Question Bank

Q.1 Choose the correct option from the following :

1. Hydrocarbons are

   (a) Composed of carbon and hydrogen

   (b) Composed of carbon, hydrogen, and oxygen

   (c) Composed of carbon and oxygen

   (d) Composed of carbon and nitrogen

2. Hydrocarbons are

   (a) insoluble in water (b) composed of carbon and hydrogen

   (c) both (a) and (b) (d) None of these

3. Which of the following is a correct name according to the IUPAC rules ?

   (a) 2-Mcthylcyclohexane (b) 2-Ethyl-2-methylpentane

   (c) 3,4-Dimethylpentane (d) 3-Ethyl-2-methylpentane

4. What type of an alkyl group is an isobutyl group?

   (a) primary (b) secondary (c) tertiary (d) none of these

5. Which molecular formula indicates 2-methylpentane ?

   (a) C_5H_{12} (b) C_6H_{14} (c) C_5H_{10} (d) C_6H_{12}

6. Which molecular formula indicates 2,2,4-trimethylhexane?

   (a) C_9H_{20} (b) C_9H_{18} (c) C_8H_{18} (d) C_8H_{16}

7. How many isomers are possible for butane?

   (a) 2 (b) 3 (c) 4 (d) 5

8. How many isomers are possible for 2-methylpropane ?
(a) 2 (b) 3 (c) 4 (d) 5

9. How many isomers are possible for pentane ?
(a) 2 (b) 3 (c) 4 (d) 5

10. How many isomers are possible for hexane ?
(a) 4 (b) 5 (c) 6 (d) 7

11. How many isomers are possible for heptane?
(a) 9 (b) 10 (c) 11 (d) 12

12. Which of following statement is false ?
(a) Many alkanes arc soluble in water.
(b) All alkanes have a lower density than water.
(c) At room temperature some alkanes are liquids, some solids, some gases.
(d) All alkanes burn.

13. Which of the following alkanes will have the highest boiling point ?
(a) n-Octane (b) Isopentane (c) n-Butane (d) Neopentane

14. Which of the following alkanes will have the lowest boiling point ?
(a) n-Heptane (b) Isopentane (c) n-Hexane (d) Neopentane

15. Which of the following is a correct name of isobutylene according to the IUPAC rules ?
(a) 2-Methyl- 1 -propene (b) 2-methyl-2-propene
(c) 3,4-Dimethylpentane (d) isobutene

16. Which of the following is a correct name of allyl alcohol according to, the IUPAC rules ?
(a) 2- propen-1-ol (b) 2-methyl-3-ol
(c) 3-propen-l-ol (d) 3-propenol

17. The maximum number of isomers for an alkene with molecular formula C_4H_8 is :
(a) 2 (b) 4 (c) 5 (d) 3

18. The number of isomers of C_6H_{14} is
(a) 2 (b) 4 (c) 5 (d) 3

19. Cis-trans isomerism generally :
(a) Contains chiral carbon (b) Rotation along carbon atom
(c) Rotate the plane polarized light (d) Contain double bonded carbon atoms.

20. The maximum number of isomers for heptane is :
(a) 5 (b) 4 (c) 8 (d) 9

21. Which of the following compound is alkenol ?
(a) 2-propanol (b) 2-butenal (c) Vinyl chloride (d) Allyl alcohol.

22. The structure of isobutyl group is :
(a) $(CH_3)_3CH$ (b) $CH_3CH_2CH_2CH_2$
(c) $(CH_3)_2CHCH_2CH_3$ (d) $(CH_3)_2 C=CH_2$

23. Which of the following alkanes will have the highest boiling point ?
(a) Neopentane (b) Isopentane (c) n-Butane (d) n-Octane

24. The maximum number of isomers for an alkene with molecular formula C_4H_8 is :
(a) 2 (b) 4 (c) 5 (d) 3

25. The number of isomers of C_6H_{14} is :
(a) 4 (b) 6 (c) 7 (d) 5

26. The number of possible isomers for compound $C_2H_3Cl_2Br$ is :
(a) 5 (b) 4 (c) 2 (d) 3

27. Monochlorination of alkane in presence of light involves ..... as an intermediate.
(a) Carbocation (b) Carbanion (c) Free radical (d) None of these

28. How many isomeric products obtained upon monochlorination of n-pentane ?
(a) 2 (b) 3 (c) 1 (d) 4

29. Hydrolysis of Grignard reagent produces .....
(a) Alkane (c) Alcohol (c) Alkyl halide (d) None of these

30. Photochemical monohalogenation of isobutane involves formation of ..... free radical.
(a) 2^o as well as 3^o (c) 1^o as well as 3^o
(c) 1^o as well as 2^o (d) none of these

31. Both symmetrical and unsymmetrical alkanes can be synthesized using.....
(a) Wurtz reaction (b) Corey-Herbert House
(c) Kolbe electrolysis (d) Wurtz-fitting reaction

32. Initiation step for the photochemical halogenations of alkane is .....
(a) exothermic (b) endothermic
(c) both exothermic and endothermic (d) depend on alkane.

33. The general formula of Grignard reagent is .....
(a) RMgLi (b) RMgX (c) MgX (d) R_2CuLi

34. In a homologous services, each member differ from the next member by a constant amount :
(a) $-CH_3$ (b) $-CH_2$ (c) $-C_2H_5$ (d) $-CH$

35. How many isomeric products obtained upon monochlorination of iso-pentane ?
(a) 2 (b) 3 (c) 1 (d) 4

36. Sec. Butyl bromide upon reaction with Zn and acid produce .....
(a) n-Butane (b) isobutane (c) n-octane (d) isoctane

37. Organic molecules contains ..... bond.
(a) covalent (b) ionic (c) coordinate (d) dative

38. During the chlorination of n-butane in presence of light, which types of H-atom is replaced ?
(a) only 1° (b) 3° (c) only 2° and 3° (d) only 1° and 2°

39. When ethyl chloride react with Li and CuI to produce :
(a) Lithium diethyl copper (b) Dimethyl copper
(c) Copper diethyl lithium (d) Lithium methyl ethyl copper

40. The chlorination of methane in presence of heat give CCl_4 is an example of :
(a) an electrophilic addition (b) a free radical substitution
(c) an electrophilic substitution (d) nucleophilic addition

41. Cycloalkanes have the same molecular formula as :
(a) Alkanes (b) Cycloalkenes (c) Alkenes (d) Alkynes

42. In the chlorination of alkane in presence of light, the second step in which chlorine free radical react with alkane is called :
(a) Initiation (b) Propagation (c) Termination (d) Rate determining

43. In Grignard reagent, carbon-magnesium bond is .....
(a) Covalent (b) Ionic (c) H-bond (d) π-bond

44. During the chlorination of n-pentane in presence of light, which type of H-atoms is replaced ?
(a) 1° and 2° (b) 1° only (c) 2° and 3° (d) 1° and 3°

45. If during the reaction energy is absorbed then the reaction is .....
(a) Endothermic (b) Exothermic (c) Homogeneous (d) Hetrogeneous

46. Which of the following reaction cannot be used to prepare alkanes ?
(a) Wurtz reaction (b) Corey-House reaction
(c) Friedal-Craft alkylation (d) Grignard reaction

47. The reaction of ethylchloride with Na gives butane. This reaction is known as :
(a) Wurtz reaction (b) Grignard reaction
(c) Corey-House reaction (d) Friedal-Craft reaction

48. Which product is formed due to hydrolysis of ethylmagnesium bromide ?
(a) Ethanol (b) Ethylbromide (c) Ethane (d) Magnesium bromide

49. Which of the following intermediate involve in E2 reaction mechanism ?
(a) Free radical (b) Carbocation (c) Carbanion (d) Pentavalent

50. Which of the following reagent is suitable for syn-hydroxylation of cycloalkene ?
(a) Cold alkaline $KMnO_4$ (b) Hot $KMnO_4$
(c) HCOOOH (d) $Hg(OAc)_2$

51. How many steps are involve in E1 reaction mechanism ?
(a) Two (b) Single (c) three (d) zero

52. The dehydrohalogenation of 2-bromopentane with alcoholic KOH gives mainly :
(a) 2-pentene (b) 1-pentene (c) 1-butyne (d) n-pentane

53. Baeyer's reagent is :
(a) HCOOH (b) Alcoholic KOH
(c) Alkaline cold $KMnO_4$ (d) $Hg(OAc)_2/NaBH_4$

54. Isobutene react with HBr to give : .....
(a) Isobutane (b) Isobutyl bromide (c) Isobutene (d) t-butyl bromide

55. The reagent for hydration of alkyne is : .....
(a) Dil. $H_2SO_4/HgSO_4$ (b) $(BH_2)_2/H_2O_2$
(c) Conc. H_2SO_4/heat (d) $Hg(OAc)_2/NaBH_4$

56. Which of the following hydrocarbon has acidic hydrogen ?
(a) 1-butene (b) 2-butene (c) Ethylene (d) 1-propyne

57. 1-pentyne can be distinguished from 2-pentyne by using :
(a) Baeyer's reagent (b) Grignard reagent
(c) Wurtz reaction (d) Tollens' reagent

58. The best suitable catalyst for the dehydrohalogination of sec. butyl bromide is .....
(a) Aqueous KOH (b) Alcoholic KOH
(c) KOH (d) None of these

59. Reaction mechanism for the chlorination of alkene involves ..... as an intermediate.
(a) Carbonium ion (b) Chloronium ion
(c) Chlorine radical (d) None of these

60. E1 mechanism follows ..... order kinetics.
(a) Second (b) Zero (c) first (d) third

61. E1 reaction mechanism involves ..... as an intermediate.
(a) Carbanion (b) carbocation (c) free radical (d) nucleophile

62. E2 reaction is a ..... step reaction.
(a) Two (b) single (c) three (d) zero

63. Which carbocation is least stable ?
(a) 2^o (b) 3^o (c) 1^o (d) $^+CH_3$

64. Alkene undergo ..... addition reaction.
(a) electrophilic addition
(b) nucleophilic addition
(c) both electrophilic and nucleophilic addition
(d) substitution

65. Which is not an oxidizing agent ?
(a) $KMnO_4$ (b) $NaIO_4$ (c) HCOOOH (d) $HgSO_4$

66. Addition of HBr to 1-propene follow .....
(a) Markovnikovs rule (b) Anti-Markovnikov's rule
(c) Satyzeff rule (d) None of these.

67. What happen during hydration of alkyne ?
(a) Addition of H_2O (b) Loss of H_2O
(c) addition of H_2 (d) loss of H_2

68. Which of the following alkyne gives white precipitation with Tollens' reagent ?
(a) 1-pentyne (b) 1-pentene (c) 2-butyne (d) 3-hexyne

69. Which of the following reagent is suitable for anti-hydroxylation of cycloalkene :
(a) Cold alkaline $KMnO_4$ (b) Hot $KMnO_4$
(c) HCOOOH (d) $Hg(OAc)_2$

70. Choose the incorrect statement for the reaction given below :

$$CH_3CH_2CH_2Br \xrightarrow[KOH]{Ethanol} A + B$$

(a) Proportion of product is decided by Saytzeff rule.
(b) Proportion of product is decided by Markovnikov's rule
(c) Both products are formed in unequal amounts
(d) The reaction is dehydrohalogenation.

71. Isobutylene react with Hl to give :
(a) Isobutane (b) Isobutyl iodide (c) lsobutene (d) t-butyl iodide

72. 1-butyne can be distinguished from 2-butyne by using :
(a) Baeyer's reagent (b) Grignard reagent
(c) Wurtz reaction (d) Tollens' reagent

73. Markovnikov's addition of HBr not applicable to :
(a) 1-propene (b) 1-butene (c) 2-butene (d) 1-hexene

74. The disappearance of the purple colour of dil $KMnO_4$ in its reaction with alkene is known as :
(a) Markovnikov reaction (b) Grignard reaction
(c) Baeyer test (d) Saytzeff test

75. 1-propene react with Cl_2 in presence of H_2O to give :
(a) 1-chlcro-2-propanl (b) 2-chloro-2-propanol
(c) 1-chlcro-1-propanl (b) 2-chloro-1-propanol

76. Ozonolysis of 2-pentyne gives :
(a) Both (b) and (d) (b) Propanoic acid
(c) Butanoic acid and CO_2 (d) Acetic acid

77. Ozonolysis of 2-butyne gives
(a) Formic acid (b) Propanoic acid
(c) Butanoic acid (d) Acetic acid

78. The dehydrohalogenation of 1,2-dibromobutane with alcoholic KOH followed by sodamide give :

(a) 1-butene (b) 2-butene (c) 1-butyne (d) 2-butanol

79. Which of following is stronger acid ?

(a) Acetylene (b) Water (c) Alcohol (d) Ethane

80. Which of the following compound will give acetaldehyde and CO_2 upon ozonolysis ?

(a) 1-butene (b) 1-propene (c) 1-pentene (d) 2-butene

81. Which of the following compound will give only acetaldehyde upon ozonlysis ?

(a) 1-butene (b) lsobutylene (c) 1-pentene (d) 2-butene

Q.2 Short and subjective long questions :

1. Define the following term.

(a) Alkane (b) Alkene (c) Alkyne (d) Free radical
(e) Chain reaction (f) Carbocation (g) Homologous series

2. Give the structured formula of following compounds :

(a) 2,3-dimethylbutane (b) 2,2,3,3-tetramethylpentane
(c) 4-ethyl-3,4-dimethyl heptane (d) 3-chloro-2-methylpentane
(e) 3,3-diethyl-5-isopropyl-4-methyloctane.

3. The names given below are objectionable. Rewrite their correct IUPAC name and structure.

(a) 3-methyl-2-butene (b) 1,1,1-trimethylpentane
(c) 2-ethyl-1- propene (d) 2,4,5-trimethylhexane
(e) 1,1,3-trimethylhexane (f) 2-propyl-1-propene.

4. Give all possible isomers of the following **aliphatic** compound and give their IUPAC name :

(a) C_4H_{10} (b) C_5H_{12}

5. Explain the following.

Arrange the boiling point of following molecules and explain your answer
(a) Pentane (b) Isopentane (c) Neopentane.

Q. 3. Explain the following :

1. What is Grignard reagent ?

2. Boiling point of n-propane n-butane, n-pentane and n-hexane are –42, 0, 36 and 69°C respectively OR B.P. of n–, iso– and neopentane are 36, 28 and 9.5°C respectively. OR Arrange the b.p. of n–, iso– and neo-pentane and explain your answer. OR In

homologous series, as number of carbon atoms increase, b.p. increase but number of branch increase, b.p. decrease.

3. Write reaction mechanism for the monochlorination of methane / ethane / alkane. OR Give **stepwise detail** mechanism for chlorination of methane/ethane/alkane.
4. Differentiate between : Wurtz and Corey– Horbet House reation
5. Calculate the percentage of isomeric products obtained upon monochlorination of n–butane / n–pentane/ Isopentane. The relative reactivity of 1°, 2° and 3° H are 1 : 3.8 : 5 respectively.
6. Monochlorination of n–butane gives 1–chlorobutane and 2–chlorobutane in 28 % and 72 % respectively. Calculate relative reactivity of concerned hydrogen.
7. Do as directed :
   (i) Sec. Butyl bromide reacts with Mg in presence of dry ether, followed by hydrolysis.
   (ii) Ethyl chloride reacts with Li and CuLi, followed by reation with n–heptyl bromide.
8. Complete and rewrite the following equation.

(i) Sec. Butyl bromide $\xrightarrow[\text{(ii) } H_2O]{\text{(i) Mg}} CH_3CH_2CH_2CH_3$

$CH_3\underset{\displaystyle Br}{\underset{|}{C}}HCH_2CH_3$

(ii) Isopropyl bromide $\xrightarrow{Zn/H^+} CH_3CH_2CH_3$

$CH_3\,\underset{\displaystyle Br}{\underset{|}{C}}H\,CH_3$

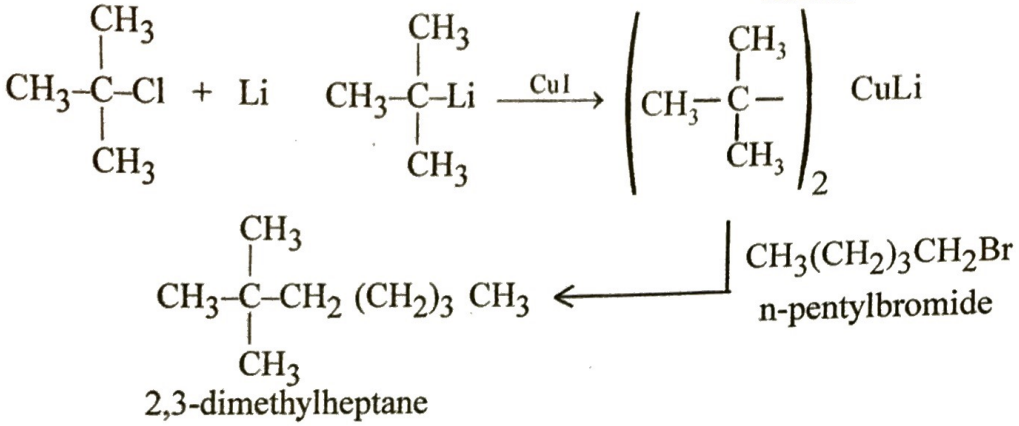
(iii) Ethylchloride $CH_3CH_2Cl \xrightarrow{Li} \underset{CH_3CH_2Li}{\overset{?}{\square}} \xrightarrow{CuLi} \underset{(CH_3CH_2)_2\,CuLi}{\overset{?}{\square}}$

$\xrightarrow[\text{i.e. } CH_3(CH_2)_5CH_2Br]{\text{n-heptylbromide}} \underset{CH_3CH_2CH_2(CH_2)_5CH_3}{\overset{?}{\square}}$

(iv) Ethylchloride $CH_3CH_2Cl \xrightarrow[\text{(ii) CuI}]{\text{(i) Li}} (CH_3CH_2)_2\,CuLi \xrightarrow[\text{bromide}]{\text{n-butyl}} CH_3CH_2CH_2CH_2CH_2CH_3$

(v) Sec–butyl bromide $CH_3\underset{\displaystyle Br}{\underset{|}{C}}HCH_2CH_3 \xrightarrow{Mg} CH_3\underset{\displaystyle MgBr}{\underset{|}{C}}HCH_2CH_3 \xrightarrow{H_2O} CH_3\underset{\displaystyle H}{\underset{|}{C}}HCH_2CH_3$

(vi) Tert–butyl chloride $\xrightarrow{Li}$? $\xrightarrow{CuI}$ ..... $\xrightarrow[\text{bromide}]{\text{n-pentyl}}$ .....



2,3-dimethylheptane

9. Complete the following reactions and give its detail stepwise mechanism.

   (i) $CH_4 + Cl_2 \xrightarrow{h\nu}$? + ?

   (ii) Ethane + Cl_2 (or Br_2) $\xrightarrow{h\nu}$? + ?

10. Write a brief account on following.

    (i) Corey–House reaction (ii) Wurtz reaction (iii) Grignard reaction

11. Give the synthesis of n-nonane from methyl bromide and appropriate alkylhalides using Corey-House synthetic route.

12. 1–butyne give white ppts. with Tollens reagent but 2–butyne does not OR 1-butyne give red ppts with Fehling solution but 2-butyne does not. **OR** How can you differentiate terminal and non–terminal alkynes ?

13. Explain kinetics and detail stepwise mechanism of E1 reaction.

14. Explain kinetics and detail stepwise mechanism of E2 reaction.

15. Explain carbanion formed reversibly or irreversibly it would leads to second order kinetics.

16. Explain with suitable experiment that E2 shows an absence of hydrogen exchange.

17. Give the reaction mechanism of dehydrohalogenation of alkyl halide.

18. Give stepwise detail carbanion mechanism for E2.

19. Explain the reactivity of various 1^o, 2^o and 3^o alkyl halides (R–X) towards E1 and E2.

20. For E2 dehydrohalogenation, what is the order of reactivity of alkyl halides ? why ?

21. Write a short note on 1,2–elimination reaction.

22. Give stepwise detail reaction mechanism of addition of Br_2 to alkene via bromoniumion.

23. Describe the reaction of bromonium ion with various reagents.

24. Give stepwise detail reaction mechanism for halohydrin formation.
25. List all evidence for E2 (or E1) mechanism and discuss in detail about any one (or two).
26. Neopentyl bromide upon E1 elimination give 2–methyl–2–butene as the major product.
27. 3,3–dimethyl–2–bromobutane upon E1 elimination give 2,3–dimethyl–2–butene as the major product.
28. Discuss Keto–enol tautomerism with illustration.
29. Give the difference between E1 and E2 mechanism.
30. Give detail stepwise general mechanism for addition of acidic reagent (HZ).
31. Give detail stepwise mechanism for addition of water to propene in acidic medium.
32. List the evidence for the electrophilic addition mechanism.
33. Acetylene is stronger acid than ethane.
34. Give detail stepwise mechanism for addition of HBr to alkene in presence of **peroxide.**
35. What are the precautions should be taken for hydroxylation of alkene with $KMnO_4$.
36. Write the synthesis of the following :
    (a) 1-propyne from 1-propene.
    (b) 1-butyne from acetylene (Ethyne)
    (c) 2-butyne from acetylene (Ethyne)
37. What is elimination reaction ? Describe with suitable example.
38. M.P. of trans-2-butene is higher than cis-2-butene
39. B.P. of trans-2-butene is lower than cis-2-butene
40. Dipole moment of Cis-2-butene is higher than trans-2-butene.
41. B.P. of cis-1,2-dichloroethene is higher than trans-1, 2-dichloroethene but M.P. of cis-1,2-dichloroethene is lower than trans-1, 2-dichloroethene

Q. 4. Do as directed :

(a) Acetylene react with Li (or $NaNH_2$) followed by methyl bromide.
(b) 2-pentene react with O_3 followed by H_2O/Zn.
(c) Propylene react with Br_2 followed by alcoholic KOH and $NaNH_2$.

Q. 5. Define the following terms :

(i) Electrophile (ii) Hydration (iii) Mechanism (iv) Carbanion (v) Elimination reaction. (vi) Tautomer.

Q. 6. Suggest the possible product and give detail stepwise mechanism involved in each.

(a) Ethylene $\xrightarrow{Br_2/H_2O}$ _____ + _____.

(b) Propylene $\xrightarrow{HCl}$ _____ + _____.

(c) Ethylene $\xrightarrow{Br_2}$ _____

(d) Propylene $\xrightarrow{H_2O/H^+}$ _____ + _____.

(e) Propylene $\xrightarrow{H_2SO_4}$ _____

Q. 7. Complete and rewrite the followings :

(i) 1–butene $\xrightarrow[CCl_4]{O_3}$ _____ $\xrightarrow{Zn/H_2O}$ _____.

(ii) 2,3–dimethyl–2–Butene $\xrightarrow[CCl_4]{O_3}$ _____ $\xrightarrow{Zn/H_2O}$ _____.

(iii) Isobutylene $\xrightarrow[CCl_4]{O_3}$ _____ $\xrightarrow{Zn/H_2O}$ _____.

(iv) 2–butene $\xrightarrow[CCl_4]{O_3}$ _____ $\xrightarrow{Zn/H_2O}$ _____.

(v) Cyclohexene $\xrightarrow[CCl_4]{O_3}$ _____ $\xrightarrow{Zn/H_2O}$ _____.

(vi) 2–pentene $\xrightarrow[CCl_4]{O_3}$ _____ $\xrightarrow{Zn/H_2O}$ _____.

(vii) Cyclopentene $\xrightarrow[CCl_4]{O_3}$ _____ $\xrightarrow{Zn/H_2O}$ _____.

(viii) 1–methylcyclopentene $\xrightarrow[CCl_4]{O_3}$ _____ $\xrightarrow{Zn/H_2O}$ _____.

(ix) 3–methylcyclopentene $\xrightarrow[CCl_4]{O_3}$ _____ $\xrightarrow{Zn/H_2O}$ _____.

(x) 2–methyl–1–pentene $\xrightarrow{alk.\ KMnO_4}$ _____ + _____.

(xi) Isobutylene $\xrightarrow[Na_2CO_3]{KMnO_4}$ _____ + _____.

(xii) 2–methyl–2–butene $\xrightarrow[OH^-]{KMnO_4}$ ——— + ———.

(xiii) Cyclohexene $\xrightarrow[NaIO_4]{KMnO_4}$ ———.

(xiv) Acetylene $\xrightarrow{LiNH_2}$ ——— + $\xrightarrow{\text{n–Butyl bromide}}$ ———.

(xv) Acetylene $\xrightarrow{NaNH_2}$ ——— $\xrightarrow{CH_3Br}$ ———.

(xvi) Methyl acetylene $\xrightarrow{NaNH_2}$ ——— $\xrightarrow{CH_3CH_2I}$ ———.

(xvii) Methyl acetylene $\xrightarrow{HCl}$ ——— $\xrightarrow{HI}$ ———.

(xviii) Methyl acetylene $\xrightarrow{HBr}$ ——— $\xrightarrow{HI}$ ———.

(xix) Acetylene + H_2O $\xrightarrow[HgSO_4]{H_2SO_4}$ ——— $\rightleftharpoons$ ———.

(xx) Methyl acetylene + H_2O $\xrightarrow[HgSO_4]{H_2SO_4}$ ——— $\rightleftharpoons$ ———.

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