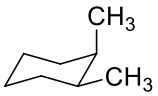
PREVIOUS YEAR QUESTIONS (CU)

ALICYCLIC CHEMISTRY

CBCS, SEMESTER-5, CC-12

1. Give an example of a substituted cyclohexane system where the conformation with axial substituent is more stable than the equatorial one. (1M) [1h, CC-12, 2022]

2. What are the number of *gauche-butane* interactions present in the following compound? (1M)



[1l, CC-12, 2022]

3. *cis*-Cyclohexane-1,3-diol is oxidised by HIO_4 more rapidly than corresponding *trans*-isomer. Explain. (3M) [3a, CC-12, 2022]

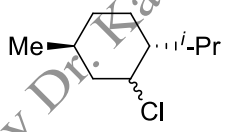
4. What happens when *cis*-and *trans*-isomers of 3-hydroxycyclohexanecarboxylic acid are heated separately? (2M) [3b, CC-12, 2022]

5. Provide an explanation for the fact that under the same condition (NaOEt / EtOH at 75 ^oC), the *cis*-isomer of 4-tertiarybutylcyclohexyl tosylate undergoes a facile E_2 elimination reaction, but the *trans*-isomer does not. (2M) [12b, CC-12, 2022]

6. Draw the boat conformation of cyclohexane in Newman projection. (1M) [1d, CC-12, 2021]

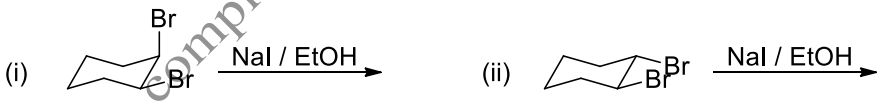
7. Calculate the value of angle strain in cyclopropane employing Baeyer strain theory. (1M) [1h, CC-12, 2021]

8(a). Two diastereoisomers of the following compound differ in the orientation of Cl atom. One isomer undergoes E_2 dehydrohalogenation 200 times faster than the other. Draw the conformations of the two diastereomers and explain the observation. (3M) [2a, CC-12, 2021]



8(b). Predict the product of the above said reaction with mechanism. (2M) [2b, CC-12, 2021]

9. Predict the product(s) with suitable mechanism: (3M) [5a, CC-12, 2021]



10. Which one of the following is stroger acid and why? (2M) [5b, CC-12, 2021]

cis-4-*tert*-butylcyclohexanecarboxylic acid or

trans-4-*tert*-butylcyclohexanecarboxylic acid

11. On treatment with aqueous $NaNO_2$ and dilute HCl, *trans*-2-aminocyclohexanol produces cyclopentanecarboxaldehyde while the *cis*-isomer gives mixture products. Explain. (3M) [1a, 6th, 2021]

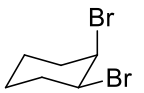
12. *Trans*-4-*t*-butylcyclohexyl tosylate does not undergo base catalysed E2 elimination reaction but the corresponding *cis*-isomer undergoes. Explain the observation with mechanism. (2M) [1b, 6th, 2021]

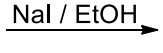
13. Draw all the possible conformations of *cis*-and *trans*-1,3-dimethylcyclohexanes. Comment on their relative stability based on steric interaction. (3M) [2a, 6th, 2021]

14. Explain the observation that *trans*-2-chlorocyclohexanol gives epoxycyclohexane under basic conditions whereas the *cis*-isomer gives cyclohexanone under the same condition. (2M)

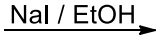
[2b, 6th, 2021]

15. Predict the product(s) with proper mechanism: (3M) [3a, 6th, 2021]

(i) 



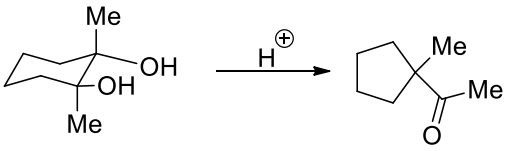
(ii) 



16. Draw the preferred conformation of 1-methyl-1-phenylcyclohexane and justify your answer. (2M)

[3b, 6th, 2021]

17. Explain the following reaction: (2M) [4b, 6th, 2021]



18. Write down the most stable conformation of *trans*-1,4-dimethylcyclohexane. (1M)

[1a, CC-12, 2020]

19. Draw the most stable chair conformation of 1-methy-1-phenylcyclohexane (1M). [1c, CC-12, 2020]

20. *Trans*-2-aminocyclohexanol on treatment with aqueous $NaNO_2$ and dilute HCl gives cyclopentanecarbaldehyde while its *cis*-isomer gives mixture of products. Explain. (3M)

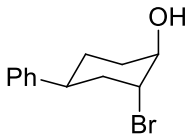
[4a, CC-12, 2020]

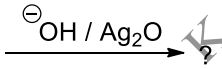
21. Explain why *cis*-4-hydroxycyclohexanecarboxylic acid lactonises on heating but the *trans*-isomer does not. (2M)

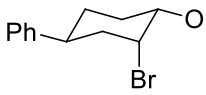
[4b, CC-12, 2020]

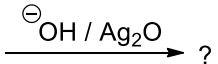
22. Write down the products of the following reactions with plausible mechanism: (3M)

[11a, CC-12, 2020]

(i) 



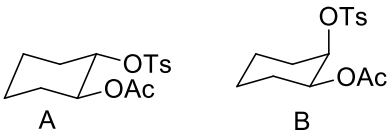
(ii) 



23. Explain the fact that *trans*-4-*tert*-butylcyclohexyl tosylate undergoes bimolecular elimination with the bases bromide and thiophenolate, although not with the much stronger base ethoxide. (2M)

[11b, CC-12, 2020]

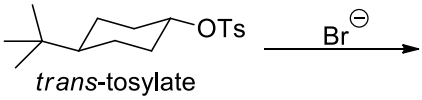
24. Both A and B produce same product on acetolysis. Explain. (3M) [1a, 6th, 2020]



25. On treatment with nitrous acid, *trans* isomer of 4-*t*-butylcyclohexyl amine gives corresponding alcohol with retention of configuration, but in the case of the *cis*-isomer, cyclohexene derivative is obtained. Explain this with mechanism. (2M)

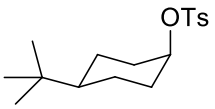
[1b, 6th, 2020]

26. Write down the product of the reaction with mechanism: (3M) [2a, 6th, 2020]

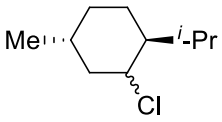


trans-tosylate

Instead of $Br^{\ominus}$, strong base like $EtO^{\ominus}$ has no effect on this trans isomer. Why? On similar treatment with $Br^{\ominus}$, what will be the product incase of *cis*-isomer



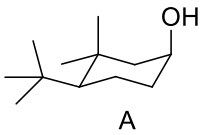
27. Two diastereoisomers of the following compound differ in the orientation of Cl. One isomer undergoes E2 dehydrohalogenation 200 times faster than the other. Draw the conformations of the two diastereoisomers and explain the observation. (3M)



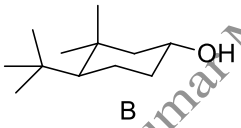
[3a, 6th, 2020]

28. Between the two isomers of 4-*tert*-butylcyclohexane carboxylic acid, which is the stronger acid and why? (2M) [3b, 6th, 2020]

29. Compare the rate of chromic acid oxidation of the compounds A and B and explain. (3M)



A



B

[4a, 6th, 2020]

30. *Cis*-1,2-dimethylcyclohexane exist as a non-resolvable *dl*-pair, why? (2M) [4b, 6th, 2020]

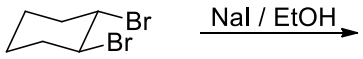
31. Draw all the possible conformations of 1,3-dihydroxycyclohexane. Also depict which conformation is most stable and which is optically inactive. (3M) [1a, 6th, 2019]

32. *Cis*-1-bromo-4-*t*-butylcyclohexane reacts rapidly with sodium ethoxide in ethanol to give 4-*t*-butylcycloxene. However, the *trans*-isomer undergoes elimination extremely slowly. Explain the observation with plausible mechanism. (2M) [1b, 6th, 2019]

33. Identify the product(s) in the following reactions with proper mechanisms: (3M) [2a, 6th, 2019]

(i)

(ii)

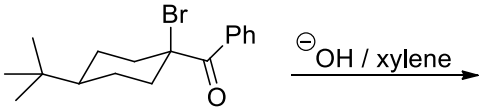


34. Applying conformational analysis, explain the observation that one of the diastereomers of 4-hydroxycyclohexanecarboxylic acid undergoes facile lactonisation on heating. (2M) [2b, 6th, 2019]

35. Give the product(s) along with the mechanisms when cis-2-aminocyclohexanol and cis-2-amino-4-tertiarybutylcyclohexanol are separately treated with sodium nitrite and dilute hydrochloric acid. (3M) [3a, 6th, 2019]

36. *Cis*-1,2-dibromocyclohexane is optically inactive but *cis*-1-bromo-2-chlorocyclohexane is optically active. explain. (2M) [3b, 6th, 2019]

37. Give the product of the following reaction along with mechanism. (2M) [5b, 6th, 2019]



38. The *cis*- and *trans*-stereoisomers of 4-chlorocyclohexanol give different products when they react with hydroxide ions. Identify the products and explain the reaction. (3M) [1a, 6th, 2018]

39. *Trans*-1,2-diaxialcyclohexane halohydrin undergoes epoxidation several times faster than diequatorial isomer. Explain. (2M) [1b, 6th, 2018]

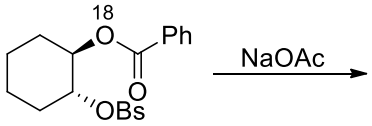
40. How can you use dipole moment values to distinguish between diastereomeric 1,2-dibromo-4-*tert*-butylcyclohexanes? (3M) [2a, 6th, 2018]

41. Isomeric 4-*tert*-butyl-3,3-dimethylcyclohexanols undergo chromic acid oxidation of different rates to give the same product. Explain this observation. (2M) [2b, 6th, 2018]

42. With appropriate conformations, delineate the preferred pathway for chair $\rightleftharpoons$ twist-boat interconversion of cyclohexane. Which symmetry element is retained along the pathway? Discuss. (3M) [3a, 6th, 2018]

43. Between *cis*- and *trans*-4-tertiarybutylcyclohexanecarboxylic acids which one is a stronger acid and why? (2M) [3b, 6th, 2018]

44. Predict mechanistically the product(s) formed in the following reaction: (3M)



[4a, 6th, 2018]

Predict the change in reaction rate when phenyl group is replaced by p-nitrophenyl group.

45. Acetolysis of both *cis*- and *trans*-tosylate shown below give the same *trans*-diacetate. Explain. (3M) [1a, 6th, 2017]

46. *Trans*-1,3-di-*tert*-butylcyclohexane prefers twist-boat conformation and readily passes to its *cis*-isomer on heating with Pd/C. Explain. (3M) [1b, 6th, 2017]

47. The *cis*-1,2-dimethylcyclohexane is less stable than its *trans*-isomer, but *cis*-1,3-dimethylcyclohexane is more stable than its *trans*-isomer. Draw the most stable conformations of both and explain. (3M) [3a, 6th, 2017]

48. Both *cis*- and *trans*-1,2-dibromocyclohexanes give the same product when heated with iodide ion. Identify the product and explain the recations. (3M) [4a, 6th, 2017]

49. Justify the fact that although iodine is larger than chorine, the conformational energies of chlorocyclohexane and iodocyclohexane are the same. (2M) [4b, 6th, 2017]

50. Explain the fact that *trans*-4-*tert*-butylcyclohexyl tosylate undergoes bimolecular elimination with thiophenolate, but not with much stronger base ethoxide. (2M) [5a, 6th, 2017]

51. Write the preferred conformation of 4-hydroxy-*N*-methylpiperidine with explanation. (2M) [5b, 6th, 2017]

52. Predict with reasons, which one of the following pair will undergo faster oxidation with chromic acid: (3M)

trans-4-*t*-butylcyclohexanol and *cis*-4-*t*-butylcyclohexanol [1a, 6th, 2016]

53. Justify the fact that although iodine is larger than chlorine, the conformational energies of chlorocyclohexane and iodocyclohexane are the same. (2M) [1b, 6th, 2016]

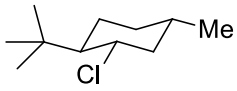
54. Ethyl *trans*-4-*t*-butylcyclohexane carboxylate undergoes base-catalysed hydrolysis twenty times faster than its *cis*-isomer, whereas *trans*-4-*t*-butylcyclohexyl *p*-nitrobenzoate undergoes similar hydrolysis only 2.5 times faster than its *cis*-isomer. Explain. (3M) [2a, 6th, 2016]

55. Write down the structures of the major products when both *cis*- and *trans*-2-phenylcyclohexyl xanthate are separately heated and also explain their formation. (3M) [3a, 6th, 2016]

56. Predict the product of the following reaction with suitable mechanism: (2M) [4b, 6th, 2016]

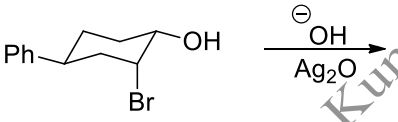
57. *Cis*-cyclohexane-1,2-diol is oxidised by periodic acid more rapidly than the corresponding *trans*-isomer. Explain. (3M) [1a, 6th, 2015]

58. What products do you expect when the following compound is treated with sodium ethoxide? Comment on the rate of the reaction. (2M) [1b, 6th, 2015]



59. Compare the rate of reaction of *cis*-and *trans*-4-*t*-butylcyclohexyl bromide with $PhS^{\ominus}\ Na^{\oplus}$. Furnish reasoning in favour of your comparison with proper schematic diagrams. (3M) [2a, 6th, 2015]

60. Identify the major product of the following reaction showing the mechanism of the reaction. GIve reason in short. (2M) [2b, 6th, 2015]



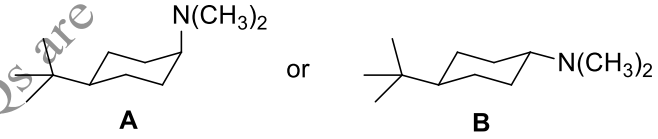
61. Identify the products of the following reactions and give plausible mechanism: (3M)

[3a, 6th, 2015]

62. What happens when *cis*- and *trans*-isomers of 3-hydroxycyclohexanecarboxylic acid are heated separately? (2M) [3b, 6th, 2015]

63. Distinguish the diastereomers of 1,2-dibromocyclohexanes from their dipole moment measurements if one shows 3.12 D while the other shows 2.11 D. (3M) [1a, 6th, 2014]

64. Which isomers **A** or **B** will be converted to a quaternary salt more rapidly? (2M) [1b, 6th, 2014]



A **B**

65. Explain the following observation: (3M) [2a, 6th, 2014]

Trans-2-aminocyclohexanol on treatment with aqueous $NaNO_2$ and dilute HCl gives cyclopentane carboxaldehyde while its *cis*-isomer gives mixture of products.

66. Explain the following observation: (2M) [2b, 6th, 2014]

Trans-4-t-butylcyclohexyl tosylate undergoes bimolecular elimination reaction with bromide ion rather than with a stronger base ethoxide ion. Explain.

67. Discuss the relative stability of cyclopropane and cyclohexane in the light of Baeyer Strain theory. (2M) [3a, 6th, 2014]

68. Comment on the optical activity of (1*R*,3*R*)-1,3-dimethylcyclohexane. (2M) [4a, 6th, 2014]

69. With appropriate conformations, delineate the preferred pathway for 'chair $\rightleftharpoons$ twist-boat' interconversion of cyclohexane. Which symmetry element is retained along the pathway? Discuss. (3M) [5a, 6th, 2014]

70. Draw stable conformations of *cis*-and *trans*-1,2-cyclohexanediol. Which one will readily form ketal with acetone? (2M) [5b, 6th, 2014]

71. Both *cis*- and *trans*-2-acetoxycyclohexyl tosylates on acetolysis give the same product. Explain. (2M) [1a, 6th, 2013]

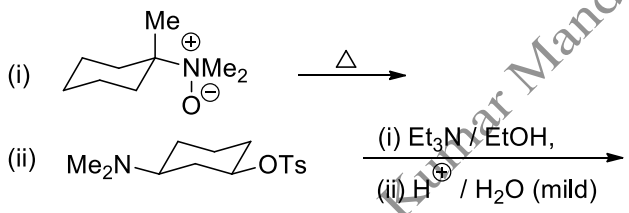
72. Draw all possible chair conformations of any one enantiomer of *trans*-1,2-dimethylcyclohexane. Although the conformation of *cis*-1,2-dimethylcyclohexane is chiral, yet it is optically inactive. Explain. (3M) [1b, 6th, 2013]

73. Predict with reasons which of the following will undergo faster oxidation with chromic acid. (3M)

(i) *Trans*-4-*t*-butylcyclohexanol (ii) *Cis*-4-*t*-butylcyclohexanol [2a, 6th, 2013]

74. *Cis*-4-hydroxycyclohexanecarboxylic acid readily forms a lactone, but the *trans*-isomer fails to do so. Explain. (2M) [3b, 6th, 2013]

75. Predict the product with mechanism(s) with mechanism: (3M) [4a, 6th, 2013]



76. Draw the preferred conformation of 1-methyl-1-phenylcyclohexane and justify your answer. (2M) [4b, 6th, 2013]

77. Draw the preferred conformation of *cis*-and *trans*-4-*t*-butylcyclohexanecarboxylic acid and comment on their acidity. (2M) [5a, 6th, 2013]

78. Esters of *trans*-4-*t*-butylcyclohexanecarboxylic acid undergoes saponification at a much faster rate than the *cis*-isomer. Explain. (3M) [5b, 6th, 2013]

79. Equal amounts of (*a*,*a*) and (*e*,*e*) conformers of *trans*-1,2-dibromocyclohexane exist in non-polar solvents but the (*e*,*e*) conformation prevails in polar solvents. Explain. (2M) [9a, 5th, 2012]

80. *Trans*-4-*t*-butylcyclohexyl tosylate undergoes bimolecular elimination reaction with bromide ion rather than with a stronger base ethoxide ion. Explain. (2M) [9c(i), 5th, 2012]

81. Rates of periodate oxidation for *cis*-and *trans*-1,2-cyclohexane diol are different. Explain. (2M) [9c(ii), 5th, 2012]

82. *Trans*-2-aminocyclohexanol on treatment with aqueous $NaNO_2$ and dilute HCl gives cyclopentane carboxaldehyde while its *cis*-isomer gives mixture of cyclopentane carboxaldehyde and cyclohexanone. Explain. (2M) [9c(iii), 5th, 2012]

83. Draw the energy profile diagram and discuss the ring inversion of cyclohexane following the C_2-pathway. (4M) [10a, 5th, 2012]

84. *Cis*- and *trans*-cyclohexane-1,2-diol are each treated with (i) 1 molecule of $(CH_3CO)_2O$; (ii) a second molecule of $(CH_3CO)_2O$. Are the rates of first and second acetylation reactions the same or different? Explain. (2M) [10b, 5th, 2012]

85. Write down the structures of the major products when both *cis*- and *trans*-2-phenylcyclohexyl xanthates are separately heated. Explain their formation. (2M) [10c, 5th, 2012]

86. *Cis*-1,2-dimethylcyclohexane is opically inactive at ordinary temperature though the molecule is chiral in either conformation of its chair representation. How can you explain this fact? (2M) [9a, 5th, 2011]

87. Compare the rates of esterification of *cis*- and *trans*-4-*t*-butylcyclohexanecarboxylic acids and justify your answer. (2M) [9b, 5th, 2011]

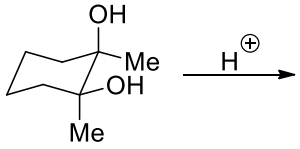
88. Rate of base catalysed elimination of menthyl chloride is 189 times slower than that of neomenthyl chloride. Explain. (3M) [9c, 5th, 2011]

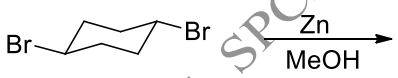
89. Draw all possible conformations of *trans*-1,2-cyclohexanecarboxylic acid and comment on their relative stabilities with reasons. (2M) [9d, 5th, 2011]

90. *Cis*-4-hydroxycyclohexanecarboxylic acid readily forms a lactone but *trans*-isomer cannot. Explain. (3M) [10a, 5th, 2011]

91. Explain why *cis*-1,4-cyclohexanediol exists preferably in twist-boat conformation. (2M) [10b, 5th, 2011]

92. Predict the products of the following reaction with relevant explanation: (2M each) [10e, 5th, 2011]

(i) 

(ii) 

93. Draw chair conformation of (*R*,*S*)-1,2-dimethylcyclohexane. Is the conformation chiral? Hence predict whether the compound would be optically active or not. (3M) [9a, 5th, 2011]

94. Both *cis*-3-hydroxycyclohexanecarboxylic acid and *cis*-4-hydroxycyclohexanecarboboxylic acid produce lactone on heating. Explain. (2M) [9b(i), 5th, 2011]

95. Write the product(s) formed when (1*R*,2*R*)-2-acetoxycyclohexyl tosylate is treated with NaOAc / AcOH and explain. (2M) [9b(ii), 5th, 2011]

96. Conformational free energy values of Cl and I atoms in cyclohexane system are almost identical, even though the size of iodine is larger than that of chlorine. Explain. (2M) [10a(i), 5th, 2011]

97. *Trans*-2-chlorocyclohexanol gives epoxy cyclohexane under basic conditions whereas *cis*-isomer gives cyclohexanone under the same conditions. Explain. (2M) [10a(ii), 5th, 2011]

98. *Trans*-4-*t*-butylcyclohexanecarboxylic acid is a stronger acid than its *cis*-isomer. Explain. (2M) [10a(iii), 5th, 2011]

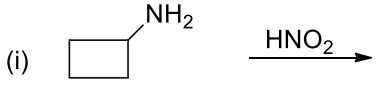
99. Ethyl *trans*-4-*t*-butylcyclohexane carboxylate undergoes base-catalysed hydrolysis faster than its *cis*-isomer. Explain. (2M) [10a(iv), 5th, 2011]

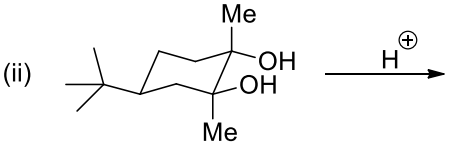
100. *Cis*-4-*t*-butylcyclohexanol undergoes faster oxidation with chromic acid than its *trans*-isomer. Explain. (2M) [10a(v), 5th, 2011]

101. Predict the product(s) with stereochemistry of the following reaction: (2M) [10b(iii), 5th, 2011]

102. Explain why *cis*-1,3-dimethylcyclopentane exists in the envelope form. (2M) [8a, 5th, 2011]

103. Identify the product(s) of the following reactions and give plausible mechanism: (2M each) [8b, 5th, 2011]

(i) 

(ii) 

104. Write down the structures of the major products obtained when both *cis*- and *trans*-2-phenylcyclohexyl xanthate are separately heated. Also explain their formation. (2M) [8c, 5th, 2011]

105. *Cis*-1-bromo-4-*t*-butylcyclohexane reacts rapidly with NaOEt in ethanol to give 4-*t*-butylcyclohexene. However, the *trans*-isomer undergoes elinination extremely slowly. (2M)
[12e, 5th, 2011]

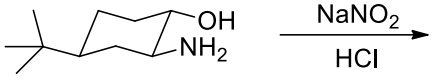
106. Draw all the possible conformations of *cis*-1,3-dimethylcyclohexane and comment on their relative stability. Is the molecule chiral? Justify your answer. (3M) [9a, 5th, 2010]

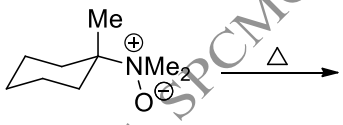
107. Draw with proper labeling the energy profile for the flipping of chair conformation of cyclohexane. (2M) [9b, 5th, 2010]

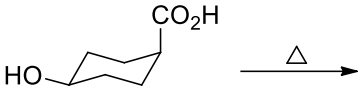
108. Explain mechanistically the product(s) formed on acetolysis (with NaOAc / AcOH) of (i) (1*R*,2*S*)-2-acetoxycylohexyl tosylate, and (ii) (1*R*,2*R*)-2-acetoxycylohexyl tosylate. Which of the above reactions would occur faster? (4M) [9c, 5th, 2010]

109. Draw the preferred chair conformation of phenylcyclohexane in Newman projection formula. (1M) [9f, 5th, 2010]

110. Predict the product(s) of the following reactions with pausible mechanism in each case: (2M each)

(i) 

(ii) 

(iii) 

[10a, 5th, 2010]

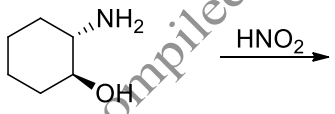
111. Between *cis*-and *trans*-4-*t*-butylcyclohexanecarboxylic acids which is stronger and why? (2M)
[10b, 5th, 2010]

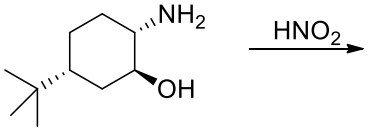
112. *Cis*-1,4-di-*t*-butylcyclohexane exist preferentially in the twist boat conformation. Explain. (2M)
[10f, 5th, 2010]

113. What do you mean by conformational free energy of a substituent in a cyclohexane system. The conformational free energy of phenyl is about twice that of vinyl in cyclohexane system. Explain. (3M)
[9a, 5th, 2010]

114. Between *trans*-1,2-dichlorocyclohexane and *cis*-1,2-dichlorocyclohexane, which would possess larger amount of (*a*,*a*) form in conformational equilibrium? Give reasoms. (2M) [9b, 5th, 2010]

115. Compare the following reactions with reference to the reaction course followed and the product(s) formed. Give proper explanation in support of your answer. (4M) [9c, 5th, 2010]

(i) 

(ii) 

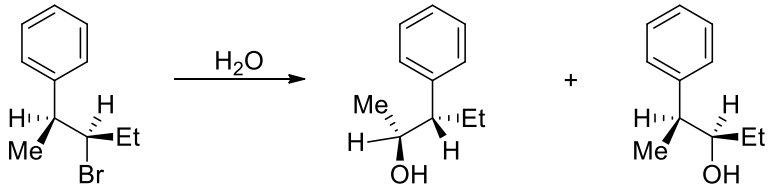
116. With appropriate conformations, delineate the preferred pathway for 'chair ⇌ twiat-boat' interconversion of cyclohexane. Which symmetry element is retained along the pathway? Discuss. (4M)
[10a, 5th, 2010]

117. *Trans*-1,3-di-*tert*-butylcyclohexane prefers twist-boat conformation and readily passes to its *cis*-isomer on heating with Pd/C. Explain. (2M) [10b, 5th, 2010]

118. Both *cis* and *trans*-1,2-dibromocyclohexane, on heating with $I^{\ominus}$, give cyclohexene. Explain mechanistically. Predict their relative rates with reason. (2M) [10c, 5th, 2010]

119. Explain why the *trans*-2-acetoxycyclohexyl tosylate undergoes acetolysis 670 times faster than the corresponding reaction of *cis*-2-acetoxycyclohexyl tosylate and that the product has the same *trans*-stereochemistry in both the cases. (3M) [9a, 5th, 2009]

120. Explain the following reaction: (2M) [9b, 5th, 2009]



121. Explain the formation of different products by the action of acid on *trans*- and *cis*-1,2-dimethyl-1,2-cyclohexanediols. (3M) [9c, 5th, 2009]

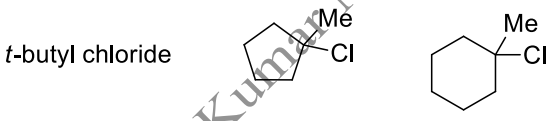
122. Discuss the symmetry property of skew-boat conformation of cyclohexane. (2M) [9d, 5th, 2009]

123. *Cis*-form of 1,2-dimethylcyclohexane esists as a pair of conformational enantiomers and it is difficult to separate them - explain. Under which condition can their interconversion be stopped? (2M) [9e, 5th, 2009]

124. When *trans*- 2-methylcyclohexanol is treated with *p*-toluenesulfonyl chloride followed by KOEt, 3-methylcyclohexene is the only product; on the other hand, *cis*-2-methylcyclohexanol, under the same reaction condition, gives 1-methylcyclohexene as the main product. Account for this difference. (2.5M) [10a, 5th, 2009]

125. Ethyl *trans*- 4-*t*-butylcyclohexanecarboxylate undergoes base-catalysed hydrolysis twenty times faster than its *cis*-isomer, whereas *trans*-4-*t*-butylcyclohexyl *p*-nitrobenzoate undergoes similar hydrolysis only 2.5 times faster than its *cis*-isomer. Explain. (3M) [10b, 5th, 2009]

126. Account for the following observation. (2M) [10c, 5th, 2009]



Relative rates of hydrolysis: 1.0 43.7 0.35

127. Predict, with reasons, which one of the following pair will undergo faster oxidation with chromic acid. (3M) [10f, 5th, 2009]

trans-4-*t*-butylcyclohexanol and *cis*-4-*t*-butylcyclohexanol

128. Both *cis*- and *trans*-4-hydroxycyclohexanecarboxylic acids are separately heated. Indicate the structural changes, if any. (2M) [10g, 5th, 2009]

129. Indicate the stereochemistry of the 4-hydroxycyclohexanecarboxylic acid which lactonises on heating. Explain your answer. (2M) [9a, 5th, 2009]

130. Draw the possible conformations of *trans*-2-bromocyclohexanol. Indicate their relative proportion in the aggregate. (2M) [9c, 5th, 2009]

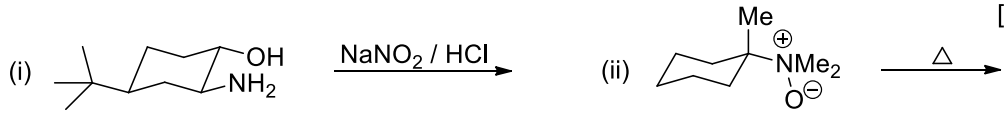
131. What are the symmetry elements present in the chair form of cyclohexane. (2M) [9g, 5th, 2009]

132. Predict, with reasons, which of the following pair will react faster with chromic acid. (2M)

trans-4-*t*-butylcyclohexanol and *cis*-4-*t*-butylcyclohexanol [10a, 5th, 2009]

133. *Cis*-1-bromo-4-*t*-butylcyclohexane reacts rapidly with sodium ethoxide in ethanol to give 4-*t*-butylcyclohexene. However, the *trans*-isomer undergoes elimination extremely slowly. Explain. (2M) [10b, 5th, 2009]

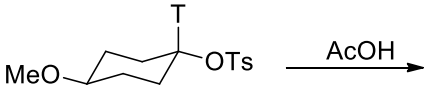
134. Predict the products of the following reactions with plausible mechanism in each case. (2M) [10c, 5th, 2009]

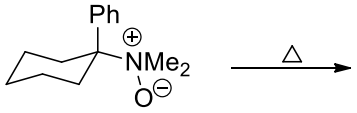


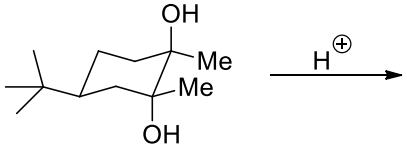
135. One of the diastereomeric 4-hydroxycyclohexanecarboxylic acids forms lactone on heating. Identify it and explain the formation of the product. (2M) [8a, 5th, 2009]

136. How can you identify the diastereoisomeric 1,2-dibromocyclohexanes from their dipole moment measurement? (2M) [8c, 5th, 2009]

137. Predict the products: (2M each) [8d, 5th, 2009]

(i) 

(ii) 

(iii) 

138. Draw the preferred conformation of *cis*-and *trans*-1-phenyl-2-aminocyclohexanol. (2M) [12f, 5th, 2009]

139. Predict with proper reasoning the preferred conformation between the *cis*-and *trans*-1-phenyl-2-aminocyclohexanols. (3M) [9a, 5th, 2008]

140. Solvolysis rate of the *cis*-isomer of 4-*tert*-butylcyclohexyl tosylate is greater than that of the *trans*-isomer. (3M) [9b, 5th, 2008]

141. Draw the energy profile diagram and discuss the ring inversion of cyclohexane following the C_2-pathway. (4M) [9c, 5th, 2008]

142. Draw the preferred conformation of 1-methyl-1-phenylcyclohexane and justify your answer. (2M) [9d, 5th, 2008]

143. Draw all possible chair conformations of (1*R*,3*S*)-1-methyl-3-bromocyclohexane and indicate the most stable conformer. (3M) [10a, 5th, 2008]

144. Explain the fact that *trans*-4-*tert*-butylcyclohexyl tosylate undergoes bimolecular elimination with the bases bromide and thiophenolate, although not with the much stronger base ethoxide. (3M) [10b, 5th, 2008]

145. Between *cis*- and *trans*-isomers of 4-hydroxycyclohexanecarboxylic acid, the former readily forms lactone while the other does not. Explain. (2M) [10c, 5th, 2008]

146. What are the symmetry elements present in the boat form of cyclohexane? (1M) [10d, 5th, 2008]

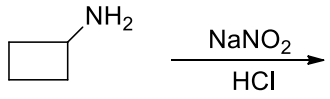
147. Justify the fact that although iodine is larger than chlorine, the conformational energies of chlorocyclohexane and iodocyclohexane are the same. (2M) [10e, 5th, 2008]

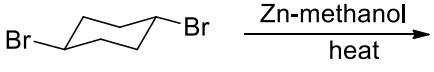
148. *Cis*-1,2-dimethylcyclohexane is optically inactive though it possesses no S_n axis. Account this observation with justificaton. (2M) [8a(i), 5th, 2008]

149. Cyclohexanone reacs faster than cyclopentanone towards HCN addition. Account this observation with justificaton. (2M) [8a(ii), 5th, 2008]

150. Write the most stable conformer of *cis*-1,2-di-tertiarybutylcyclohexane and give reasons for its stability. (2M) [8b, 5th, 2008]

151. Predict the product(s) of the following reactions with plausible mechanism in each case. (2M) [8c, 5th, 2008]

(i) 

(ii) 

152. The dipole moment of *trans*-1,3-dibromocyclobutane is not zero. Give reason. (2M) [12c, 5th, 2008]

153. Predict the product of the following reaction with suitable mechansim. (2M) [12d, 5th, 2008]