

8. HALOALKANES (ALKYL HALIDES)

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Introduction

1. An alkyl halide is represented by the general formula
a. $C_nH_{2n-1}X$ b. $C_nH_{2n}X$ c. $C_nH_{2n+1}X$ d. $C_nH_{2n-2}X$
2. A haloalkane has the molecular formula C_3H_7Cl . How many structural isomers are possible?
a) 1 b) 2 c) 3 d) 4
3. The number of primary alkyl halides having molecular formula C_4H_9X is
a. 1 b. 2 c. 4 d. 3
4. 2-bromohexane is an example of
a. Haloarene c. Primary haloalkane b. Secondary haloalkane d. Tertiary haloalkane
5. Which of the following is a primary haloalkane?
A. 2-bromopropane B. 1-bromopropane C. tert-butyl chloride D. isopropyl chloride
6. Which shows position isomerism?
A. CH_3Cl B. C_2H_5Cl C. C_3H_7Cl D. CH_4
7. Which of the following correctly matches the common name with its classification?
a) Methyl bromide – Secondary haloalkane b) Isopropyl chloride – Primary haloalkane
c) tert-Butyl bromide – Tertiary haloalkane d) n-Propyl iodide – Secondary haloalkane
8. The IUPAC name of $(CH_3)_2CH-CH_2-Br$ is:
a) 1-Bromo-2-methylpropane b) 2-Bromobutane
c) 1-Bromo-2,2-dimethylethane d) 2-Bromo-1-methylpropane
9. Which type of isomerism is possible in 1-chloropropane and 2-chloropropane?
a) Chain isomerism b) Position isomerism c) Functional isomerism d) Metamerism
10. A student writes the formula of a compound as C_4H_9Br . Which of the following is **not** a possible structural isomer?
a) 1-Bromobutane b) 2-Bromobutane c) 1-Bromo-2-methylpropane d) 2-Bromo-2-ethylpropane

Preparation

11. How many monochlorobutanes will be possible on the chlorination of n-butane?
a. 1 b. 2 c. 3 d. 5
12. When **Propylene** reacts with HCl in the presence of traces of organic peroxide, it follows
a. Markovnikov's rule c. Anti-Markovnikov's rule
b. Free radical addition d. Chain reaction
13. When But-1-ene reacts with HBr gives 1-bromobutane in the presence of peroxide, it follows
a. Markovnikov's rule b. anti-Markovnikov's rule c. Saytzeff's rule d. Hofmann's rule
14. When propene reacts with HCl in the presence of benzoyl peroxide, it forms products according to
a. Kharasch rule b. Markovnikov's rule
c. Saytzeff's rule d. Anti-Markovnikov's rule
15. Ethyl alcohol gives ethyl chloride with the help of
a. $SOCl_2$ b. NaCl c. Cl_2 d. KCl
16. Which hydrogen halide requires $ZnCl_2$ catalyst to react readily with alcohols?
a. HCl b. HBr c. Both HCl and HBr d. HI
17. Which reagent is best for preparing chloroalkanes from alcohols?
A. HCl B. PCl_5 C. $SOCl_2$ D. Cl_2
18. Which reagent can't be used to prepare an alkyl halide from an alcohol?
a. PCl_5 b. NaCl c. $SOCl_2$ d. $ZnCl_2 + HCl$
19. Which reaction is used to prepare chloroethane from ethene?
a) Substitution b) Elimination c) Addition d) Oxidation

20. Chlorination of methane proceeds by
 a. electrophilic substitution b. nucleophilic substitution
 c. free radical substitution d. elimination
21. When methane reacts with chlorine in the presence of sunlight, the product is a mixture. This reaction is an example of:
 a) Electrophilic addition b) Nucleophilic substitution
 c) Free radical substitution d) Elimination
22. Why is ZnCl_2 used when preparing a chloroalkane from an alcohol and concentrated HCl ?
 a) To absorb water produced b) To act as an oxidising agent
 c) To catalyse the slow reaction d) To prevent side reactions
23. Which reagent is preferred to prepare chloromethane from methanol because the by-products are gases that escape easily?
 a) PCl_5 b) SOCl_2 c) HCl/ZnCl_2 d) $\text{Cl}_2/\text{sunlight}$
24. The addition of HBr to propene in the presence of benzoyl peroxide gives:
 a) 2-Bromopropane (Markovnikov product) b) 1-Bromopropane (Anti-Markovnikov product)
 c) A mixture of both d) No reaction occurs
25. $\text{HX} + \text{alkene} \rightarrow \text{alkyl halide}$ is:
 a) Electrophilic addition b) Nucleophilic addition
 c) Electrophilic substitution d) Free radical substitution

Physical Properties

26. Which of the following compounds is nonpolar?
 a. CH_3Cl b. CH_2Cl_2 c. CHCl_3 d. CCl_4
27. Which of the following has the highest boiling point among isomeric butyl chlorides?
 a. n-Butyl chloride b. sec-Butyl chloride
 c. Isobutyl chloride d. tert-Butyl chloride
28. The correct order of boiling points of alkyl halides is:
 A. $\text{RCl} > \text{RBr} > \text{RI}$ B. $\text{RI} > \text{RBr} > \text{RCl}$ C. $\text{RBr} > \text{RCl} > \text{RI}$ D. $\text{RCl} > \text{RI} > \text{RBr}$
29. Which of the following alkyl halides has the highest boiling point?
 a. $\text{C}_2\text{H}_5\text{F}$ b. $\text{C}_2\text{H}_5\text{I}$ c. $\text{C}_2\text{H}_5\text{Br}$ d. $\text{C}_2\text{H}_5\text{Cl}$
30. Haloalkanes are insoluble in water because:
 A. They are ionic B. They are nonpolar
 C. They react with water D. They are acidic
31. Alkyl halides are insoluble in water because
 a. They are non-polar b. Can't form intermolecular H-bond
 c. Higher molecular mass d. They are polar in nature

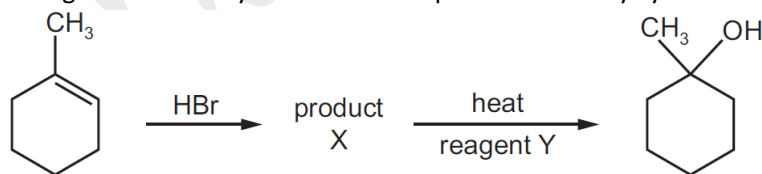
Chemical Properties

32. What is true of **every** nucleophile?
A It attacks a double bond. **B** It donates a lone pair of electrons.
C It is a single atom. **D** It is negatively charged.
33. Which of the following is not a nucleophile?
 A. OH^- B. CN^- C. NH_3 D. H^+
34. $\text{S}_\text{N}1$ reaction involves the formation of
 a. carbocation b. carboanion c. free radical d. carbene
35. Which of the following shows the $\text{S}_\text{N}1$ reaction fastest?
 A. CH_3Cl B. $\text{CH}_3\text{CH}_2\text{Cl}$ C. $(\text{CH}_3)_2\text{CHCl}$ D. $(\text{CH}_3)_3\text{CCl}$
36. $\text{S}_\text{N}1$ reaction mechanism involvesstep(s).
 a. 1 b. 2 c. 3 d. 4

37. Which undergoes nucleophilic substitution exclusively by the SN1 mechanism?
 a) Ethyl chloride b) Benzyl chloride c) Isopropyl chloride d) sec-Butyl chloride
38. The rate of an SN1 reaction depends on:
 a) Concentration of haloalkane only b) Concentration of nucleophile only
 c) Concentration of both haloalkane and nucleophile d) Temperature only
39. Assertion (A): Tertiary haloalkanes undergo SN1 reaction faster than primary haloalkanes.
 Reason (R): Tertiary carbocations are more stable than primary carbocations.
 A. Both A and R are true, and R is the correct explanation
 B. Both A and R are true, but R is NOT the correct explanation
 C. A is true, but R is false
 D. A is false, but R is true
40. SN² mechanism proceeds through the intervention of
 a. Carbonium ion b. Carbocation c. Carbanion d. Transition state
41. The rate law of the SN2 reaction is:
 A. rate = $k[R-X]$ B. rate = $k[Nu^-]$ C. rate = $k[R-X][Nu^-]$ D. rate = $k[R-X]^2$
42. Which statement about the SN2 reaction is **correct**?
 a) It occurs in two steps b) It involves a carbocation intermediate
 c) It shows first-order kinetics d) It shows second-order kinetics
43. Which of the following will react fastest by the SN2 mechanism?
 a) $(CH_3)_3C-Br$ b) CH_3-Br c) $(CH_3)_2CH-Br$ d) CH_3CH_2-Br
44. A secondary haloalkane is treated with a nucleophile. The reaction proceeds by:
 a) Only SN1 mechanism b) Only SN2 mechanism
 c) Either SN1 or SN2 depending on conditions d) Neither mechanism
45. In the SN² reaction, the rate of reaction depends upon
 a. concentration of alkyl halide b. concentration of nucleophile
 c. concentration of both alkyl halide and nucleophile d. none of these

Reaction with aq. NaOH/KOH

46. An alkyl halide can be converted to an alcohol by
 a. Addition b. Elimination c. Substitution d. Dehydrogenation
47. Hydrolysis of alkyl halide with aqueous caustic alkali is
 a. electrophilic substitution b. nucleophilic substitution
 c. free radical substitution d. nucleophilic addition
48. The diagram shows a synthetic route to produce 1-methylcyclohexanol.



What is reagent Y?

- A aqueous NaOH B cold dilute $KMnO_4$ C ethanolic NaOH D hot concentrated $KMnO_4$
49. Which of the following gives alcohol?
 A. $R-X + KOH$ (alc) B. $R-X + KOH$ (aq) C. $R-X + Na$ D. $R-X + AgCN$
50. When ethyl bromide is treated with aqueous KOH, the product is:
 a) Ethene b) Ethanol c) Diethyl ether d) Ethyl nitrite

Williamson's Etherification

51. Methyl iodide reacts with sodium ethoxide to form:

- a. $\text{CH}_3\text{COOCH}_3$ c. CH_3COCH_3 b. $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$ d. $\text{CH}_3\text{OCH}_2\text{CH}_3$
52. The reaction of an alkyl halide with sodium alkoxide yields
 a. Ether b. Alcohol c. Haloalkane d. Alkene
53. Williamson's synthesis is used to prepare:
 a) Alcohols b) Alkenes c) Ethers d) Nitriles
54. When the compound sodium ethoxide reacts with chloroethane, it forms the compound $\text{C}_4\text{H}_{10}\text{O}$. What reaction is this?
 a. Wurtz reaction c. Williamson's synthesis
 b. Rosenmund reaction d. Dehydrohalogenation reaction
55. When the compound sodium ethoxide reacts with chloroethane, it gives the compound $\text{C}_4\text{H}_{10}\text{O}$. What is this reaction called?
 a. Wurtz reaction c. Williamson's synthesis
 b. Rosenmund's reduction d. Dehydrohalogenation reaction
56. When ethyl halide reacts with sodium ethoxide, diethyl ether is formed. This reaction is
 a. Williamson's synthesis c. Wurtz reaction
 b. Grignard's synthesis d. Kolbe's reaction.
57. The given reaction is an example of

$$\text{CH}_3\text{CH}_2\text{ONa} + \text{CH}_3\text{CH}_2\text{I} \longrightarrow \text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3 + \text{NaI}$$

 a. Grignard's synthesis c. Wurtz synthesis
 b. Nucleophilic substitution reaction d. Hoffmann's synthesis
58. Ethyl iodide reacts with sodium methoxide to give
 a. Methyl ethanoate c. Ethyl methanoate
 b. Methyl ethyl ether d. Ethyl ethyl ether
59. In Williamson's synthesis, RX reacts with RONa to give ROR . The most suitable RX is
 a. primary haloalkane c. secondary haloalkane
 b. tertiary haloalkane d. haloarene
60. Ethyl chloride is converted into diethyl ether by
 a. Perkin reaction c. Wurtz reaction
 b. Grignard's reagent d. Williamson's reaction
61. Which of the following gives ether?
 A. $\text{R-X} + \text{KOH (aq)}$ B. $\text{R-X} + \text{RO}^-$ C. $\text{R-X} + \text{NH}_3$ D. $\text{R-X} + \text{KCN}$
62. Williamson synthesis involves:
 a) Nucleophilic addition b) Electrophilic substitution c) SN^2 displacement d) SN^1 displacement
63. In Williamson's synthesis, the haloalkane is treated with:
 a) ammonia b) alcohol c) sodium alkoxide d) silver salt of fatty acid
64. Anisole is a product obtained from phenol by a reaction known as:
 a) etherification b) coupling c) oxidation d) esterification

Other Substitutions

65. Alkanenitrile is the IUPAC name of
 a. Alcohols b. Cyanides c. Esters d. Olefins
66. $\text{C}_2\text{H}_5\text{NC}$ is known as
 a. Ethyl isocyanide c. Ethyl carbylamine
 b. Both Ethyl isocyanide and Ethyl carbylamine d. None of these
67. Alkyl halide reacts with alcoholic AgCN to give
 a. Alkyl cyanide b. Alkyl isocyanide c. Alkyl isocyanate d. Nitrile
68. The product formed when ethyl bromide reacts with silver cyanide is
 a. Ethyl carbylamine c. Propionitrile
 b. Methyl carbylamine d. Acetonitrile

69. The reaction of preparing alkyl cyanide by reacting alkyl halide with potassium cyanide is
 a. Elimination reaction c. Electrophilic reaction
 b. Nucleophilic reaction d. Condensation reaction
70. Which reagent gives nitrile from a haloalkane?
 A. KOH (aq) B. KCN (alc) C. AgCN D. NH₃
71. The product formed by the reaction of Chloroethane with alc. NaCN is
 a. Ethanenitrile c. Ethyl isocyanide b. Propanenitrile d. Propane isocyanide
72. Alkyl halides react with alcoholic AgCN to form
 a. alkyl cyanide b. alkyl cyanate c. alkyl carbylamide d. alkyl nitrile
73. Assertion (A): AgCN gives isocyanides while KCN gives nitriles.
 Reason (R): CN⁻ is an ambident nucleophile.
 A. Both A and R are true, and R is the correct explanation
 B. Both A and R are true, but R is NOT the correct explanation
 C. A is true, but R is false
 D. A is false, but R is true
74. Assertion (A): Methyl halides do not undergo SN1 reactions.
 Reason (R): Methyl carbocation is highly unstable.
 A. Both A and R are true, and R is the correct explanation
 B. Both A and R are true, but R is NOT the correct explanation
 C. A is true, but R is false
 D. A is false, but R is true
75. $\text{C}_2\text{H}_5\text{I} \xrightarrow{\text{KNO}_2} \text{X}$. X is
 a. Ethyl nitrate c. Ethyl nitrite b. Ethanamine d. Nitroethane
76. Which of the following is an ambident nucleophile, meaning it can attack through two different atoms?
 A) NH₃ B) OH⁻ C) CN⁻ D) H₂O
77. Ethyl chloride reacts with alcoholic KCN to form:
 a) Ethyl isocyanide b) Ethyl cyanide (Propanenitrile) c) Ethyl nitrite d) Ethane
78. Butane nitrile is formed by the reaction of KCN with
 a. Propyl alcohol b. Butyl Chloride c. Butyl alcohol d. Propyl chloride
79. Why does AgCN give isocyanides while KCN gives cyanides when reacted with alkyl halides?
 a) AgCN is insoluble in water b) CN⁻ is an ambident nucleophile
 c) KCN is a weaker base d) Silver catalyses different reactions
80. Which reagent would you use to convert bromoethane to nitroethane?
 a) Alcoholic KNO₂ b) Alcoholic AgNO₂ c) Aqueous KNO₂ d) Concentrated HNO₃
81. Ethyl halides react with alcoholic silver nitrite to form
 a. Nitroethane c. Ethyl alcohol b. Ethyl nitrite d. Ethylene
82. The most common reaction that alkyl halide shows is
 a. Electrophilic addition c. Nucleophilic substitution
 b. Free radical addition d. Electrophilic substitution

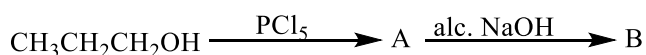
Elimination

83. Alkyl halide can be changed into an alkene by
 a. Addition b. Substitution c. Elimination d. Hydrogenation
84. Which of the following is an elimination reaction?
 a. Hydrogenation c. Halogenation b. Dehydrohalogenation d. Oxidation
85. Ethyl bromide on treatment with alc. KOH gives
 a. Ethyl alcohol c. Ethylene b. Acetic acid d. Ethane

86. Isopropyl chloride reacts with alcoholic KOH to give

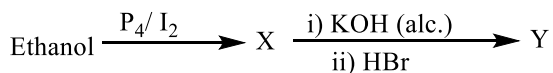
- a. Propane b. Propene c. Propyne d. Propanol

87. The compound B formed in the following sequence of reaction is



- a. Propane b. Propanol c. Propene d. Propyne

88. In the following sequence of reaction, Y is:



- a. Ethene c. Bromoethene b. Bromoethane d. Iodoethane

89. Which row describes the solvent used and the type of reaction occurring when bromoethane reacts with NaOH to form ethene?

	solvent	type of reaction
A	ethanol	elimination
B	ethanol	substitution
C	water	elimination
D	water	substitution

90. Saytzeff's rule is related to:

- A. Substitution B. Addition C. Elimination D. Oxidation

91. Which gives an alkene on reaction with alc. KOH?

- A. Alcohol B. Haloalkane C. Ether D. Amine

92. The reaction of 2-bromopropane with alcoholic KOH mainly gives:

- a) Propane b) Propene c) Propan-2-ol d) 1-Bromopropane

93. Saytzeff's rule states that in an elimination reaction, the major product is the alkene with:

- a) The fewest carbon atoms b) The most substituted double bond
c) The least substituted double bond d) The lowest molecular mass

94. When 2-bromobutane is treated with alcoholic KOH, two possible alkenes are formed. According to Saytzeff's rule, the major product will be:

- A) But-1-ene, because it is less substituted.
B) But-2-ene, because it has a more substituted double bond.
C) An equal mixture of both.
D) Butane, as no elimination occurs.

95. What is the key difference in reaction conditions that determines whether a haloalkane undergoes substitution or elimination?

- a) Temperature only b) Solvent (aqueous vs. alcoholic)
c) Concentration of haloalkane d) Presence of light

96. Alcoholic solution of KOH is used for

- a. Dehalogenation b. Dehydrohalogenation c. Dehydration d. Dehydrogenation

Wurtz Reaction

97. An alkyl halide 'A' reacts with Na in the presence of dry ether to form B. If the molecular formula of B is C_4H_{10} , what is 'A'?

- a. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$ b. $\text{CH}_3\text{CH}_2\text{Br}$ c. $\text{CH}_3\text{CHClCH}_3$ d. CH_3Cl

98. In the Wurtz reaction, two molecules of ethyl bromide react with sodium in dry ether to form:

- a) Ethane b) Propane c) Butane d) Pentane

99. Haloalkanes can be converted into higher alkanes by

- a. Coupling reaction c. Sand-Meyer reaction
b. Wurtz reaction d. Kolbe's reaction

100. A 3-carbon haloalkane undergoes a reaction to produce a 6-C alkane. Which of the following reactions might it have undergone?
- Williamson's synthesis
 - Reduction with LiAlH_4
 - Haloform reaction
 - Wurtz reaction
101. Ethane, as well as Methane, can be prepared in a single step from
- CH_3Br
 - $\text{C}_2\text{H}_5\text{Br}$
 - CH_3CHO
 - $\text{C}_2\text{H}_5\text{OH}$
102. The compound B formed in the following sequence of reaction is
- $$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH} \xrightarrow{\text{PCl}_5} \text{A} \xrightarrow{\text{alc. NaOH}} \text{B}$$
- Propane
 - Propanol
 - Propene
 - Propyne
103. The Wurtz reaction is **not suitable** for preparing alkanes from two different haloalkanes because:
- The reaction does not proceed
 - A mixture of three alkanes is obtained
 - Only the smaller alkane is formed
 - Elimination occurs instead
104. Which of the following reagents would be most suitable for converting an alkyl halide into an alkane with the same number of carbon atoms?
- Alcoholic KOH
 - Na in dry ether
 - LiAlH_4 in dry ether
 - Aqueous AgNO_3

Chloroform- Preparation

105. Haloforms are trihalogen derivatives of
- Ethane
 - methane
 - propane
 - benzene
106. Chloroform is prepared in the lab by heating bleaching powder with
- Ethanol
 - Acetone
 - Ethanal
 - All of the above
107. During lab preparation of Chloroform, an aqueous paste of bleaching powder acts as
- Chlorinating agent
 - Oxidising agent
 - Hydrolysing agent
 - All of the above
108. Chloral is
- $\text{Cl}-\text{CH}_3$
 - $\text{CCl}_3\text{COCH}_3$
 - Cl_3CCHO
 - Cl_2CCOOH
109. Pure Chloroform is obtained from chloral by treatment with:
- Cl_2
 - CaOCl_2
 - Both
 - None
110. Pure chloroform can be obtained from chloral by the action of
- $\text{Ca}(\text{OH})_2$
 - Cl_2
 - both
 - none
111. In a laboratory preparation of chloroform from ethanol and bleaching powder, the bleaching powder performs multiple roles. It acts as an oxidizing agent first, then as a chlorinating agent, and finally as a hydrolyzing agent. What is the intermediate compound formed after the chlorination step?
- Acetaldehyde
 - Trichloroacetaldehyde (Chloral)
 - Acetone
 - Dichloromethane

Chloroform Properties

112. Chloroform does not give white ppt. with silver nitrate because
- AgNO_3 is an ionic compound.
 - CHCl_3 does not ionise in water.
 - CHCl_3 is chemically inert.
 - AgNO_3 does not ionise in water.
113. Chloroform on oxidation gives:
- CO_2
 - CO
 - Phosgene
 - Methane
114. Which of the following compounds is used as an anaesthetic?
- ethylene
 - ethyl alcohol
 - chloroform
 - acetylene
115. Chloroform reacts with air in the presence of sunlight to give a poisonous gas called
- Phosphene
 - Phosgene
 - Lewisite
 - Sulphur gas
116. Which compound is added to Chloroform for commercial storage to convert poisonous phosgene gas into a non-poisonous compound?
- Diethyl carbonate
 - Ethanal
 - Ethyl alcohol
 - Chloroethane

117. Chloroform is stored in dark bottles because:
- It evaporates
 - It reacts with water
 - It forms phosgene in light
 - It decomposes in cold
118. Chloroform, on heating with water and zinc dust, gives
- CH_3Cl
 - CHCl_3
 - CH_4
 - CH_2Cl_2
119. Chloroform reacts with silver powder to give:
- Silver acetylide
 - Ethane
 - Ethyne
 - Silver formate
120. Chloroform, when heated with aq. KOH gives:
- Methanal
 - Potassium methanoate
 - Methanetriol
 - None
121. Trichloromethane reacts with alcoholic KOH, followed by acidification, gives
- carbonylchloride
 - methanoic acid
 - methanal
 - potassium methanoate
122. When Chloroform is treated with conc. HNO_3 gives
- CHCl_2NO_2
 - CCl_3NO_2
 - $\text{CHCl}_3\text{HNO}_3$
 - $\text{CHCl}_2\text{HNO}_3$
123. Reaction of chloroform with conc. HNO_3 gives:
- Chloropicrin
 - Methanol
 - Ethane
 - Acetone
124. Chloropicrin is obtained by the reaction of
- Steam on CCl_4
 - Nitric acid on chlorobenzene
 - Chlorine on picric acid
 - Nitric acid on chloroform
125. Which of the following is used as tear gas/war gas
- CCl_3CHO
 - CCl_3NO_3
 - CCl_3NO_2
 - $\text{C}_6\text{H}_5\text{NO}_2$
126. When Chloroform is treated with acetone, the product is
- Ethylide chloride
 - Mesitylene
 - Chloretone
 - Chloral
127. Chloretone is formed when chloroform reacts with:
- Acetone
 - Acetaldehyde
 - Nitric acid
 - Phenol
128. Chloropicrin is obtained by the reaction of:
- Steam on carbon tetrachloride
 - Nitric acid on chlorobenzene
 - Chlorine on picric acid
 - Nitric acid on chloroform
129. Which of the following statements best explains why chloroform (CHCl_3) is a liquid at room temperature while methane (CH_4) is a gas?
- Chloroform has stronger ionic bonds.
 - Chloroform has a higher molecular mass and stronger van der Waals forces.
 - Chloroform can form hydrogen bonds with itself.
 - Chlorine atoms are more electronegative than hydrogen.
130. In an SN^2 reaction, the nucleophile attacks the carbon atom from the backside, leading to an inversion of configuration. This is most analogous to:
- Flipping an umbrella inside out in a strong wind.
 - A key fitting perfectly into a lock.
 - Water flowing down a hill.
 - Two magnets repelling each other.
131. During an elimination reaction, the hybridisation of carbon atoms involved changes as shown below
- sp^3 to sp^2
 - sp^3 to sp
 - no change in hybridization
 - either (a) or (b)

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