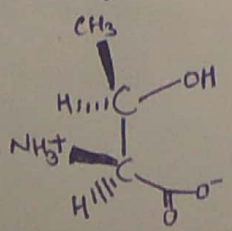


corrected structure

→ L-Tryptophan

('W')

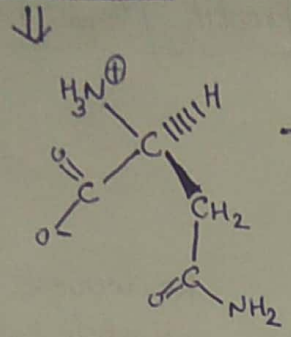
(ii) Already correct structure ⇒



L-threonine

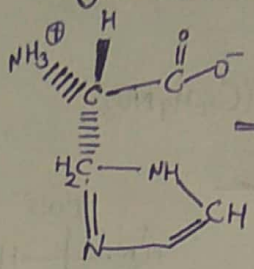
('T')

iii) Corrected structure.



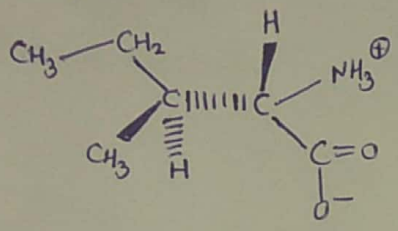
→ L-Asparagine ('N')

(iv) Already correct structure.



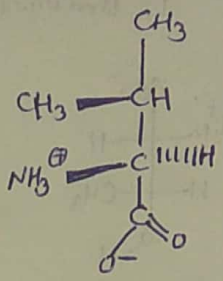
→ L-Histidine ('H')

(v) Corrected structure.



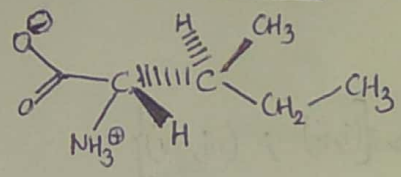
→ L-Isolucine ('I')

(vi) Corrected Structure



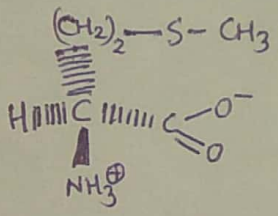
→ L-Valine ('V').

(vii) Already correct structure.



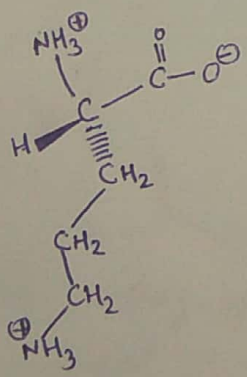
→ L-Isolucine ('I').

(viii) Corrected structure.



L-methionine ('M')

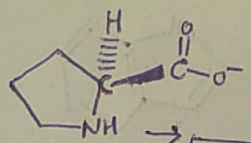
(ix) Corrected Structure



L-Ornithine 'O'.

$C_5 N_2 O_2 H_{13}$

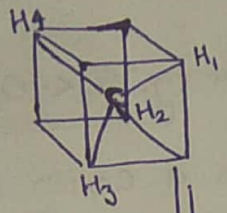
(x) Already correct Structure.



→ L-proline ('P')

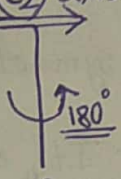
ABA Assignment 8. 20161172 Pratik Mandlecha.

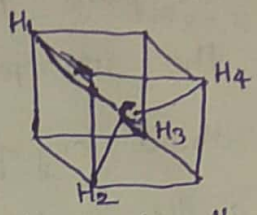
1



Methane

(a) C_2 axis of symmetry.



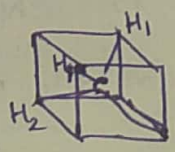


C_2.

Rotation of CH_4 about the axis passing through the center by 180°. gives same molecule back.

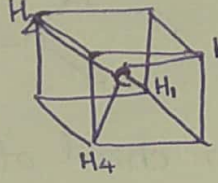
(b) $S_4 = C_4 + \sigma$.

C_4



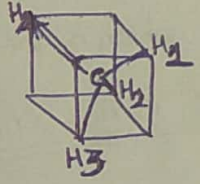
σ ——————

$S_4 \leftarrow C_4 + \sigma$.



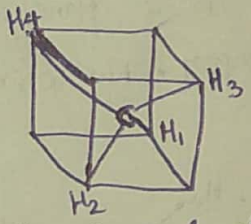
same as initial ~~original~~ CH_4 Structure $\Rightarrow$ S_4 axis of symmetry.

(c) Rotating CH_4 by 120° about axis through C & H_4 again gives the same result.



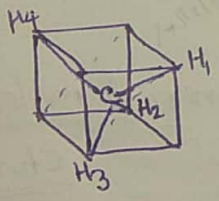
C_3 axis of symmetry.

120°



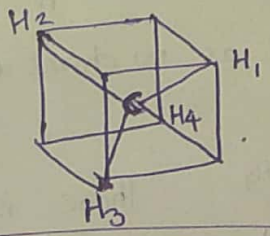
C_3.

(d) σ $\Rightarrow$ By taking mirror plane along the diagonal plane, we get same element back again

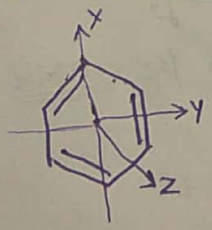


σ

mirror Plane.

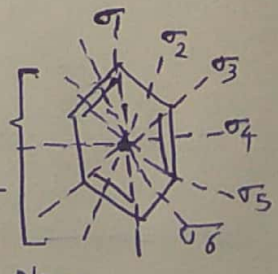


2



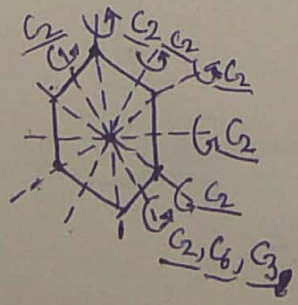
Reflection planes.

7 planes of symmetry



Plane along benzene plane

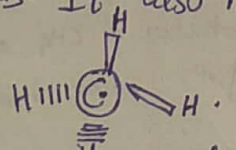
9 rotation axes of symmetry.



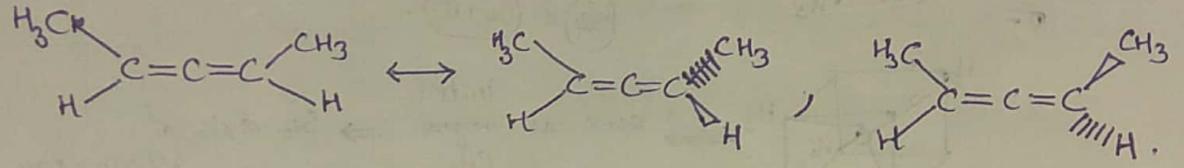
3]

⟹ An improper rotation is a combination of a rotation about an axis followed by a reflection in the plane perpendicular to the rotation axis and the rotation axis is called the improper axis of symmetry. for e.g. $S_4 \leftarrow C_4 + \sigma_H$.

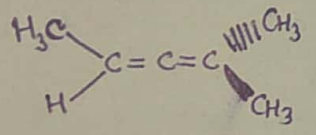
CH_4 has axis of symmetry about any of 4 CH bonds. It also has a center of symmetry by keeping C as the center.



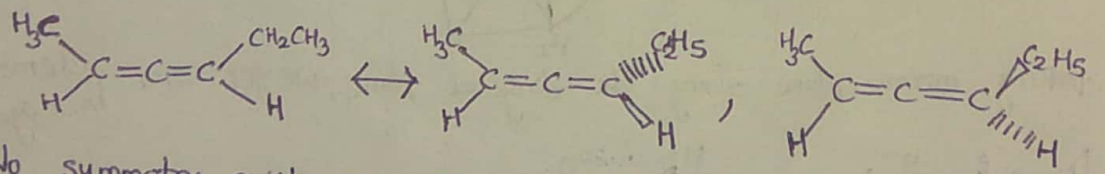
(a) ∴ No symmetry exist in this element. N here is chiral. Also all 4 Carbons attached to N are chiral. ∴ Overall, molecule is chiral.

(b) 

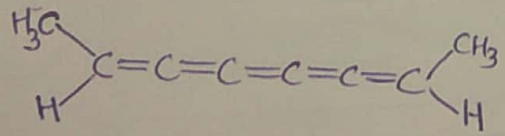
There is no plane of symmetry and no chiral atoms but overall molecule is chiral.

(c) 

There is a plane of symmetry in the molecule which is the plane of the paper. No chiral atoms and molecule is not chiral.

(d) 

No symmetry exist as well as no chiral atoms, but the overall molecule is chiral!

(e) 

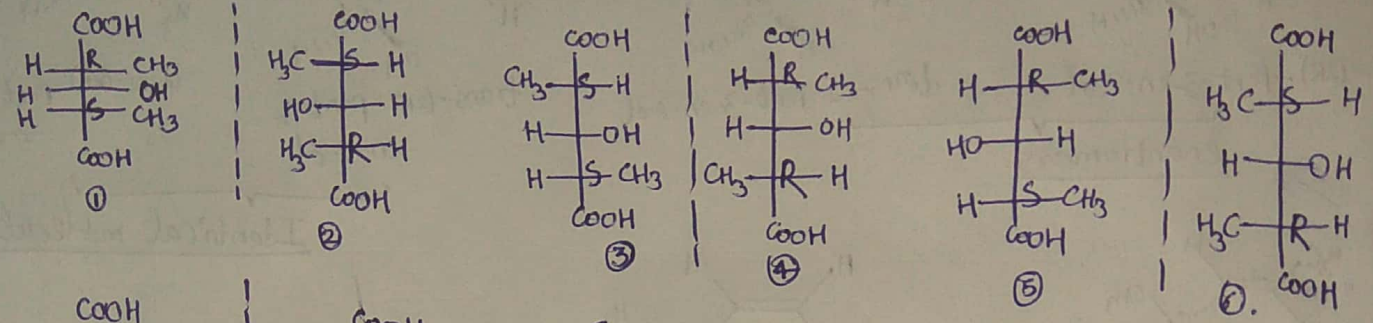
There is 1 plane of symmetry. No chiral atoms are there and the overall molecule is not chiral.

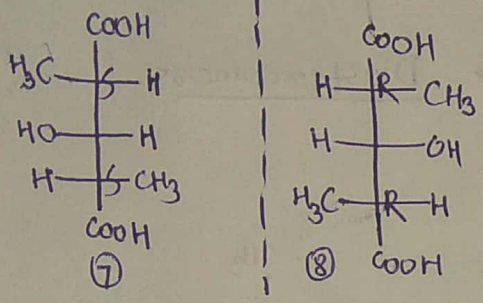
(d)

25-

4

→ diastereomers of 2,4-dimethyl-3-hydroxy pentane-1,5-dicarboxylic acid.





{(1,2); (3,7); (4,8); (5,6)} ⇒ Identical pairs.

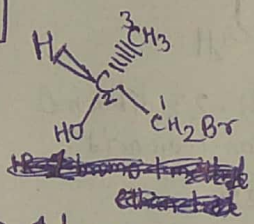
1 & 5 ⇒ optically inactive.

{(3,4); (7,8)} ⇒ pair of enantiomers

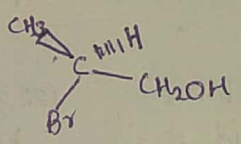
{(1,3); (1,4); (1,5); (3,5); (4,5)} ⇒ pairs of diastereomers.

5

a)



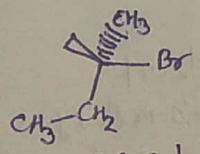
2R-1-bromopropan-2-ol



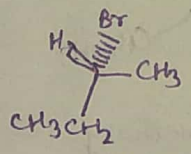
2S-2-bromopropan-1-ol.

Structural isomers.

b)



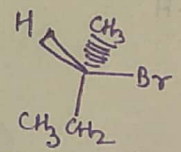
2S-2-bromobutane



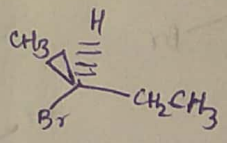
2R-2-bromobutane

Enantiomers.

(c)



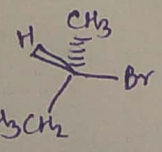
2S-2-bromobutane



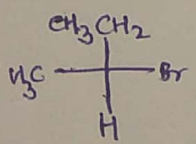
2S-2-bromobutane

identical.

(d)



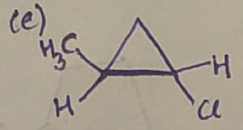
2S-2-bromobutane



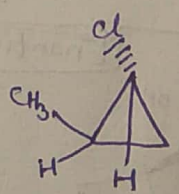
2S-2-bromobutane (H away)

Identical molecules.

(e)



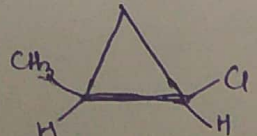
trans-1-chloro-2-methyl cyclopropane



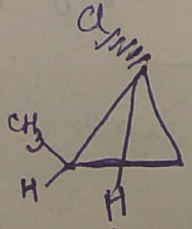
cis-1-chloro-2-methyl cyclopropane

Diastereomers.

(f)



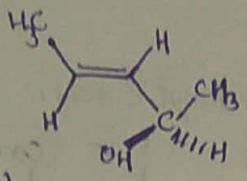
cis-1-chloro-2-methylcyclopropane



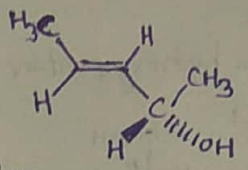
cis-1-chloro-2-methyl cyclopropane

Identical.

(g)



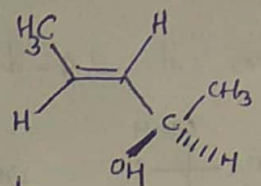
trans-(2R)-Pent-3-en-2-ol



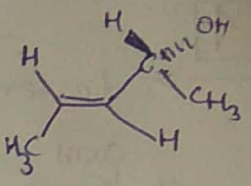
trans-2S-pent-3-en-2-ol

enantiomers.

(h)



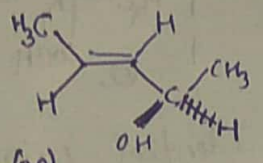
trans-(2R)-pent-3-en-2-ol



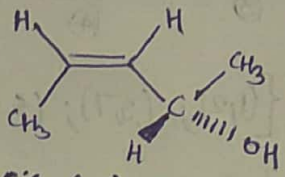
trans-(2R)-pent-3-en-2-ol.

Identical molecules.

(i)



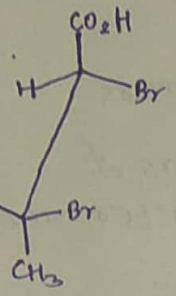
trans-(2R)-pent-3-en-2-ol



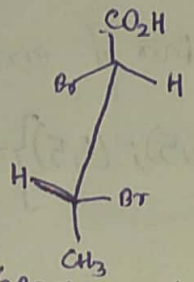
cis-(2S)-pent-3-en-2-ol.

⟹ Diastereomers.

(j)



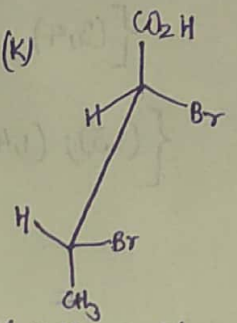
(2S,3R)-2,3-dibromo butan-1-oic acid



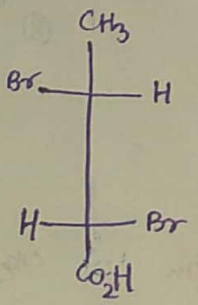
(2R,3R)-2,3-dibromo butanoic acid

Diastereomers

(k)



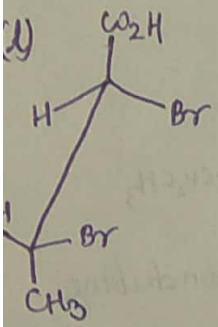
(2S,3R)-2,3-dibromo butan-1-oic acid



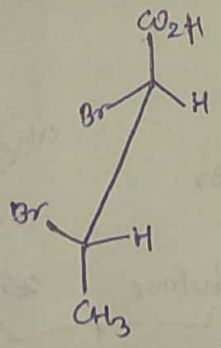
(2R,3R)-2,3-dibromo butan-1-oic acid.

Diastereomers.

(l)



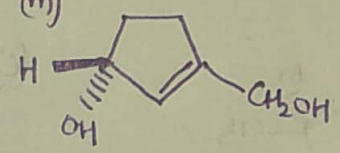
(2S,3R)-2,3-dibromo butanoic acid



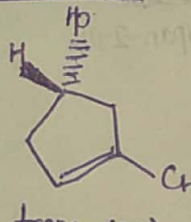
(2R,3S)-2,3-dibromo butanoic acid

Enantiomers

(m)



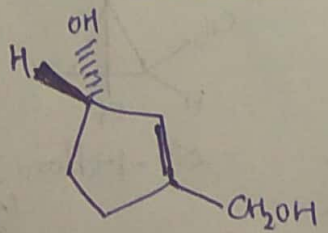
trans-(1R)-3-methoxy cyclopent-2-en-1-ol



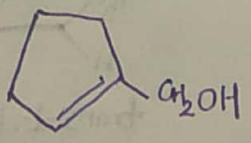
trans-(1S)-3-methoxy cyclopent-3-en-1-ol.

Structural isomers

(n)



trans-(1S)-3-methoxy-cyclopent-2-en-1-ol



1-methoxy cyclopent-1-ene.

Not isomers.