BYJU'S EXAM PREP

Important Questions On Stereochemistry

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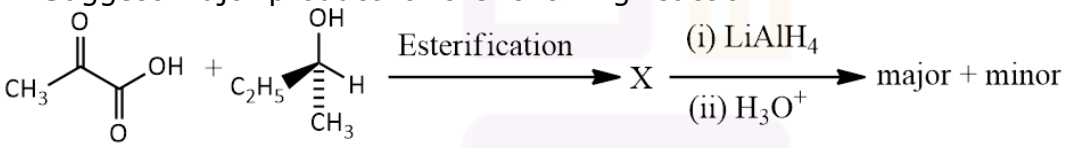
Important questions: STEREOCHEMISTRY

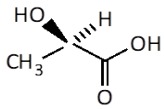
1. Any non-racemic chiral substance is known as?
A. Enantiomer
B. Diastereomer
C. Conformational Enantiomer
D. Scalemic

2. Which among the following statements is incorrect?
A. Structures that can be interconverted simply by rotation about single bonds are conformation of the same molecule.
B. Structures that can be interconverted only by breaking one or more bonds have different configurations and they are stereoisomers specifically known as configurational isomers.
C. If two compounds are mirror images of each other, they are known as conformational identical.
D. Structures that are not superimposable on their mirror image and can therefore exist as two enantiomers are called chiral.

3. Which among the following statements are true?
A. All symmetric molecules are chiral.
B. All dissymmetric molecules are achiral.
C. Chiral molecules which do not convert into their conformational enantiomer are optically active.
D. Presence of any reflective symmetry makes the molecule chiral.

4. Suggest major product for the following reaction



A.


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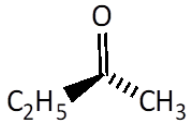

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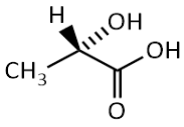
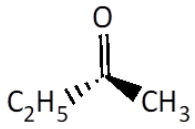


D.



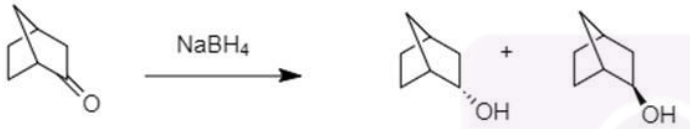
5. If C_n^n is applied to any molecule, it is most appropriately equivalent to?
A. i
B. E
C. σ
D. S_n

6. Match the following correctly-

Column A	Column B
1. Identical	P. Non-racemic, chiral
2. Disymmetric	Q. Non-identical
3. Chiral	R. No reflective symmetry
4. Scalemic	S. Indistinguishable configuration

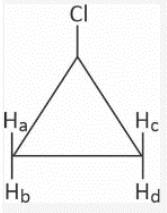
A. 1- R, 2-P, 3-Q, 4-S
B. 1-S, 2-R, 3-Q, 4-P
C. 1-R, 2-P, 3-S, 4-Q
D. 1-S, 2-P, 3-Q, 4-R

7. Which of the following statements is true regarding the given chemical reaction?



A. It is an example of a stereo-selective reaction.
B. It is an example of stereospecific reaction.
C. The product A and B are Anomer.
D. None of these

8. In the compound given below, the hydrogen (H_a, H_c) and (H_b, H_d) are respectively:



A. Both diastereotopic
B. Ha & Hc- enantiotopic; Hb &Hd- diastereotopic

C. Ha & Hc- diastereotopic; Hb &Hd-enantiotopic
D. Both enantiotopic

9. Which of the following compounds exhibit stereoisomerism?
A. 3-methyl butanoic acid
B. 2-methyl but-1-ene
C. 3-methyl but-1-yne
D. 2-methyl butanoic acid

10. Which out of the following complexes exist as a pair of enantiomers?
A. $[Co(H_2NCH_2CH_2NH_2)_3]^{+3}$
B. cis-$[Co(NH_3)_4Cl_2)]^{+}$
C. $[Pt(PPh_3)(Cl)(Br)(CH_3)]^{-}$
D. trans-$[Co(en)_2\ Cl_2]^{+}$

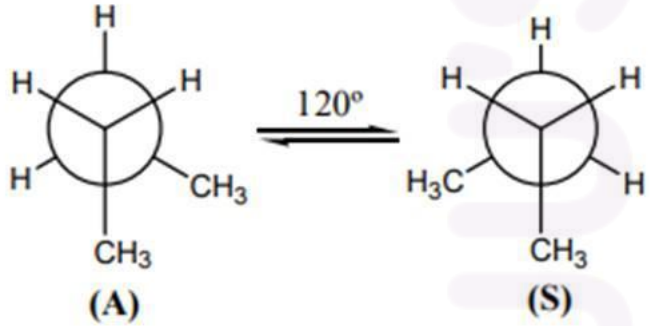
Answers

1. D
2. C
3. C
4. A
5. B
6. B
7. A
8. D
9. D
10. A

Solutions

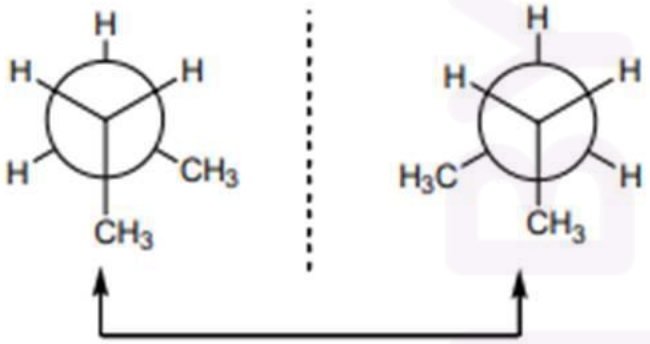
Solution 1:
Scalemic- Any non-racemic chiral substance is called Scalemic.
A chiral substance is enantio-pure or homochiral when only one of the two possible enantiomers is present.
A chiral substance is enantio-enriched or heterochiral when an excess of one enantiomer is present but not the exclusion of the other.

Solution 2:



(A) (S)

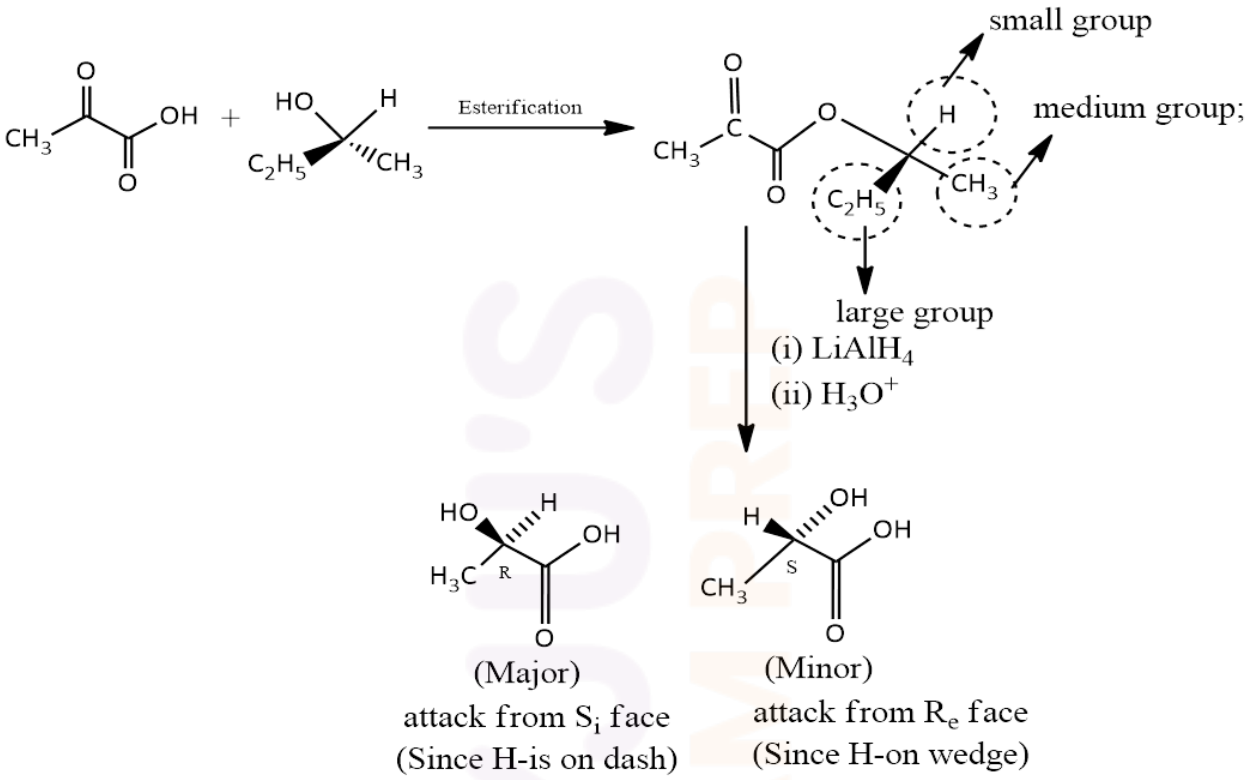
So, (A) and (S) are mirror image of each other as shown below



So, these two are conformational enantiomers

Solution 3:
* All asymmetric molecules are chiral, and all symmetric molecules are achiral.
* All dissymmetric molecules are chiral.
* Absence of reflective symmetry makes molecules chiral.
* Presence of any reflective symmetry makes molecules achiral.

Solution 4:



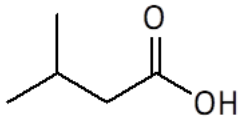
Solution 5:
C_n^n = E, i.e., when C_n axis is rotated 'n' number of times, it gives Identical Orientation which is designated as 'E'.

Solution 6:
* Any non-racemic chiral substance is called Scalemic.
* There is absence of all reflective symmetry in dissymmetric molecules.
* A symmetry operation is the movement of a molecule about the symmetry element in such a manner that the resulting configuration of the molecule is indistinguishable from the original molecule. The molecule may assume an equivalent configuration or an identical configuration.
* A chiral molecule has non-identical and non-superimposable mirror image.

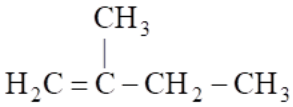
Solution 7:
Stereo-selective reactions give two products- major and minor.
Whereas the stereo-specific reaction gives one product exclusively.

Solution 8:
On passing the P.O.S., if the protons reflect each other then these protons are termed as enantiotopic protons.
When a Plane of Symmetry (P.O.S) passes through the molecule bisecting the chlorine atom, the Ha and Hc reflect each other.

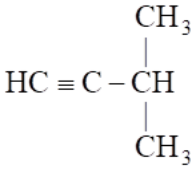
Solution 9:



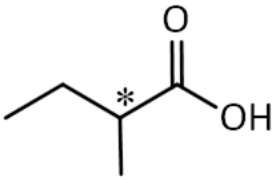
3-methyl butanoic acid – (No chiral carbon present)



2-methyl but-1-ene– (No chiral carbon present)



3—methyl but-1-yne– (No chiral carbon present)



2-methyl butanoic acid (Chiral carbon present. So, exhibit stereoisomerism)

Solution 10:

$[Co(en)_3]^{+3}$ is disymmetric; chiral and optically active

cis-$[Co(NH_3)_4Cl_2)]^+$ since 'σ' is present (i.e., plane of symmetry) So it is achiral

$[Pt(PPh_3)(Cl)(Br)(CH_3)]^-$ it is square planar complex (dsp^2); 'σ' present. So, achiral and optically inactive.

trans-$[Co(en)_2\ Cl_2]^+$ in this 'σ'present. So, it is achiral and thus optically inactive.

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