有机化学问题、例题和习题

（习题答案部分）

吴　泳编

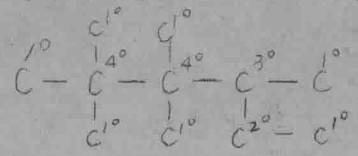
南平师专化学科印

目　录

第一章 脂肪烃

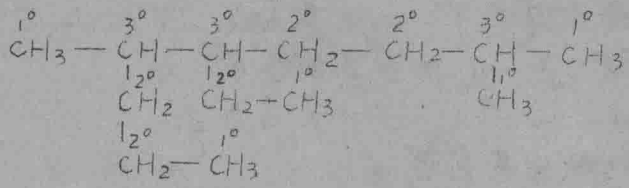
71、相同。它们只不过是从不同角度投影而已。

72. ①



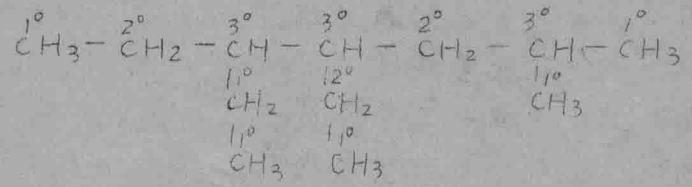
2,2,3,3,4 - 五甲基己烷

②



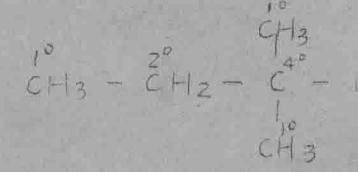
2,6 - 二甲基 - 5 - 乙基壬烷.

③



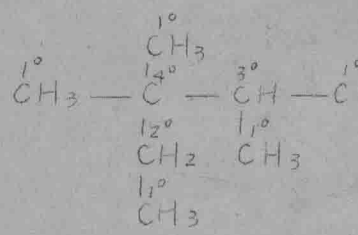
2 - 甲基 - 4,5 - 二乙基庚烷

73. ①



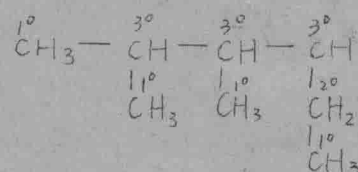
2,2 - 二甲基丁烷

②



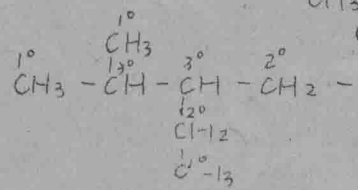
2,3,3 - 三甲基戊烷

③



2,3-二甲基-4-乙基己烷

④



2,2,5-三甲基-4-乙基己烷

(或2,2-二甲基-4-异丙基己烷)

74. ① 3-甲基-4-乙基庚烷 ② 2,4-二甲基-3-乙基戊烷

75. ① 3-甲基戊烷 ② 2,3,5-三甲基己烷

③ 3,4,9-三甲基癸烷 ④ 5-甲基-4-异丙基壬烷

76. ① 2,3,5-三甲基-4-丙基庚烷

② 2-甲基-4-乙基-4-异丙基庚烷

③ 4-乙基-5,7-二丙基-5-异丙基十五烷

77. ① 2-甲基丁烷 ② 3,3-二甲基戊烷

③ 5-甲基-5-乙基-4,7-二异丙基十一烷

78. ① 2-甲基戊烷 ② 3,4,5-三乙基庚烷

③ 2,3,3,4,4,5-六甲基己烷

79. ①、⑦相同，为2,4-二甲基戊烷

②、④相同，为3,3-二乙基戊烷

③、⑤相同，为2-甲基戊烷

⑥、⑧相同，为2,2,4-三甲基戊烷

80. ①②⑤⑦相同，为2,3-二甲基戊烷

③、④、⑩相同，为2,4,4-四甲基戊烷

⑥、⑧、⑨相同，为2-甲基-3,3-二乙基戊烷

81. 都是3-甲基己烷

82. ①、③、④、⑤、⑥为丁烷

②、⑦为2-甲基丙烷（异丁烷）

83. ① 2,3-二甲基丁烷 ② 2,2,3-三甲基丁烷

③ 2-甲基戊烷 ④ 3-甲基-3-乙基庚烷

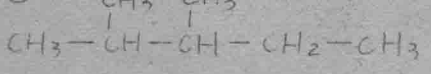
⑤ 2-3-二甲基-3-乙基戊烷

⑥ 2,5-二甲基-3,4-二乙基己烷

（或3,4-二异丙基己烷）

（或2-甲基-3-乙基-4-异丙基己烷）

84. ①



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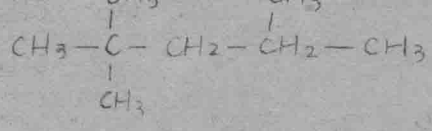

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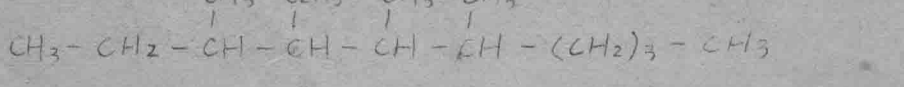

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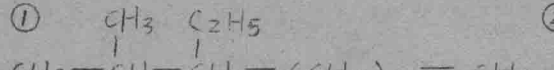

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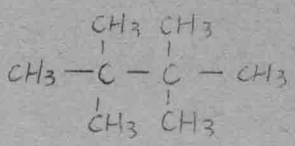

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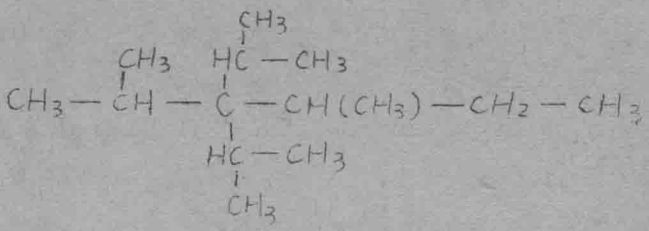

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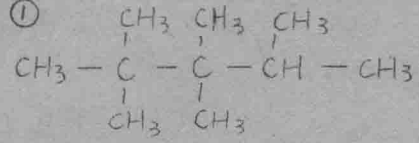

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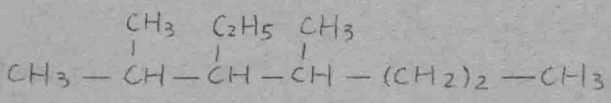

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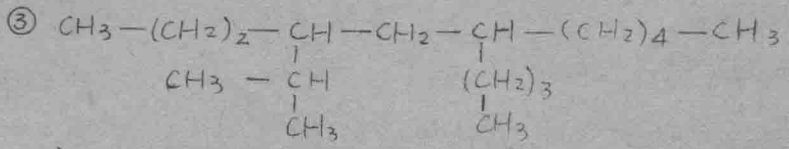
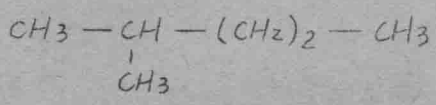
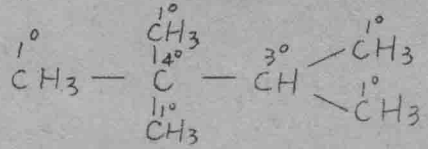


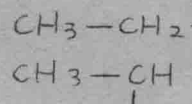
④分子量为86的烷烃为C_6H_{14}，因此

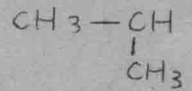


⑤分子量为100的烷烃为C_7H_{16}，因此

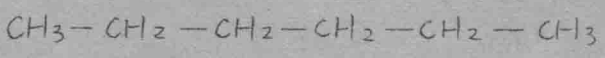


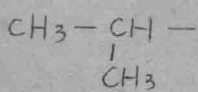
87、①C_4H_{10}可能有两种同分异构体，即：

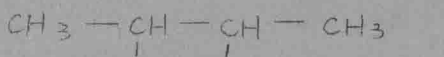

正丁烷

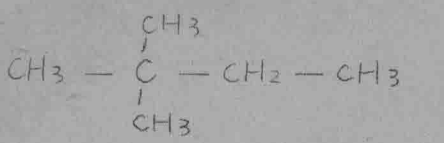

异丁烷(2-甲基丙烷)

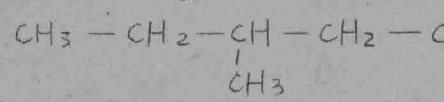
②C_6H_{14}可能有五种同分异构体即：


正己烷

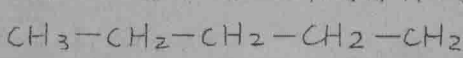

2-甲基戊烷

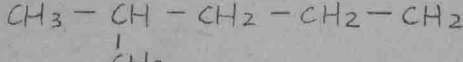

2,3-二甲基丁烷

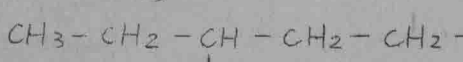

2,2-二甲基丁烷

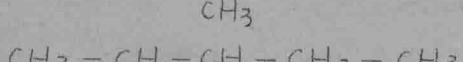

3-甲基戊烷

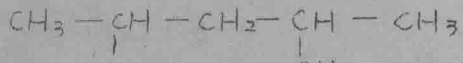
③ C_7H_{16} 可能有九种同分异构体，即：

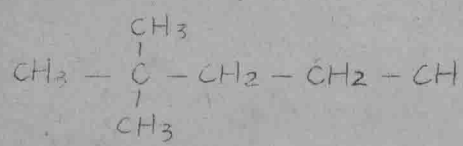

正庚烷


2-甲基己烷


3-甲基己烷


2,3-二甲基戊烷


2,4-二甲基戊烷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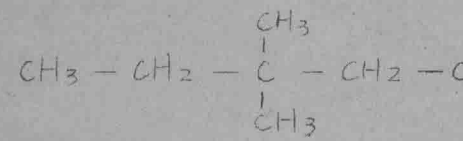
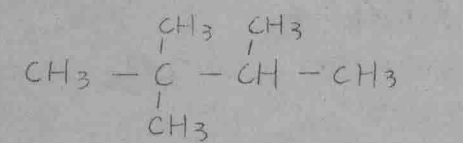
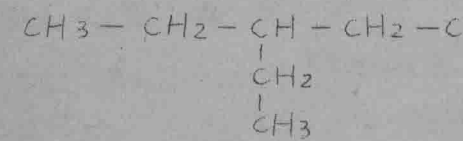

3,3-二甲基戊烷


2,2,3-三甲基丁烷


3-乙基戊烷

88. ① 3-甲基丁烯—[1]　② 4-甲基戊烯—[2]

③ 3-甲基-4-乙基己烯—[3]　④ 2,3,4-三甲基戊烯—[2]

89. ① 2-甲基戊烯—[2]　② 3-甲基丁炔—[1]

③ 3,3-二甲基丁烯—[1]

90. ①4-乙基-3-丙基庚烯—[1] ②3-甲基-4-异丙基庚烯—[3]
③2,2,5-三甲基-己炔—[3]
④庚烯—[2]—炔—[5] (或庚烯—[5]—炔—[2])
⑤3-特丁基—己二烯[2,4]

91. ①3-乙基己烯—[2] ②5-甲基己二烯—[1,3]
③2,5,6-三甲基庚炔—[3]
④8-甲基-4,4-二异丙基壬炔—[2]

92. ①2,2,6,6—四甲基庚炔—[3]
②4-甲基庚烯—[2]—炔—[5]
(或4-甲基庚烯—[5]—炔—[2])
③3-乙基己烯—[1]—炔—[4] ④己烯—[1]—炔—[5]

93. ①2,2-二甲基己烯—[3] ②2-甲基-4-乙基己烯—[3]
③3,3-二甲基戊烯—[1]

94. ①3-甲基-2-乙基丁烯—[1] ②4-甲基戊二烯—[1,3]
③2-甲基戊二烯—[2,3]

95. ①5-甲基己炔—[2] ②4-甲基戊烯—[1]
③3-甲基戊烯—[3]—炔—[1]

96. ① $CH_3-\underset{\underset{CH_3}{|}}{C}=CH-CH_2-\underset{\underset{CH_3}{|}}{CH}-CH_3$

② $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH=CH-\underset{\underset{CH_3}{|}}{CH}-CH_2-CH_3$

③ $CH_2=\underset{\underset{\underset{CH_3}{|}}{CH-CH_3}}{\overset{|}{C}}-CH(CH_3)-CH_2-CH_3$

97. ① $CH_3-CH=\underset{\underset{CH_3}{|}}{C}-\underset{\underset{CH_3}{|}}{\overset{CH_3}{\overset{|}{C}}}-CH_3$

② $CH\equiv C-\underset{\underset{CH_3}{|}}{CH}-CH_2-CH_3$

③ $CH\equiv C-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{\underset{CH_3}{|}}{CH-CH_3}}{\overset{\overset{CH_2-CH_2-CH_3}{|}}{C}}-CH_2-\underset{\underset{CH_3}{|}}{CH}-C\equiv CH$

98. ①1,1,2,3-四甲基环己烷 ②1-甲基-3-乙基环戊烷
③1-乙基-2-异丙基环丙烷 ④1,2-二甲基-3-乙基环丁烷

99. ①3-甲基环戊烯—[1]
②2-甲基-3-乙基-环己烯—[1]
③环己二烯—[1,4] ④环辛四烯—[1,3,5,7]

100. ①螺[3,4]辛烷 ②二环[3,2,0^{1,5}]庚烷
③二环[2,2,1]庚烷

101. ①二环[4,1,0^{1,6}]庚烷
②1,8-二甲基-2-乙基二环[3,2,1]辛烷
③二环[3,2,1]辛烷

102. 可能有二十八种构造异构和顺反异构的同分异构体：

① $CH_2=CH(CH_2)_3CH_3$ 己烯—[1]

② $CH_2=C(CH_3)-(CH_2)_2CH_3$ 2-甲基戊烯—[1]

③ $CH_2=CH-CH(CH_3)-CH_2-CH_3$ 3-甲基戊烯—[1]

④ $CH_2=CH-CH_2-CH(CH_3)-CH_3$ 4-甲基戊烯—[1]

⑤ $CH_2=CH-C(CH_3)_2-CH_3$ 3,3-二甲基丁烯—[1]

⑥ $CH_3-CH=CH-CH_2CH_2CH_3$ 顺-己烯—[2]

⑦ $CH_3-CH=CH-CH_2CH_2CH_3$ 反-己烯—[2]

⑧ $CH_3-C(CH_3)=CHCH_2CH_3$ 己-甲基戊烯—[2]

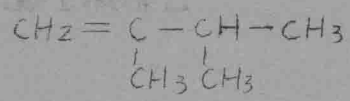
⑨ $CH_3-CH=C(CH_3)-CH_2CH_3$ 顺-3-甲基戊烯—[2]

⑩ $CH_3-CH=C(CH_2CH_3)-CH_3$ 反-3-甲基戊烯—[2]

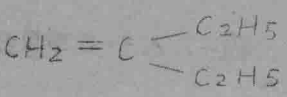
⑪ $CH_3-CH=C(CH(CH_3)_2)-H$ 顺-4-甲基戊烯—[2]

⑫ 

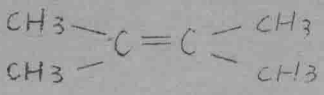
反-4-甲基戊烯—[2]

⑬ 

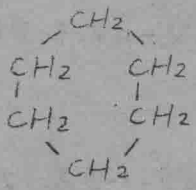
2,3-二甲基丁烯—[1]

⑭ 

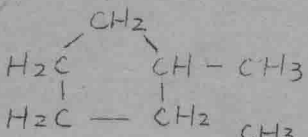
2-乙基-丁烯—[1]

⑮ 

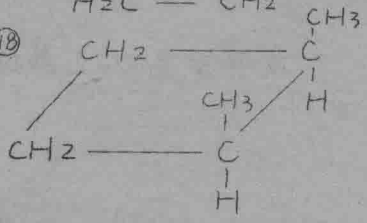
2,3-二甲基丁烯—[2]

⑯ 

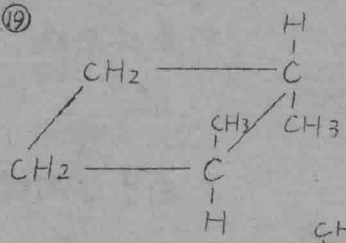
环已烷

⑰ 

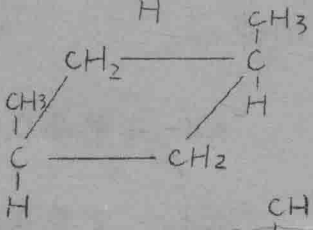
甲基环戊烷

⑱ 

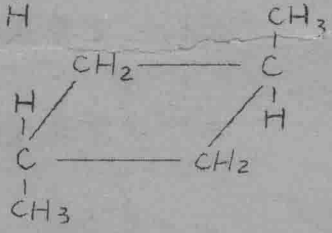
顺-1,2-二甲基环丁烷

⑲ 

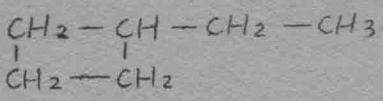
反-1,2-二甲基环丁烷

⑳ 

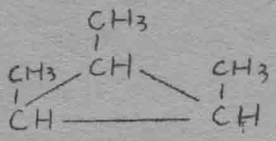
顺-1,3-二甲基环丁烷

㉑ 

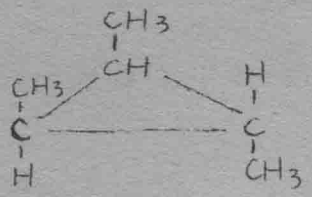
反-1,3-二甲基环丁烷

㉒ 

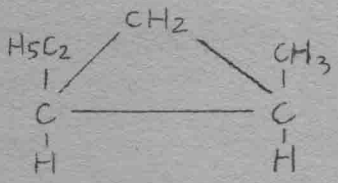
乙基环丁烷

㉓ 

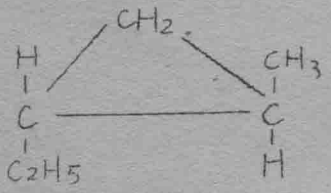
顺-1,2,3-三甲基环丙烷

㉔ 

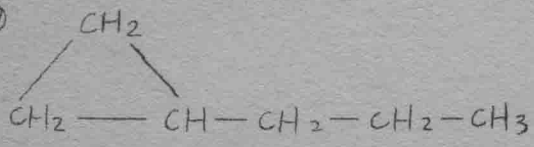
反-1,2,3-三甲基环丙烷

㉕ 

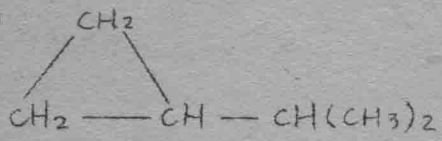
顺-1-甲基-2-乙基环丙烷

㉖ 

反-1-甲基-2-乙基环丙烷

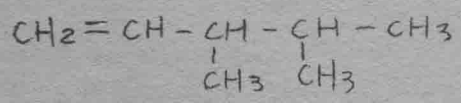
㉗ 

丙基环丙烷

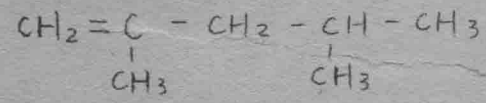
㉘ 

异丙基环丙烷

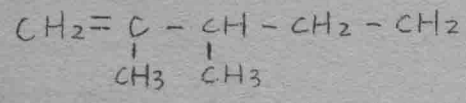
103. 可能有构造异构和顺反异构体十四种：

① 

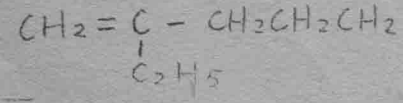
3,4-二甲基戊烯-(1)

② 

2,4-二甲基戊烯-(1)

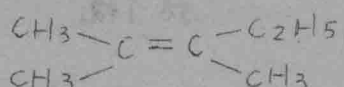
③ 

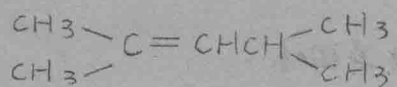
2,3-二甲基戊烯-(1)

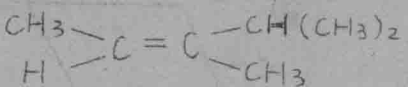
④ 

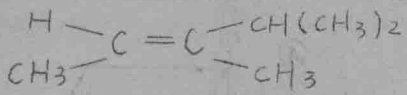
2-乙基戊烯-(1)

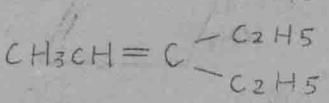
⑤ $CH_2=CH-\underset{\underset{C_2H_5}{|}}{CH}CH_2CH_2$ 3-乙基戊烯—〔1〕

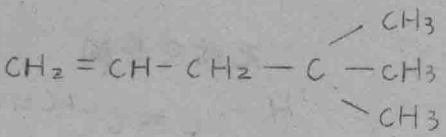
⑥  2,3-二甲基戊烯—〔2〕

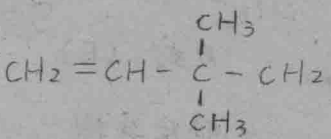
⑦  2,4-二甲基戊烯—〔2〕

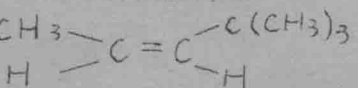
⑧  (Z)-3,4-二甲基戊烯—〔2〕

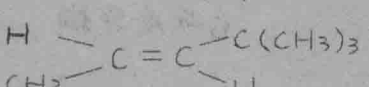
⑨  (E)-3,4-二甲基戊烯—〔2〕

⑩  3-乙基戊烯—〔2〕

⑪  4,4-二甲基戊烯—〔1〕

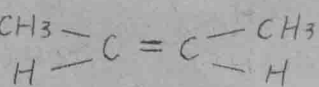
⑫  3,3-二甲基戊烯—〔1〕

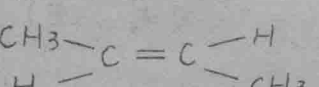
⑬  (Z)-4,4-二甲基戊烯—〔2〕

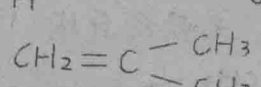
⑭  (E)-4,4-二甲基戊烯—〔2〕

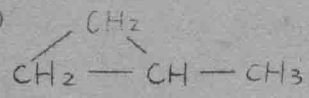
104. 该烃分子量为56，分子式为C_4H_8，它可能的构造异构和顺反异构体有以下几种：

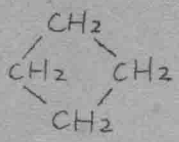
① $CH_2=CH-CH_2CH_3$ 丁烯—〔1〕

②  (Z)-丁烯—〔2〕

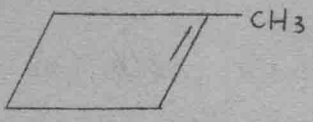
③  (E)-丁烯—〔2〕

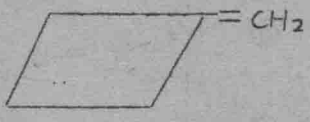
④  2-甲基丙烯—〔1〕

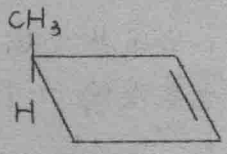
⑤  甲基环丙烷

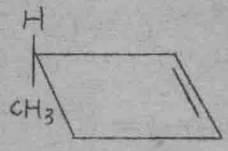
⑥  环丁烷

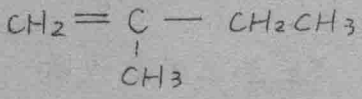
105、可能存在以下构造异构和顺反异构体：

① 

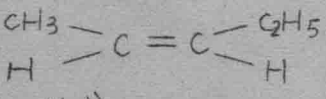
② 

③ 

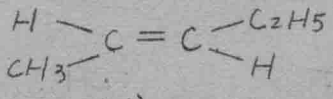
④ 

106. ① 

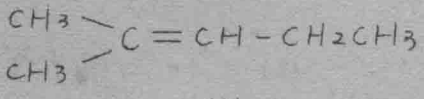
无顺反异构

② 

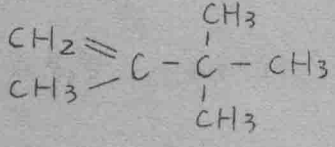
顺式：(Z)



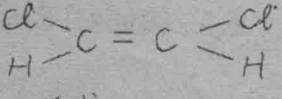
反式：(E)

③ 

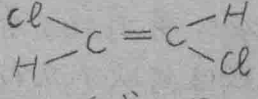
无顺反异构

④ 

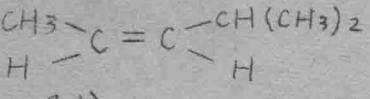
无顺反异构

⑤ 

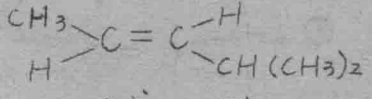
顺式：(Z)



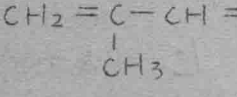
反式：(E)

⑥ 

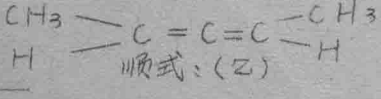
顺式：(Z)



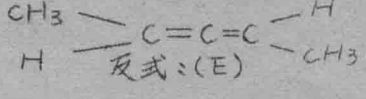
反式：(E)

107. ① 

无顺反异构

② 

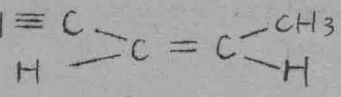
顺式：(Z)



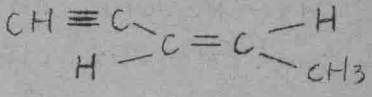
反式：(E)

③ $CH_3-C\equiv C-CH_3$ 无顺反异构

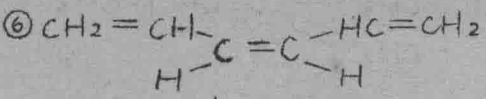
④ $CH\equiv C-CH_2-CH_2CH_3$ 无顺反异构

⑤ 

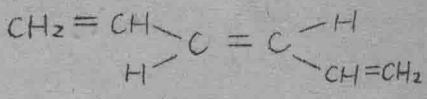
顺式：(Z)



反式：(E)

⑥ 

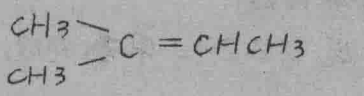
顺式：(Z)

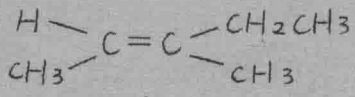


反式：(E)

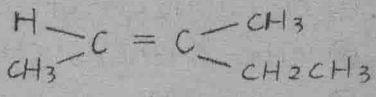
108. ① $CH_2=CCl_2$ 无顺反异构

② $CH_2=CHCH_2CH_2CH_3$ 无顺反异构

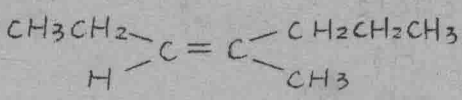
③  无顺反异构

④ 

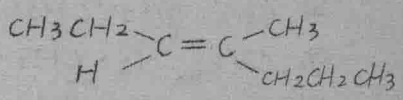
顺式：(E)



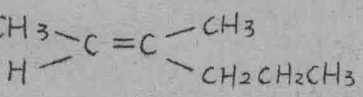
反式：(Z)

⑤ 

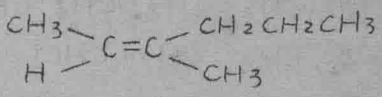
(Z)



(E)

⑥ 

顺式：(E)



反式：(Z)

109. C_2H_4O

110. C_2H_6O

111. C_2H_4

112. C_6H_6

113. $C_2H_4O_2$

114. $C_{14}H_{14}N_3O_3SNa$

115. 可能含6个硫原子

116. $C_{11}H_{16}O_2$

117. $C_{15}H_{49}N_3$

118. 实验式：$C_7H_8N_2O$

分子式：$C_7H_8N_2O$

119. ① +292.8 千卡/摩尔 (吸热)

② −27.5 千卡/摩尔 (放热)

③ −278.75 千卡/摩尔 (放热)

120. 生成溴甲烷，$Q=-10.7$ 千卡/摩尔 (放热)

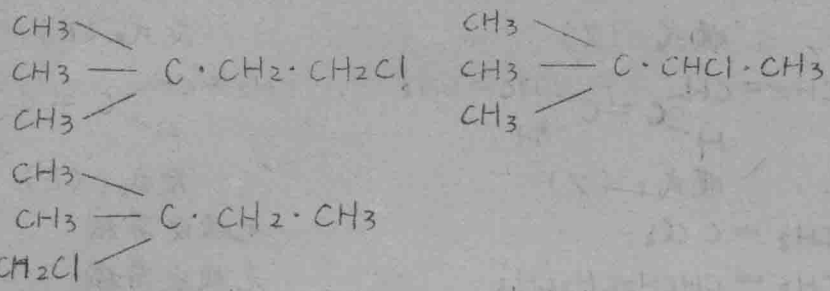
生成二溴甲烷，$Q=-21.4$ 千卡/摩尔 (放热)

121. ① -29.0千卡/摩尔　　② -58.0千卡/摩尔

122. ① $CH_3、CH_2、CH_2、CH_2、CH_2、CH_2Cl$

$CH_3、CH_2、CH_2、CH_2、CHCl、CH_3$

$CH_3、CH_2、CH_2、CHCl、CH_2、CH_3$

② 

123. 十二烷 > 正庚烷 > 正己烷 > 2-甲基戊烷

124. 十二烷 > 庚烷 > 戊烷 > 2-甲基丁烷 > 2.2-二甲基丙烷 > 丁烷

125. ① $CH_3、CH_2CH_2CH_2CH_2Cl$

② $CH_3·CH_2·CH_2·CHCl·CH_3$

③ $CH_3、CH_2、CHCl、CH_2、CH_3$

④ $CH_3、CH_2、CH_2、CH_2、CHCl_2$

⑤ $CH_3、CH_2、CH_2、CCl_2、CH_3$

⑥ $CH_3、CH_2、CCl_2、CH_2、CH_2$

⑦ $CH_3、CH_2、CH_2·CHCl、CH_2Cl$

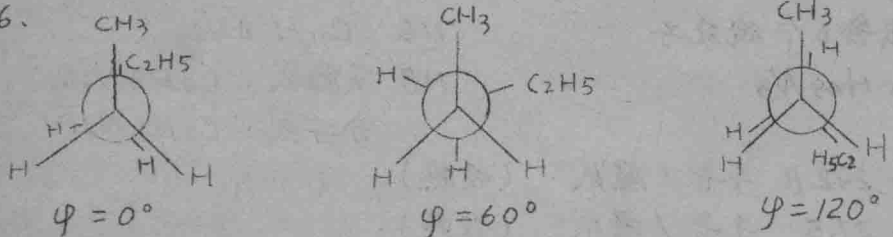
⑧ $CH_3、CH_2、CHCl、CH_2、CH_2Cl$

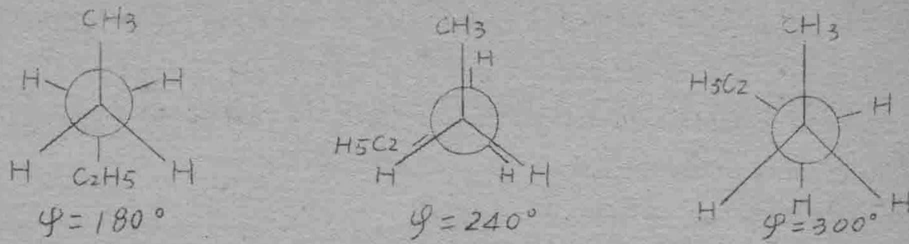
⑨ $CH_3、CHCl、CH_2、CH_2、CH_2Cl$

⑩ $CH_2Cl、CH_2、CH_2、CH_2、CH_2Cl$

⑪ $CH_3、CH_2、CHCl、CHCl、CH_3$

⑫ $CH_3、CHCl、CH_2、CHCl、CH_3$

126. 



127. ①烯烃加成是亲电加成；②碘分子为非极性分子；③氯化碘分子因氯电负性强，为极性分子，且碘原子带正电性 $\overset{\delta-}{Cl}-\overset{\delta+}{I}$，因此易使烯的双键极化，π键破裂，从而发生亲电加成。

128. ① $CH_3\cdot CHI\cdot CH_2\cdot CH_2\cdot CH_3$　② $CH_3\cdot CI(CH_3)\cdot CH_2\cdot CH_3$

③ $CH_3\cdot CI(CH_3)\cdot CH_2\cdot C(CH_3)_3$　④ $CH_3\cdot CHI\cdot CH(CH_3)\cdot CH_3$

⑤ $CH_3\cdot CI(CH_3)\cdot CH_2\cdot CH(CH_3)_2$

129. 由于三个电负性很强的氟原子诱导效应的结果，使得第2位碳原子电子云密度增加，第1位碳原子带正电性，因此加成结果与马氏定则相反。

130. ① $CH_3\cdot CH_2\cdot CH_2\cdot CH_3$　② $CH_3\cdot CH_2\cdot CHI\cdot CH_3$

③ $CH_3\cdot CH_2\cdot CH(OSO_3H)\cdot CH_3$

131. ① $CH_3\cdot CH_2\cdot CH=CH_2$，$CH_3\cdot CH_2\cdot CH_2\cdot CH_3$

② $CH_3\cdot CH_2\cdot CBr=CHBr$，$CH_3\cdot CH_2\cdot CBr_2\cdot CHBr_2$

③ $CH_3\cdot CH_2\cdot CBr=CH_2$，$CH_3\cdot CH_2\cdot CBr_2\cdot CH_3$

④ $CH_3\cdot CH_2\cdot C\equiv CAg\downarrow$

132. $CH_3\cdot \underset{\displaystyle CH_3}{\underset{|}{C}}=CH_2+HOCl \longrightarrow CH_3\cdot \underset{\displaystyle CH_3}{\underset{|}{C}}(OH)\cdot CH_2Cl$

133. 碳原子杂化轨道由 sp 杂化 ⟶ sp^2 杂化 ⟶ sp^3 杂化

134. ① $CH_3\cdot CH_2\cdot \underset{\displaystyle OH}{\underset{|}{C}}(CH_3)\cdot CH_2Cl$

② $CH_3\cdot CH_2\cdot C(CH_3)-O-CH_2$（C 与 CH_2 各连一个 O，两个 O 相连成环）；$\begin{matrix}C_2H_5\\CH_3\end{matrix}\!\!>C=O+HCHO$

③ $CH_3\cdot CH_2\cdot \underset{\displaystyle OH}{\underset{|}{C}}(CH_3)\cdot \underset{\displaystyle OH}{\underset{|}{CH_2}}$

④ $CH_3\cdot CH-CH-CH_3$（两个 CH 均与 CH_2 相连，成三元环）

135、① $CH_3 \cdot CH_2 \cdot \underset{\mid \atop OCOR}{CH} \cdot CH_3$ ； $CH_3 \cdot CH_2 \cdot \underset{\mid \atop OH}{CH} \cdot CH_3 + RCOOH$

② $CH_3 \cdot CH(OH) \cdot CH_2OH$ ③ $CH_3 \cdot CH(OH) \cdot CH_2OH$

④ $CH_3COOH + CO_2$

136. ① $(CH_3)_2\underset{\mid \atop Cl}{C} - CH_2I$

② $CH_3(CH_2)_7\underset{\mid \atop O}{CH} - O - \underset{\mid \atop O}{CH}(CH_2)_7COOH$ ；（两个 O 相连）

$CH_3(CH_2)_7CHO + HOC(CH_2)_7CHO$

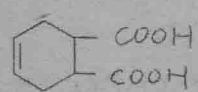
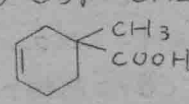
③ $CH_2 = CH - CN$

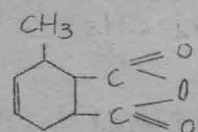
137. ① $CH_3 \cdot CH_2 \cdot CH = CH_2$ ； $CH_3 \cdot CH_2 \cdot CH_2 \cdot CH_3$

② $CH_3 \cdot CH_2 - C(=O) - CH_3$ ③ $CH_2 = CH - C(=O) - CH_3$

138. ① $CH_3 \cdot \underset{\mid \atop CN}{C} = CH_2$ ② $CH_3 \cdot CH = CH - \underset{\mid \atop Cl}{C} = CH - CH_3$

③ $CH_3 \cdot CBr_2 \cdot CHBr_2$ ④ $CH_3 \cdot CBr = CH_2$

139、①  ② 

③ 

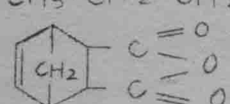
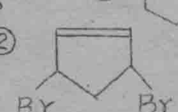
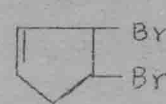
140、① $CH_3 \cdot C \equiv CH + 2[H] \xrightarrow{Na/液NH_3} CH_3 \cdot CH = CH_2$

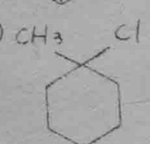
② $CH_3 \cdot C \equiv CH + AgNO_3 \xrightarrow{NH_4OH} CH_3 \cdot C \equiv CAg \downarrow$

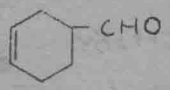
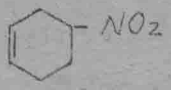
③ $CH_3 \cdot C \equiv CH + NaNH_2 \xrightarrow{液NH_3} CH_3 \cdot C \equiv CNa + NH_3$

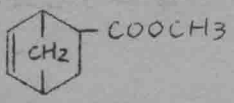
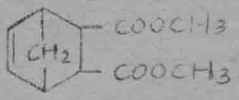
141、① $CH_3 \cdot CH_2 \cdot CHI \cdot CH_3$ ② 

③ $CH_3 \cdot CH_2 \cdot CH_2 \cdot CH_3$ ④ 

142、①  ②  或 

③ 

143. ①  ② 

③  ④ 

144. ①加 Br_2 ②加 $KMnO_4$ 溶液

145. 第一步加 Br_2 或 $KMnO_4$ 溶液；第二步加 $AgNO_3$ 的氨氧化铵溶液。

146. ①第一步加 Br_2；第二步加 $AgNO_3+NH_4OH$

②加 $AgNO_3+NH_4OH$

147. ①用 $AgNO_3+NH_4OH$

②第一步加 Br_2；第二步，加 $AgNO_3+NH_4OH$

148. ①第一步，$KMnO_4$ 溶液；第二步，Br_2 水溶液，

②第一步，加 $AgNO_3+NH_4OH$；第二步加 Br_2 水溶液。

③第一步，$KMnO_4$ 溶液；第二步 Br_2。

149. ① $KMnO_4$

②第一步用 $AgNO_3+NH_4OH$；第二步用丁二酸酐；第三步用 Br_2。

150. 第一种方法，催化加氢；第二种方法通过 Br_2 的水溶液。

151. 用 $AgNO_3+NH_4OH$

152. 用丙烯水化

153. 乙烯水化可制得伯醇；丙烯水化可制得仲醇；异丁烯水化可制得叔醇。

154. ①与溴化氢加成

②在 550°C 以上高温下与氯反应，甲基一氯代而后再催化加氢。

③与次氯酸加成

155. ①催化加氢 ②加溴化氢

③加一分子氯 ④汞盐催化水合

156. ① $C \xrightarrow[2000°C]{CaO} CaC_2 \xrightarrow{2H_2O} C_2H_2 \xrightarrow{HCl} CH_2=CHCl$

② $2C(红热) \xrightarrow{2H_2O(气)} 2CO+H_2 \xrightarrow[Ni,250°C]{+4H_2} 2CH_4 \xrightarrow{1500°C} C_2H_2 \xrightarrow{HCl} CH_2=CHCl$