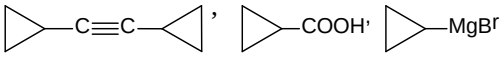
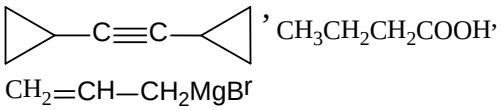
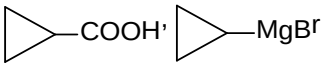
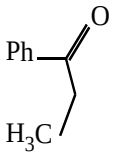
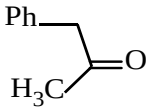
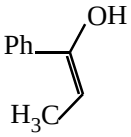
HYDROCARBONS

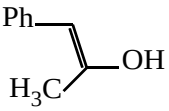
Single Correct Answer Type

1. The next higher homologue of C_6H_{14} is:
   a) C_7H_{14} b) C_7H_{16} c) C_7H_{10} d) C_7H_{12}
2. Complete oxidation of one mole of an alkane forms 3 moles ofCO_2. The alkane is
   a) CH_4 b) C_2H_6 c) C_3H_8 d) C_6H_{14}
3. $CH_3—C \equiv CH$ reacts with HCI to give:
   a) 2,2-dichloropropane b) 1,1-dichloropropane c) 1,2-dichloropropane d) 1-chloropropene
4. Aqueous solution of an organic compound, $'A'$ on electrolysis liberates acetylene and CO_2 at a node. $'A'$ is
   a) Potassium acetate b) Potassium succinate
   c) Potassium citrate d) Potassium maleate
5. Nitrating mixture is
   a) Fuming nitric acid
   b) Mixture of conc. H_2SO_4 and conc. HNO_3
   c) Mixture of nitric acid and anhydrous zinc chloride
   d) None of the above
6. $C_8H_{10}(A) \xrightarrow{O_3/H_2O} \text{acid}(B)$
   $C_3H_5MgBr(C) \xrightarrow{CO_2, H_3O^+} \text{acid } B$
   Identify A, B and C
   a) 
   b) 
   c) $CH_3 - CH_2 - CH_2 - CH_3, CH_3CH_2CH_2COOH, CH_2 = CH - CH_2MgBr$
   d) $CH_3CH_2CH_2CH_3$, 
7. Which of the following reagent can distinguish between 1-butyne and 2-butyne?
   a) Aqueous NaOH
   b) Bromine water
   c) Fehling's solution
   d) Ammoniacal $AgNO_3$
8. On halogenation, an alkane (C_5H_{12}) gives only one monohalogenated product. The alkane is
   a) n-pentane b) 2-methyl butane
   c) 2, 2-dimethyl propane d) Cyclopentane
9. What volume of methane (NTP) is formed from 8.2 g of sodium acetate by fusion with sodalime?
   a) 10 litre b) 11.2 litre c) 5.6 litre d) 2.24 litre
10. Which of the following will give three mono-bromo derivatives?
    a) $CH_3CH_2CH_2CH(CH_3)CH_3$ b) $CH_3CH_2C(CH_3)_2CH_3$
    c) $CH_3CH_3(CH_3)CH\ (CH_3)CH_3$ d) All the above can give
11. According to Huckel's rule an aromatic compound must possess
    a) $(4n+1)\pi$-electrons b) $(4n+2)\pi$-electrons
    c) $4n\ \pi$-electrons d) $(4n+3)\pi$-electrons
12. $Ph—C \equiv C—CH_3 \xrightarrow{Hg^{2+}/H^+} A$. A is:

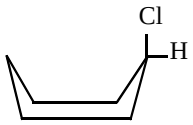
a) 

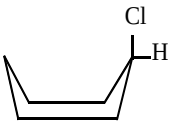
b) 

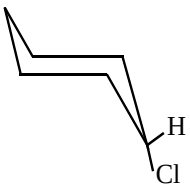
c) 

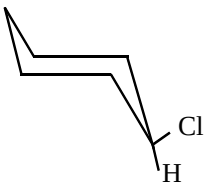
d) 

13. Which of the following will react with sodium metal?
    a) Ethene b) Propyne c) But-2-yne d) Ethane
14. By heating tetraethyl ammonium hydroxide, the product formed are:
    a) C_2H_4
    b) $(C_2H_5)_3N$
    c) H_2O
    d) All of these
15. Direct fluorination of alkanes is not made because:
    a) Reaction does not occur
    b) Alkane fluorides are not formed
    c) Reaction occurs violently
    d) None of the above
16. How many isomeric forms of pentane exist?
    a) 3 b) 2 c) 5 d) 6
17. The compound that is most reactive towards electrophilic nitration is
    a) toluene b) benzene c) benzoic acid d) nitrobenzene
18. An alkane of mol. weight 72 gives on monochlorination only one product. Name the alkane:
    a) 2-methylbutane b) n-pentane c) 2,2-dimethylpropane d) None of these
19. Among the following, the compound that be most readily sulphonated is
    a) Benzene b) Nitrobenzene c) toluene d) chlorobenzene
20. Aromatic compound among other things should have a π-electron cloud containing $(4n+2)\pi$ electrons where, n cannot be
    a) $\frac{1}{2}$ b) 3 c) 2 d) 1
21. Thermal decomposition of alkanes in the absence of air is called
    a) Cracking b) Oxidation c) Combustion d) Hydrogenation
22. When butane-1 is mixed with excess of bromine, the expected reaction product is:
    a) Hydrogen bromide b) Butylene gas c) 1,2-dibromobutane d) Perbromobutane
23. Alkene-1 on hydroboration followed with action of H_2O_2 gives:
    a) Alkanol-2 b) Alkanol-1 c) Alkanal d) Alkanone
24. An alkene on vigorous oxidation with $KMnO_4$ gives only acetic acid. The alkene is
    a) $CH_3CH_2CH=CH_2$ b) $CH_3CH=CHCH_3$ c) $(CH_3)_2C=CH_2$ d) $CH_3CH=CH_2$
25. Which of the following organic compounds exhibit acidic character?
    a) $H_3C-C\equiv CH$ b) $H_3C-C\equiv C-CH_3$ c) $H_2C=CH_2$ d) H_3C-CH_3
26. The most stable conformation of chlorocyclohexane at room temperature is:

a) 

b) 

c) 

d) 

27. Which of the following differs with the other three?
    a) Naphthalene b) Ethylene c) Toluene d) Xylene
28. The compound which cannot decolourise alkaline $KMnO_4$:

a) Acetylene b) Ethanol c) Ethanal d) Ethane

29. Ozonolysis can be used to detect:
a) 1-butene and 2-butene
b) Branched alkene from unbranched alkene
c) Location of double bond/triple bond in carbon chain
d) All are correct

30. Addition of HBr on:
$CH \equiv C—CH_2—CH = CH_2$ and $CH \equiv C—CH = CH_2$
Separately gives:
a) $CH\equiv C-CH_2-CHBr-CH_3$ and $CH_2=C(Br)-CH=CH_2$
b) $CH\equiv C(Br)-CH_2-CHBr-CH_2$ and $CH_2=C(Br)-CH=CH_2$
c) $CH\equiv C(Br)-CH_2-CH-CH_3$ and $CH\equiv C-CH(Br)-CH_3$
d) None of the above

31. Reduction of 2-methyl-1-bromopropane with metal and acid gives:
a) Butyl bromide b) n-butane c) Isobutene d) None of these

32. 2-chloro-3-methylbutane is treated with sodium in etherial solution, then it will give
a) 2,4-dimethylhexane b) 3,5-dimethylhexane
c) 2,3,4,5-tetramethylhexane d) 2,6-dimethyloctane

33. During pyrolysis of alkane, C—C bond rather than C—H bond break because:
a) C—C bond is reactive site in alkane
b) C—H bond is reactive site in alkane
c) Bond energy of C—C is lower than C—H bond
d) Energy of activation of C—C bond is very high

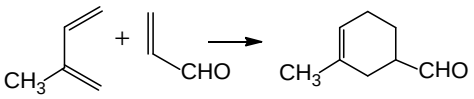
34. The structural formula of the compound which yields ethylene upon reaction with zinc:
a) $CH_2Br—CH_2Br$ b) $CHBr_2—CHBr_2$ c) CHBr=CHBr d) None of these

35. Which of the following react with Cl_2 and Br_2 at room temperature and in the absence of diffused sunlight to produce dihalogen derivatives?
a) Cyclobutane b) Cyclopentane c) Cyclohexane d) All of these

36. The order of appearance of the following with rising temperature during the refining of crude oil is:
a) Kerosene, gasoline, diesel
b) Diesel, gasoline, kerosene
c) Gasoline, diesel, kerosene
d) Gasoline, kerosene, diesel

37. Distillation of acetone with concentrated sulphuric acid gives
a) Diacetone alcohol b) Mesityl oxide c) Mesitylene d) Propene-2-ol

38. Mustard gas is a
a) Oil gas b) Poisonous gas c) Fuel gas d) Life gas

39. The following reaction is called


a) Michael addition reaction b) Diels-alder reaction
c) Wolff-Kishner reaction d) None of the above

40. Butene-1 may be converted to butane by reaction with
a) $Zn - HCl$ b) $Sn - HCl$ c) $Zn - Hg$ d) Pd/H_2

41. Which of the following reagents cannot be used to locate the position of triple bond in $CH_3 — C \equiv C — CH_3$?
a) Br_2 b) O_3 c) Cu^+ d) $KMnO_4$

42. 1-butyne on hydration gives
a) Butyn-1, 2-diol b) Butan-1-ol c) Butan-2-ol d) Butan-2-one

43. Which reacts with ammoniacal $AgNO_3$?
a) Propyne b) 2-butyne c) 1,3-butadiene d) Pentene

44. Which of the following statements is true for ethane, ethene and acetylene?
a) Acetylene is the weakest acid and has the longest $C - H$ bond distance
b) Acetylene is the strongest acid and has the shortest $C - H$ bond distance
c) Ethane is the strongest acid and has the longest $C - H$ bond distance
d) Ethene is the strongest acid and has the shortest $C - H$ bond distance

45. Bacterial decomposition of cellulose material present in sewage water gives:
a) H_2 b) CH_4 c) O_2 d) N_2

46. The compound formed when silver powder is heated with chloroform:
a) CH_4 b) C_2H_2 c) C_2H_4 d) C_2H_6

47. During ozonolysis of $CH_2 = CH_2$ if hydrolysis is made in absence of Zn dust the products formed are:
a) HCHO b) HCOOH c) CH_3OH d) CH_2OHCH_2OH

48. The substance that would not at all be formed during the reaction of methane and chlorine in the presence of sunlight is:
a) CH_3Cl b) $CHCl_3$ c) CH_3CH_3 d) $CH_3CH_2CH_3$

49. n-hexadecane (cetane) has cetane number:
a) 100 b) Zero c) 90 d) 110

50. Which will give $CH_2 = C = CH_2$?
a) $CH_2Br — CBr = CH_2 \xrightarrow{Zn/CH_3OH}$
b) $CH \equiv C — CH_2 — COOH \xrightarrow{K_2CO_3(aq)}$
c) $2CH_2 = CH — CH_2I \xrightarrow{2Na}$
d) None of the above

51. As compared to melting points of even carbon chain isomers, the melting points of odd carbon chain alkanes are:
a) Lower
b) Higher
c) Same
d) Not depend upon branching

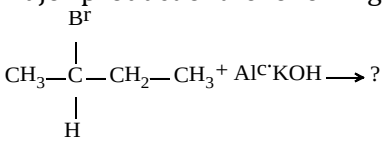
52. $C_6H_5CH_3 \xrightarrow{CrO_2Cl_2} Z$
In the given sequence, Z is
a) Benzaldehyde b) Toluic acid c) Phenyl acetic acid d) Benzoic acid

53. Ozonolysis of an organic compounds gives formaldehyde as one of the products. This confirms the presence of
a) Two ethylenic double bonds b) A vinyl group
c) An *iso*-propyl group d) An acetylenic triple bond

54. Which one of the following gives, on ozonolysis, both aldehydes and ketones?
a) $Me_2C = CHMe$ b) $Me_2C = CMe_2$

c) $MeCH_2 - C(Me) = CMe_2$ d) $MeCH(Me) - CH = CHMe$

55. Major product of the following reaction is:



a) Butene-1 b) Butene-2 c) Butane d) Butyne-1

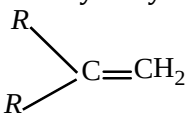
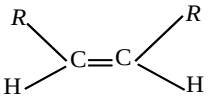
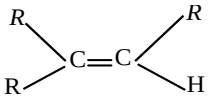
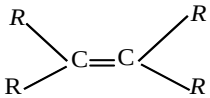
56. $CH_3 - C \equiv C - CH_3 \xrightarrow{\text{Lindlar's catalyst}} A$, the compound A is

a) *cis*-2-butene b) *trans*-2-butene c) *iso*-butene d) 1-butene

57. When cyclohexane is poured on water, it floats, because:

a) Cyclohexane is in 'boat' form
b) Cyclohexane is in 'chair' form
c) Cyclohexane is in 'crown' form
d) Cyclohexane is less dense than water

58. The catalytic hydrogenation is more easier in case of which alkene?

a) 
b) 
c) 
d) 

59. *Gem* dihalides on treatment with alcoholic KOH give

a) Alkyne b) Alkene c) Alkane d) All of these

60. The IUPAC name of $-C \equiv C-CH_3$ group is:

a) Prop-2-ynyl b) Prop-2-enyl c) Prop-1-ynyl d) None of these

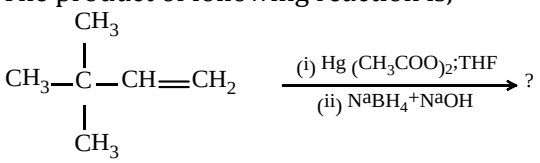
61. Conformation in molecules is due to:

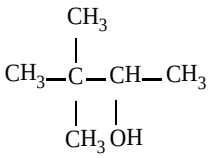
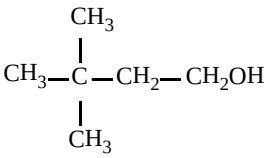
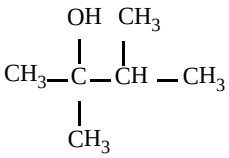
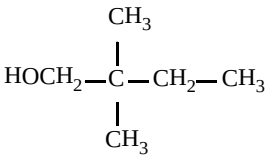
a) Rotation about a single bond
b) Change in direction of light
c) Structural changes
d) Restricted rotation about a double bond

62. It is necessary to use.....in the iodination of alkane.

a) Alcohol b) Oxidant c) Benzene d) Reductant

63. The product of following reaction is,



a) 
b) 
c) 
d) 

64. Ethyl benzene cannot be prepared by

a) Wurtz reaction b) Wurtz-Fittig reaction
c) Friedel-Craft's reaction d) Clemmensen reduction

65. The greatest strain is involved in cycloalkane, when the bond angle is:

a) 60° b) 90° c) 120° d) 108°

66. Ethylene is used in making:

a) Anti-freeze b) Solvent c) Fumigant d) All of these

67. Which is most acidic of the following?

a) Methane b) Acetylene c) 1-butene d) *Neo*-pentane

68. The major product P in the following reaction is

$$CH_3-CH=CH_2 \xrightarrow[\text{peroxide}]{HI} P$$

a) $CH_3CH_2CH_2I$

b) $CH_3-\underset{\underset{I}{|}}{CH}-CH_3$

c) $\begin{array}{l} CH_2-CH=CH_2 \\ | \\ I \end{array}$

d) $\begin{array}{l} CH_2-CH_2 \\ | \quad\quad | \\ I \quad\quad I \end{array}$

69. Water can be added across a triple bond in the presence of

a) Acidic medium b) Alkaline medium c) Neutral medium d) Acid and $HgSO_4$

70. Among the following statement on the nitration of aromatic compounds, the false one is

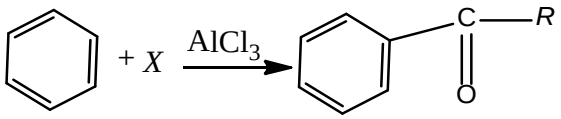
a) The rate of nitration of benzene is almost the same as that of hexadeuterobenzene

b) The rate of nitration of toluene is greater than that of benzene

c) The rate of nitration of benzene is greater than that of hexadeuterobenzene

d) Nitration is an electrophilic substitution reaction

71. Friedel-Craft acylation can be given by



X is

a) $R-\underset{\underset{O}{||}}{C}-Cl$ b) $R-\underset{\underset{O}{||}}{C}-R$ c) $R-\underset{\underset{O}{||}}{C}-H$ d) $R-O-R$

72. The electrolysis of aqueous solution of potassium succinate produces

a) Methyl alcohol b) ethyl alcohol c) ethene d) ethane

73. 2-phenyl propene on acidic hydration gives,

a) 2-phenyl-2-propanol b) 2-phenyl-1-propanol

c) 3-phenyl-1-propanol d) 1-phenyl-2-propanol

74. Grignard's reagent gives alkane with:

a) H_2O b) C_2H_5OH c) $C_2H_5NH_2$ d) All of these

75. The reaction, $CH_2=CH_2+H_2 \xrightarrow[250\ 300^\circ C]{Ni} CH_3-CH_3$

is called:

a) Wurtz's reaction b) Kolbe's reaction c) Sabatier and Senderens reaction d) Carbylamines reaction

76. A chlorohydrocarbon, named chlorodane is used especially as:

a) Insecticide b) Anti-worm c) Fungicide d) Anti-termite

77. The process where straight run gasoline is cracked in order to increase octane number is called:

a) Aromatization b) Rearrangement c) Substitution d) Reforming

78. Most of the hydrocarbons from petroleum are obtained by:

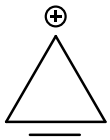
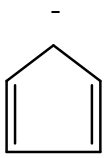
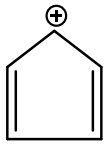
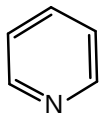
a) Fractional distillation

b) Fractional crystallization

c) Vaporisation

d) Polymerization

79. Which of the following compounds is not aromatic?

a)  b)  c)  d) 

80. $CH_3 - CH_2 - C \equiv CH \xrightarrow[H_2SO_4]{HgSO_4} A$

The compound A is

a) $CH_3 - CH_2 - \overset{O}{\overset{||}{C}} - CH_3$ b) $CH_3 - CH_2 - CH_2 - CHO$

c) $CH_3 - CH_2 - CH_2 - COOH$ d) None of the above

81. Formation of alkane by the action of zinc on alkyl halide is called

a) Wurtz reaction b) Kolbe's reaction c) Ulmann's reaction d) Frankland reaction

82. Hydrocarbon reacts with metal by displacing the H-atom is:

a) CH_4 b) C_2H_6 c) C_2H_4 d) C_2H_2

83. Aniline is treated with a mixture of sodium nitrite and hypophosphorus acid, the product formed is

a) Aniline diazonium hypophosphate b) Benzene

c) Anilinium hypophosphite d) Aniline diazonium hypophosphite

84. $CH_3C{\equiv}C{-}CH_3 \xrightarrow[(II)\ H_2O/Zn]{(I)\ X} CH_3{-}\underset{\underset{O}{\|}}{C}{-}\underset{\underset{O}{\|}}{C}{-}CH_3$

In the above reaction, X is

a) HNO_3 b) O_2 c) O_3 d) $KMnO_4$

85. The most stable conformational isomer of cyclohexane is:

a) Chair form b) Boat form c) Half chair form d) Twisted form

86. Product formed on electrolysis of potassium salt of fumaric and maleic acid is

a) Ethane b) Ethene c) Ethyne d) Methane

87. The compound (i) decolourises $KMnO_4$ (ii) forms ozonide with ozone and (iii) undergoes polymerization. It will be:

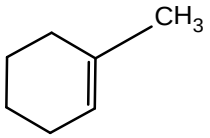
a) C_6H_6 b) C_3H_8 c) C_2H_4 d) C_2H_6

88. The lowest possible alkane with ethyl group as substituents possesses mol. mass equal to:

a) 16 b) 72 c) 84 d) 128

89. Which does not react with chlorine in dark?

a) CH_4 b) C_2H_2 c) C_2H_4 d) CH_3CHO

90. 

On reductive ozonolysis yields

a) 6-oxoheptanal b) 6-oxoheptanoic acid

c) 6-hydroxyheptanal d) 3-hydroxypentanal

91. The following reaction is an example of,

$C_3H_8 + 2Cl_2 \xrightarrow{Light} C_3H_6Cl_2 + 2HCl$

a) An addition reaction

b) A substitution reaction

c) An elimination reaction

d) None of the above

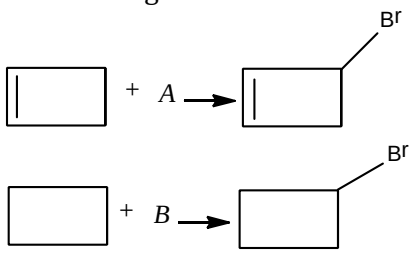
92. Which of the following characteristic apply both to ethane and ethyne?

a) Explode when mixed with chlorine
b) Decolourise Baeyer's reagent giving brown precipitate
c) Rapidly absorbed by cold conc. H_2SO_4
d) Form white precipitate with $AgNO_3$ solution

93. Wet ether is not used as a solvent in Wurtz reaction, because the water present in it
a) Hydrolyses RX to ROH b) Reduces RX to RH
c) Destroy the Na metal d) Reacts with $R-R$

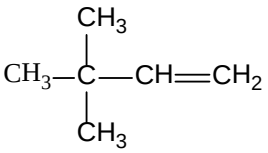
94. Acetylene on reacting with hypochlorous acid gives:
a) CH_3COCl b) $ClCH_2CHO$ c) $Cl_2CH.CHO$ d) $ClCH_2COOH$

95. Suitable reagents A and B for the following reactions are

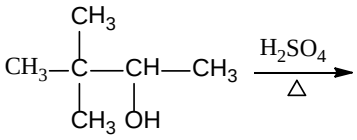


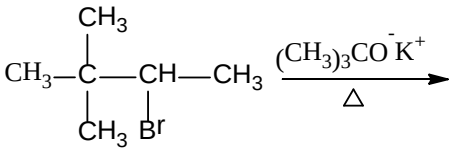
a) Br, Br_2 b) Br_2, NBS c) NBS, NBS d) NBS, Br_2

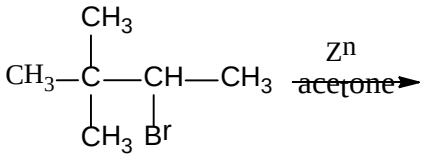
96. Which of the following reactions are not expected to give



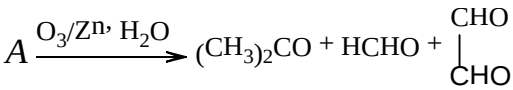
In yields of more than 50%?

a) 

b) 

c) 

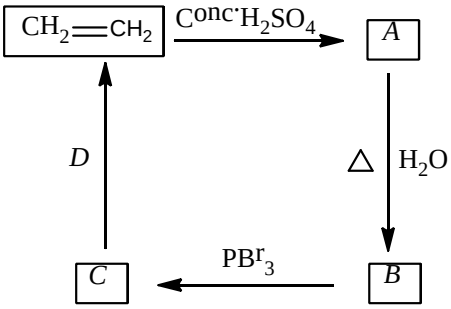
d) None of the above

97. 

Thus, A is
a) $(CH_3)_2CHCH=CHCH=CH_2$ b) $(CH_3)_2C=CH-CH=CH_2$
c) $CH_3CH=CH-CH=CH-CH=CH_2$ d) none of the above

98. When methane is made to react with a halogen (X_2), halides are formed, the order of reactivity is:
a) $F_2 > Cl_2 > Br_2 > I_2$ b) $Cl_2 > F_2 > Br_2 > I_2$ c) $I_2 > Br_2 > Cl_2 > F_2$ d) $Cl_2 > F_2 > I_2 > Br_2$

99. Identify B and D in the following sequence of reactions.



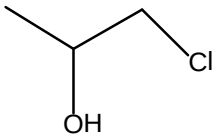
a) Methanol and bromoethane
b) Ethyl hydrogen sulphate and alcoholic KOH
c) Ethyl hydrogen sulphate and aqueous KOH
d) Ethanol and alcoholic KOH

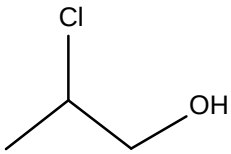
100. Which statement is false?
a) Peroxide effect is applicable only for HBr and not for the other halogen halides
b) Meta directing groups are deactivating groups
c) Chlorination of methane follows an ionic mechanism
d) In benzene the C atoms are sp^2-hybridized

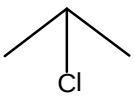
101. Oxidation of 1-butene with hot $KMnO_4$ solution produces
a) $CH_3CH_2COOH + HCOOH$
b) $CH_3CH_2COOH + CO_2$
c) $CH_3COOH + CO_2$
d) $(CH_3)_2C = O + CO_2$

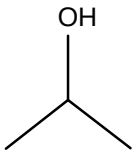
102. Toluene, when treated with Br_2/Fe, gives p-bromotoluene as the major product because the $-CH_3$ group
a) Is *meta* directing
b) deactivates the ring
c) activates the ring by hyperconjugation
d) None of the above

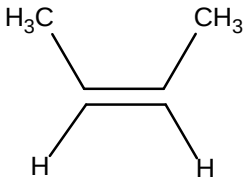
103. Wurtz reaction converts alkyl halide into alkane when it is made to react with
a) Na in alcohol
b) Na in dry ether
c) Zn in alcohol
d) Zn in dry ether

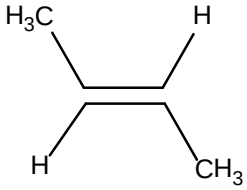
104. Propene on reaction with hypochlorous acid to give
a) 

b) 

c) 

d) 

105. The major product in the reaction of 2-butyne with Li/liq. NH_3 is
a) 

b) 

c) $CH_3CH_2CH_2CH_3$
d) $H_2C = CH - CH_2 - CH_3$

106. The substance used as an anti-knock compound is:
a) Tetraethyl lead
b) Lead tetrachloride
c) Lead acetate
d) Ethyl acetate

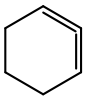
107. A solution of sodium salt of fatty acid was electrolysed during Kolbe's reaction. The solution left after electrolysis is:
a) Richer in NaOH
b) Richer in H_2SO_4
c) Richer in sodium salt
d) All of these

108. Kolbe's synthesis on electrolysis of sodium salt of butanoic acid gives :
a) n-hexane
b) Isobutene
c) Butane
d) Ethene

109. The general formula of a cycloalkane is

a) C_nH_n b) C_nH_{2n} c) C_nH_{2n-2} d) C_nH_{2n+2}

110. Which of the following compounds is the most stable?

a) b) c)  d)

111. The chemical reactivity of ethylene is due to:
a) Short carbon to carbon bond distance
b) High double bond energy
c) Trigonal planar structure
d) Presence of π-electrons

112. Petrol or gasoline used as an automobile fuel is a mixture of:
a) Hydrocarbons
b) Alcohols
c) Carbohydrates
d) Hydrocarbons and alcohols

113. According to Markownikoff's rule, what will be the major product of reaction

$$CH_2 = CH - CH_3 \xrightarrow{HBr} ?$$

a) $CH_3 - \overset{\overset{Br}{|}}{CH} - CH_3$ b) $Br - CH_2 - CH_2 - CH_3$
c) $CH_2 = CH - CH_2Br$ d) $CH_2 = C = CH_2$

114. Which of the following gives methane $[CH_4]$ on hydrolysis?
a) Fe_3O_4 b) Al_2O_3 c) CaC_2 d) Al_4C_3

115. 1-propyne on treatment with dilute H_2SO_4 in presence of $HgSO_4$ gives acetone. The change is due to:
a) Hyperconjugation b) Resonance c) Tautomerism d) None of these

116. Two jars A and B are filled with hydrocarbons. Br_2 in CCl_4 is added to these jars. A does not decolourise the Br_2 solution but B decolourises. What are A and B?
a) Alkane and alkene b) Alkene and alkane c) Alkene and alkyne d) None of these

117. Cyclobutadiene is said to be
a) aromatic b) aliphatic c) non-aromatic d) None of these

118. Which of the following compounds can form metallic derivatives?
a) Ethane b) Propyne c) 2-butyne d) 2-butene

119. Catalyst used in dimerization of acetylene to prepare chloroprene is:
a) $HgSO_4 + H_2SO_4$ b) Cu_2Cl_2 c) $Cu_2Cl_2 + NH_4Cl$ d) $Cu_2Cl_2 + NH_4OH$

120. Benzene can react with
a) Bromine water b) HNO_3 c) H_2O d) CH_3OH

121. Which of the following is called Marsh gas?
a) C_2H_4 b) C_2H_6 c) C_2H_2 d) CH_4

122. Butene -1 may be converted to butane by the reaction with:
a) Zn–Hg b) Pd–H_2 c) Zn–HCI d) Sn–HCI

123. Method of converting high boiling hydrocarbons into low boiling hydrocarbons is called:
a) Polymerisation b) Isomerisation c) Cracking d) Condensation

124. The flash point in India is fixed at:
a) 44°C b) 35°C c) 22.8°C d) 30°C

125. The order of relative acidic strengths of water, ethyne and propyne is:
a) Water>propyne>ethyne
b) Propyne>ethyne>water

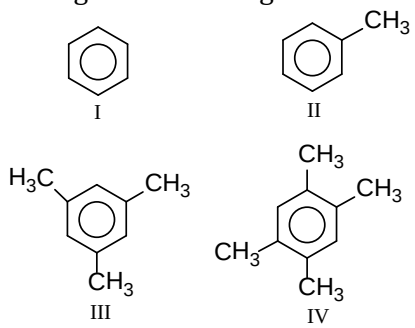
c) Water>ethyne>propyne
d) Ethyne>water>propyne

126. Petroleum is formed by the chemical changes in:
a) Inorganic matter b) Vegetable matter c) Animal matter d) Both (b) and (c)

127. When C_2H_5, CH_4 and C_2H_4 passes through a test tube which have ammoniacal Cu_2Cl_2, find out which gas comes out unaffected from test tube?
a) C_2H_2 and CH_4 b) C_2H_2 and C_2H_4 c) C_2H_4 and CH_4 d) C_2H_2

128. The treatment of benzene with benzoyl chloride in the presence of $AlCl_3$ gives
a) Benzaldehyde b) Benzophenone c) Diphenyl d) Cyclohexane

129. Arrange the following in order of decreasing boiling point

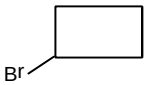


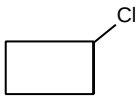
a) I > *II* > *III* > *IV* b) IV > *III* > *II* > *I* c) I > *III* > *IV* > *II* d) II > *III* > *I* > *IV*

130. 2-methylpropene is isomeric with butane-1. They can be distinguished by:
a) Baeyer's reagent b) Ammoniacal $AgNO_3$ c) Br_2 solution d) $O_3, Zn/H_2O$

131. Which of the following annulenes is *anti*-aromatic?
a) Benzene b) Cyclobutadiene c) Cyclodecapentene d) Cyclooctatetraene

132. What would be the product formed when 1-bromo-3-chlorocyclobutane reacts with two equivalents of metallic sodium in ether?

a) 

b) 

c)
d)

133. Formation of ethylene from ethyl bromide is a case of:
a) Addition reaction
b) Substitution reaction
c) Elimination reaction
d) Rearrangement reaction

134. Reactive species in halogenation of benzene in cold and dark
a) $Cl^{\bullet}$ b) Cl^{+} c) Cl^{-} d) None of these

135. At low temperature, the slow addition of molecular bromine to $H_2C = CH — CH_2 — C \equiv CH$ gives:
a) $CH_2 = CH — CH_2 — CBr = CHBr$
b) $BrCH_2 — CHBr — CH_2 — C \equiv CH$
c) $H_2C = CH — CH_2 — CH_2 — CBr_3$
d) $CH_3 — CBr_2 — CH_2 — C \equiv CH$

136. Electrolysis of cold concentrated aqueous solution of potassium methyl succinate yields:
a) Ethane b) Ethyne c) Propene d) Ethane-1,2-diol

137. Cycloalkanes are isomeric with
a) Alkanes b) Alkenes c) Alkynes d) Arenes

138. Two organic compounds (*A*) and (*B*) both containing only carbon and hydrogen, on quantitative analysis gave the same percentage composition by weight
$C = \left(\frac{12}{12}\right) \times 100\%,\ H = \left(\frac{1}{13}\right) \times 100\%$

A decolourises bromine water but B does not. A and B respectively are

a) C_2H_2 and C_6H_6 b) C_6H_6 and C_2H_2 c) C_2H_4 and C_2H_6 d) C_2H_2 and C_2H_6

139. $R—COOH \longrightarrow RCH_2OH$. This mode of reduction can be effected only by:

a) $NaBH_4$ b) Na + Alcohol c) $LiAlH_4$ d) All of these

140. When an aqueous solution containing sodium acetate and sodium propionate is electrolysed we get:

a) Ethane b) Propane c) Butane d) All of these

141. $C_2H_5I + C_5H_{11}I + 2Na \xrightarrow{\text{Ether}} C_2H_5—C_5H_{11} + 2NaI$

The above equation represents:

a) Hofmann's reaction

b) Dow's reaction

c) Wurtz synthesis

d) Reimer-Tiemann's reaction

142. Addition of halogen acid occurs at slowest rate in:

a) $CH_2 = CHCl$ b) $CH_2 = CH_2$ c) $CH_3—CH = CH_2$ d) $(CH_3)_2C = CH_2$

143. On treatment with chlorine in presence of sunlight, toluene gives the product

a) o-chloro toluene b) 2,5-dichloro toluene

c) p-chloro toluene d) Benzyl chloride

: ANSWER KEY :

1)	b	2)	c	3)	a	4)	d	5)	b	6)	a	7)	d	8)	c
9)	d	10)	b	11)	b	12)	a	13)	b	14)	d	15)	c	16)	a
17)	a	18)	c	19)	c	20)	a	21)	a	22)	c	23)	b	24)	b
25)	a	26)	d	27)	b	28)	d	29)	d	30)	a	31)	c	32)	c
33)	c	34)	a	35)	a	36)	d	37)	c	38)	b	39)	b	40)	d
41)	c	42)	d	43)	a	44)	b	45)	b	46)	b	47)	b	48)	d
49)	a	50)	a	51)	a	52)	a	53)	b	54)	a	55)	b	56)	b
57)	d	58)	b	59)	a	60)	c	61)	a	62)	b	63)	a	64)	a
65)	a	66)	d	67)	b	68)	b	69)	d	70)	a	71)	a	72)	c
73)	a	74)	d	75)	c	76)	d	77)	d	78)	a	79)	c	80)	a
81)	d	82)	d	83)	b	84)	c	85)	a	86)	c	87)	c	88)	d
89)	a	90)	a	91)	b	92)	b	93)	c	94)	c	95)	d	96)	a
97)	b	98)	a	99)	d	100)	c	101)	b	102)	c	103)	b	104)	a
105)	b	106)	a	107)	a	108)	a	109)	b	110)	a	111)	d	112)	a
113)	a	114)	d	115)	c	116)	a	117)	c	118)	b	119)	c	120)	b
121)	b	122)	d	123)	c	124)	a	125)	c	126)	d	127)	c	128)	b
129)	a	130)	d	131)	b	132)	d	133)	c	134)	b	135)	b	136)	c
137)	b	138)	a	139)	d	140)	d	141)	c	142)	d	143)	d		

: HINTS AND SOLUTIONS :

1 **(b)**

Successive homologous differ by $—CH_2$ gp.

2 **(c)**

$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

3 **(a)**

Follow Markownikoff's rule for addition.

4 **(d)**

$$\begin{matrix} CHCOOK \\ || \\ CHCOOK \end{matrix} \xrightarrow{\text{Electrolysis}} \begin{matrix} CH \\ ||| \\ CH \end{matrix} + 2CO_2 + 2KOH + H_2$$

Potassium maleate acetylene anode cathode

5 **(b)**

Nitrating, mixture is conc. HNO_3 + conc. H_2SO_4.

It produces NO_2^+ electrophile which carried out electrophilic substitution reaction.

7 **(d)**

$$H_3C - CH_2C \equiv CH \xrightarrow[NH_4OH]{AgNO_3} CH_3CH_2C \equiv CAg$$

(1-butyne) (silver-1 butynide)

$$H_3C - C \equiv C - CH_3 \xrightarrow[NH_4OH]{AgNO_3} \text{No reaction}$$

2-butyne

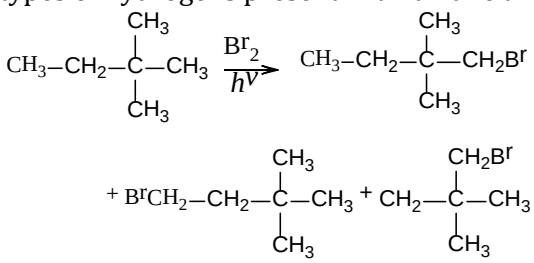
9 **(d)**

$$CH_3COONa + NaOH \xrightarrow{CaO} CH_4 + Na_2CO_3$$

82 g CH_3COONa gives 22.4 litre CH_4.

10 **(b)**

The number of di-and poly-halogenation products depends upon (i) and the number of different types of hydrogens present in an alkane and (ii) the number of halogens introduced



11 **(b)**

According to Huckel's rule, the molecules which contain $(4n + 2)\pi$-electrons are aromatic.

13 **(b)**

This reaction is utilized for the preparation of higher alkynes

$$CH_3 - C \equiv C - H + Na \xrightarrow{\text{Liq.}NH_3} CH_3 - C \equiv C - Na$$

Propyne

$$CH_3 - C \equiv C - Na + BrCH_3 \rightarrow CH_3 - C \equiv C - CH_3 + NaBr$$

But-2-yne

14 **(d)**

$$(C_2H_5)_4NOH \xrightarrow{\Delta} (C_2H_5)_3N + C_2H_4 + H_2O$$

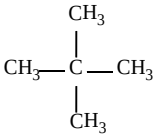
15 **(c)**

Fluorination is highly explosive and occurs violently.

17 **(a)**

Toluene has electron releasing group (CH_3) thus it most reactive towards electrophilic nitration

18 **(c)**


is symmetrical alkane and will give only one monosubstituted product.

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Also $C_nH_{2n+2}, i.e., 12n + 2n + 2 = 72$

$\therefore \quad n=5$

19 **(c)**

Reactivity towards electrophilic substitution increases as the electron density in the benzene ring increases. Since CH_3 is a strong electron donating group thus can be most readily sulphonated

20 **(a)**

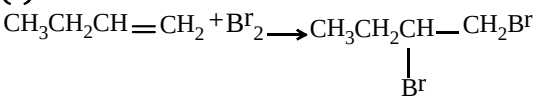
According to Huckel's rule, an aromatic compound should have $(4n + 2)\pi$-electrons. Where, n is an integer, $i.e.$, 0, 1, 3, 4, ... and possesses unusual stability due to the delocalisation of π-electrons.

21 **(a)**

Thermal decomposition of alkanes in the absence of air is called cracking or pyrolysis $e.g.$,

$CH_4 \xrightarrow{1000°C} C + 2H_2$

22 **(c)**



(addition reaction).

23 **(b)**

$6R—CH = CH_2 \xrightarrow{B_2H_6} 2(RCH_2CH_2)_3\,B_2$

$2(RCH_2CH_2)_3B_2 \xrightarrow{6H_2O_2} RCH_2CH_2OH + 2H_3BO_3$

This process always gives alkanol-1 from alkane-1.

24 **(b)**

Since, the alkene of oxidation gives only acetic acid, therefore, the alkene must be symmetrical containing two carbon-atoms on either side of the double bond, $ie.$, 2-butene.

$CH_3CH = CHCH_3 \xrightarrow{KMnO_4} 2CH_3COOH$

25 **(a)**

The H-atoms of terminal alkyne ($ie.$, $H_3C - C \equiv CH$) is weakly acidic.

$CH_3 \equiv CH + NaNH_3 \xrightarrow{Liq.NH_3} H_3C - CH \equiv CNa + NH_3$

26 **(d)**

In this conformer Cl is at equatorial position and is least hindered.

27 **(b)**

Rest all are aromatic compounds.

28 **(d)**

Primary alcohols are oxidized to aldehydes and then to acid to decolourise $KMnO_4$. Also ethylene oxidizes to formic acid.

29 **(d)**

These are characteristics of ozonolysis.

30 **(a)**

The first addition will occur on double bond. Thus, $CH \equiv CH—CH_2—CH = CH_2 \xrightarrow{HBr} CH \equiv C—CH_2—CHBr—CH_3$ but in $CH \equiv C—CH = CH_2$, the addition will occur at $CH \equiv C$ because the product formed is conjugated alkadiene, which is more stable.

$$CH{\equiv}C—CH{=}CH_2 \xrightarrow{HBr} CH_2{=}\underset{\underset{Br}{|}}{C}—CH{=}CH_2$$

32 **(c)**

When an alkyl halide reacts with sodium in presence of dry ether, an alkane with the double number of carbon atoms than the parent halide, is obtained and this reaction is known as Wurtz reaction.

$$\overset{4}{CH_3} - \underset{\underset{CH_3}{|}}{\overset{3}{CH}} - \underset{\underset{CH_3}{|}}{\overset{2}{CH}} - Cl$$

2-chloro-3-methyl butane

$$+CH_3 - \underset{\underset{CH_3}{|}}{\overset{3}{CH}} - \underset{\underset{CH_3}{|}}{\overset{2}{CH}} - Cl \xrightarrow[\text{Dry ether}\ -2NaCl]{Na}$$

$$\overset{6}{CH_3} - \underset{\underset{CH_3}{|}}{\overset{5}{CH}} - \underset{\underset{CH_3}{|}}{\overset{4}{CH}} - \underset{\underset{CH_3}{|}}{\overset{3}{CH}} - \underset{\underset{CH_3}{|}}{\overset{2}{CH}} - \overset{1}{CH_3}$$

2,3,4,5-tetramethyl hexane

33 **(c)**

C—C bond involves $2sp^3 - 2sp^3(\sigma)$ whereas, C—H bond involves $2sp^3 - 1s(\sigma)$ in alkanes.

34 **(a)**

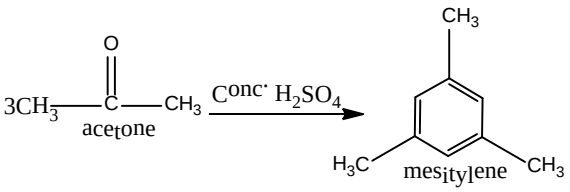
$$CH_2Br—CH_2Br \xrightarrow{Zn} CH_2 = CH_2 + ZnBr_2$$

36 **(d)**

At 70–120°C gasoline, at 150–250°C kerosene; at 250–400°C diesel oil.

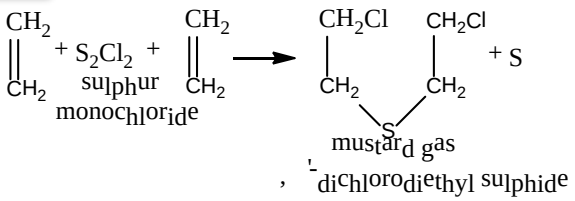
37 **(c)**

Distillation of acetone with concentrated conc. H_2SO_4 gives mesitylene.



38 **(b)**

Mustard gas is β, β-dichlorodethylsulphide which is prepared by the action of sulphur monochloride on ethylene.



40 **(d)**

$CH_2 = CH - CH_2CH_3$

Butene-1

$\xrightarrow[\Delta,\text{pressure}]{Pd/H_2} CH_3 - CH_2 - CH_2 - CH_3$

butane

Other reagents are successful with polar double bonds.

41 **(c)**

It is a non-terminal alkyne.

42 **(d)**

$CH_3CH_2C \equiv CH + H_2O \xrightarrow{HgSO_4/H_2SO_4}$

1-butyne

$$CH_3CH_2\overset{OH}{\overset{|}{C}} = CH_2 \xrightarrow{H_2O} CH_3CH_2 - \overset{OH}{\overset{|}{\underset{OH}{\underset{|}{C}}}} - CH_3$$

unstable

$$\xrightarrow{-H_2O} CH_3CH_2 - \underset{O}{\underset{||}{C}} - CH_3$$

butan-2-one

43 **(a)**

Terminal alkynes react with ammoniacal $AgNO_3$ to give silver salt as they have acidic hydrogen.

$CH_3 - C \equiv CH + AgNO_3 + NH_4OH \rightarrow$

$CH_3 - C \equiv C.Ag + NH_4NO_3 + H_2O$

44 **(b)**

Acetylenichydrogens are acidic because sigma electron density of $C - H$ bond in acetylene is nearer to carbon, which has 50% s-character

45 **(b)**

$(C_6H_{10}O_5)_n + nH_2O \xrightarrow{\text{Bacteria}} 3nCH_4 + 3nCO_2$

46 **(b)**

$2CHCl_3 + 6Ag \longrightarrow C_2H_2 + 6AgCl$

48 **(d)**

$CH_4 + X_2 \longrightarrow CH_3X + CH_2X_2 + CHX_3 + CX_4$,

Also combination of $\dot{C}H_3$ free radical may give C_2H_6. The free radicals formed are $\dot{C}l$, $\dot{C}H_3$, $\dot{C}H_2Cl$, $\dot{C}HCl_2$ and $\dot{C}Cl_3$.

49 **(a)**

These are arbitrarily assigned values.

50 **(a)**

$$CH_2Br-CBr=CH_2 \xrightarrow[\text{Alcohol}]{\text{Zn dust}} CH_2=C=CH_2 + ZnBr_2$$

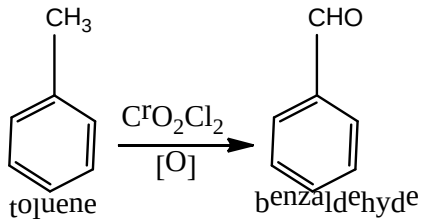
This is dehalogenation.

51 **(a)**

Due to more close packing, even carbon atom alkanes have higher value.

52 **(a)**

Toluene is oxidised to benzaldehyde in presence of chromyl chloride. This reaction is called Etard's reaction.

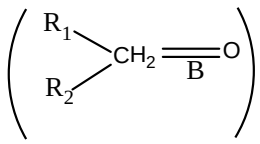


53 **(b)**

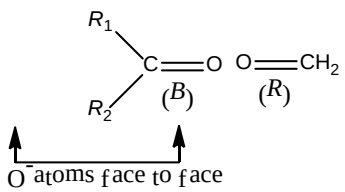
Alkenes give carbonyl compounds on ozonolysis

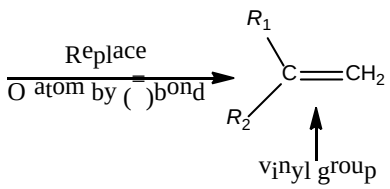
$$\text{Alkene} \xrightarrow{O_3/Zn/H_2O} HCHO + \text{other carbonyl compound}$$

(A)



To determine alkene, place carbonyl compounds with their O-atom face to face. Replace O-atom by a double bond





55 **(b)**

Follow Saytzeff's rule for elimination.

57 **(d)**

Because of less density cyclo hexane floats over water.

58 **(b)**

Catalytic hydrogenation is free radical addition. Also more is heat of hydrogenation ($\Delta H = -$ve) more is reactivity for alkene for hydrogenation.

59 **(a)**

*Gem*dihalides on treatment with alcoholic KOH give alkyne.

$$CH_3-CH\begin{matrix}X\\X\end{matrix} \xrightarrow{\text{alc. KOH}} \underset{\text{ethyne}}{HC\equiv CH} + 2HX$$

61 **(a)**

Rotation of groups or atoms round single bond produces conformation.

62 **(b)**

To oxidize HI formed during the reaction; otherwise the strong reducing nature of HI will reverse the iodination.

63 **(a)**

$$(CH_3)_3CCH = CH_2 \xrightarrow{Hg(OOC.CH_3)_2}$$

$$\underset{\underset{OOCCH_3}{|}}{(CH_3)_3CCHCH_2HgOOCCH_3} \xrightarrow[NaOH]{NaBH_4} (CH_3)_3CCHOHCH_3$$

64 **(a)**

Ethyl benzene cannot be prepared by Wurtz reaction. This method is suitable for the preparation of symmetrical alkanes.

65 **(a)**

Cyclopropane is most strained alkane; follow Baeyer's strain theory.

66 **(d)**

$C_2H_4(OH)_2$ is anti-freeze; C_2H_5Cl is solvent. C_2H_4O is fumigant.

67 **(b)**

In C_2H_5 each C-atom is *sp*-hybridised which contains 50% *s*-character. The greater the *s*-character of an orbital, the bonding electron pair will be more inclinated towards the nucleus as a result carbon would acquire a negative charge and hydrogen a positive charge. Hence, it is acidic in nature.

$$\underset{sp}{H-C} \equiv \underset{sp}{C}:H$$

and removal of hydrogen as proton takes place.

68 **(b)**

The product of give reaction will be according to Markownikoff's rule, this is because peroxide effect is applicable only in case of HBr and not effective in case of HI.

$$CH_3-CH=CH_2 \xrightarrow[\text{peroxide}]{HI} CH_3-\underset{\underset{I}{|}}{CH}-CH_3$$

71 **(a)**

Friedel-Craft's acylation in this reaction benzene reacts with acetyl chloride or acetic anhydride in presence of anhy. $AlCl_3$.

$$+ \underset{\text{or}}{CH_3COCl} \xrightarrow{AlCl_3} \text{product}$$

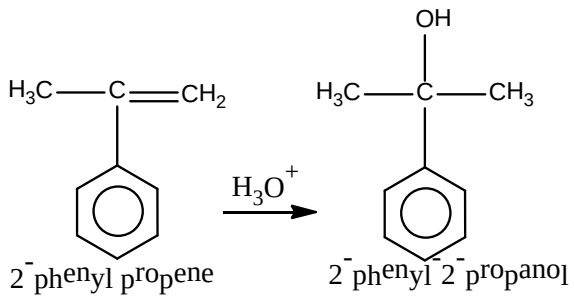
$$(CH_3CO)_2O$$

The X is

$$R-\overset{\overset{O}{\|}}{C}-Cl$$

73 **(a)**

Acidic hydration of 2-phenyl propene follows electrophilic reaction mechanism forming an intermediate 3° carbocation (more stable), thereby forming 2-phenyl-2-propanol.



74 **(d)**

R of RMgX reacts with acidic H to give alkane.

75 **(c)**

Hydrogenation of alkene or alkyne in presence of Ni is called Sabatier and Senderen's reaction.

76 **(d)**

It is an anti-termite.

77 **(d)**

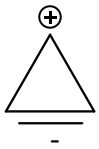
It is definition.

78 **(a)**

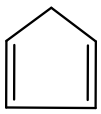
Fractional distillation of petroleum gives a large number of products aliphatic and aromatic.

79 **(c)**

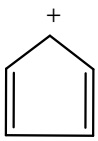
According to Huckel's rule an aromatic compound has $(4n+2)\pi$-electrons, where, n =0, 1, 2, 3,...etc.



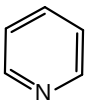
$;4n+2=2; n=0;$ aromatic



$;4n+2=6; n=1;$ aromatic



$;4n+2=4; n=0.5;$ non $-$ aromatic



$;4n+2=6; n=1;$ aromatic

81 **(d)**

(i) **Wurtz reaction**

$$2RX + 2\text{Na} \xrightarrow{\text{Ether}} \underset{\text{Alkane}}{R-R}$$

(ii) **Kolbe's reaction**

$$R\text{COONa} + \text{H}_2\text{O} \xrightarrow{\text{Electrolysis}} \underset{\text{alkane}}{R-R}$$

(iii) **Ulmann's reaction**

$2C_6H_5I + 2Cu \rightarrow C_6H_5 - C_6H_5$
biphenyl

(iv) **Frankland reaction**

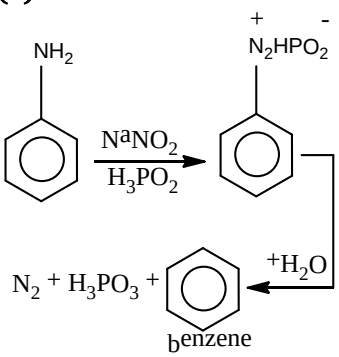
$2RX + Zn \rightarrow R - R$

alkyl halide alkane

82 **(d)**

Due to acidic hydrogen.

83 **(b)**



In this reaction H_3PO_2 serves both as an acid as well as a reducing agent.

84 **(c)**

C_2Cl_6 is artificial camphor.

85 **(a)**

Chair form is more stable.

86 **(c)**

On electrolysis of potassium salt of fumaric and maleic acid, ethyne gas is obtained.

$$\begin{matrix} CHCOOK \\ || \\ CHCOOK \end{matrix} \xrightarrow{\text{Electrolysis}} \begin{matrix} CH \\ ||| \\ CH \end{matrix} + 2CO_2 + 2KOH + H_2$$

Potassium maleate ethyne

87 **(c)**

These are characteristics of C_2H_4.

88 **(d)**

Alkane is $(C_2H_5)_4C$.

89 **(a)**

Halogenation in alkane follow free radical mechanism. Formation of free radical occurs in presence of light.

91 **(b)**

H is replaced by Cl.

92 **(b)**

Both are unsaturated and give Baeyer's test.

93 **(c)**

In Wurtz reaction alkyl halide reacts with sodium in presence of dry ether to give alkanes *e.g.*,

$$C_2H_5\boxed{Cl + 2Na + Cl}C_2H_5 \xrightarrow[\text{(dry ether)}]{} C_4H_{10} + 2NaCl$$

butane

In Wurtz reaction wet ether is not used because wet ether destroy the sodium metal.

94 **(c)**

$$CH \equiv CH + HOCl \longrightarrow CH(OH) = CHCl \xrightarrow{HOCl} CH(OH)_2CHCl_2 \longrightarrow CHCl_2.CHO$$

98 **(a)**

F_2 reacts more violently.

100 **(c)**

Chlorination of CH_4 is free radical mechanism.

101 **(b)**

Oxidation of 1-butene first gives a mixture of propionic acid and formic acid. Formic acid, however, gets further oxidised to CO_2 and H_2O. Therefore, option (b) is correct.

103 **(b)**

In Wurtz reaction, an ether solution of an alkyl halide is treated with sodium which removes the halogen of alkyl halide and the two alkyl radicals join together to form an alkane

104 **(a)**

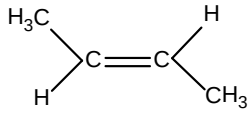
$$CH_3CH = CH_2 + H\overline{O}Cl^+ \rightarrow CH_3 - \underset{\underset{OH}{|}}{CH} - \underset{\underset{Cl}{|}}{CH_2}$$

Propyene hypochlorous acid propene chlorohydrin

105 **(b)**

Reaction of a non-terminal alkyne with a solution of an alkali metal (usually Na or Li or K) in liquid ammonia give a *trans*alkene.

$$CH_3 - C \equiv C - CH_3 + 2[H] \xrightarrow{Li/liq.NH_3}$$



106 **(a)**

TEL increases the octane no. of gasoline.

107 **(a)**

$$RCOONa \longrightarrow R—R + 2CO_2 + 2NaOH + H_2$$

108 **(a)**

$$2CH_3CH_2CH_2COONa \rightarrow \overbrace{CH_3CH_2CH_2CH_2CH_2CH_3 + 2CO_2}^{Anode}\ \overbrace{+2NaOH + H_2}^{Cathode}$$

109 **(b)**

General formula of a cycloalkane is C_nH_{2n}.

110 **(a)**

Conjugate dienesare mores stable than the other dienes.

111 **(d)**

The π-bond is unshared in electromeric effect to give +ve and –ve centres on molecule.

$$CH_2{=}CH_2 \xrightarrow{A^{\cdot}R^{\cdot}} \overset{+}{CH_4} — \overline{C}H_4$$

112 **(a)**

Petrol or gasoline contains mainly C_6 to C_{11}atoms liquid alkanes.

113 **(a)**

According to Markownikoff's rule, the negative part of the reagent gets attached to that double bonded carbon atom which has least number of H-atoms. Thus,

$$CH_3 = CH - CH_3 \xrightarrow{HBr} CH_3 - \underset{\underset{Br}{|}}{CH} - CH_3$$

114 **(d)**

We know that,

$Al_4C_3 + 12H_2O \rightarrow 4Al(OH)_3 + 3CH_4$

Thus, in this reaction methane (CH_4) is produced.

115 **(c)**

$$CH{=}C \quad CH_3 \xrightarrow[Hg^{2+}/H_2SO_4]{H_2O}$$

$CH_2 = C(OH)CH_3 \rightleftharpoons CH_3COCH_3$;

The mechanism involves tautomerism.

116 **(a)**

Br_2solution is decolourized by alkene or alkyne or molecules having unsaturation.

117 **(c)**

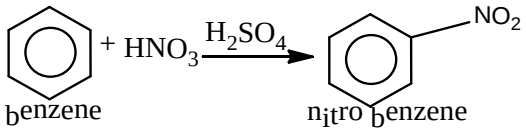
Cyclobutadiene have (4π) conjugated or delocalized electrons, thus it is *anti*-aromatic

118 **(b)**

Due to acidic—H-atom propyne forms $CH_3{-}C \equiv CNa$ with Na.

120 **(b)**

Benzene undergoes electrophilic substitution reaction. It is nitrated by HNO_3.



121 **(d)**

Methane is called marsh gas because it is found in swamps or marshy places and can be obtained by bacterial decomposition of fossils of plants and animals.

122 **(b)**

$CH_3CH_2CH = CH_2 \xrightarrow{H_2/Pd} CH_3CH_2CH_2CH_3$.

123 **(c)**

Cracking involves decomposition of higher alkanes to lower one on heating.

124 **(a)**

The lowest temperature at which an oil gives sufficient vapours to form an explosive mixture with air is referred as flash point. It is 44°C, 35°C, 22.8°C in India, France and England, respectively.

125 **(c)**

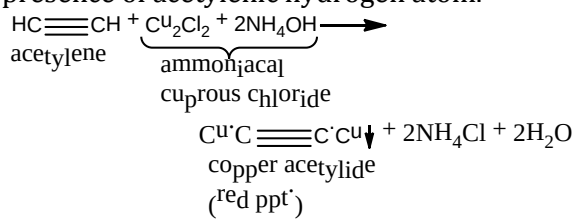
The acidic nature is $H_2O > C_2H_2 > NH_3$; thus, conjugate base order will be $OH^- > C_2H^- > NH_2^-$.

126 **(d)**

Both vegetable and animal matter are origin of petroleum.

127 **(c)**

Copper and silver alkylides are obtained by passing to alkynes in the ammoniacal solution of cuprous chloride and silver nitrate respectively. These reactions are used for detecting the presence of acetylenic hydrogen atom.



So, alkanes and alkenes remain unaffected.

128 **(b)**

Benzophenone (diphenyl ketone) can be prepared by the Friedel-Crafts' condensation between benzoyl chloride and benzene

$C_6H_6 + C_6H_5COCl \xrightarrow{AlCl_3} C_6H_5COC_6H_5 + HCl(80\%)$

129 **(a)**

As the $-CH_3$ group increases boiling point decrease

130 **(d)**

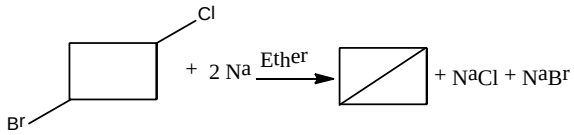
Ozonolysis of these two produces different products.

131 **(b)**

Cyclodecapentaene and Cyclooctatetraene both are nonaromatic. Cyclobutadiene is antiaromatic while benzene having 6π-electrons is aromatic

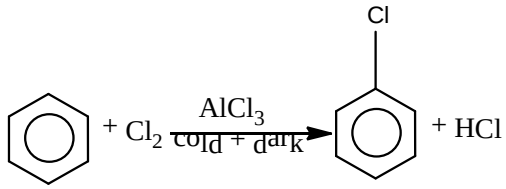
132 **(d)**

The reaction is Wurtz's type reaction.



134 **(b)**

Halogenation of benzene in cold and dark is carried by electrophilic substitution. In this reaction, Cl^+ electrophile takes part in the reaction.



$AlCl_3 + Cl - Cl \longrightarrow Cl^+ + AlCl_4^-$

electrophile

135 **(b)**

Addition of HBr first takes place round double bond.

137 **(b)**

Cycloalkanes are isomeric with alkenes because they have same general formula C_nH_{2n} ($i.e.$, same molecular formula) but possessing different structures. They show ring chain isomerism.

138 **(a)**

Given, $C = \left(\frac{12}{13}\right) \times 100\%,\ H = \left(\frac{1}{13}\right) \times 100\%$

$\therefore \quad C = 92.3\%\ H = 7.69\%$

$C = \frac{92.3}{12} = 7.69 = \frac{7.69}{7.69} = 1$

$H = \frac{7.69}{1} = 7.69 = \frac{7.69}{7.69} = 1$

$\therefore$ Empirical formula of hydrocarbon is $C_1H_1 = CH$

$\therefore$ A has empirical formula CH and decolourises bromine water.

$\therefore$ It is alkyne which is C_2H_2.

$\therefore$ B has empirical formula CH and does not decolourise bromine water.

$\therefore$ It is benzene C_6H_6.

139 **(d)**

Na/C_2H_5OH, $LiAlH_4$ or $NaBH_4$ are used for this purpose.

140 **(d)**

All possible products are obtained; C_2H_6 by CH_3COO^-; C_4H_{10} by $CH_3CH_2COO^-$ and $CH_3CH_2CH_3$ by CH_3COO^- and $CH_3CH_2COO^-$.

141 **(c)**

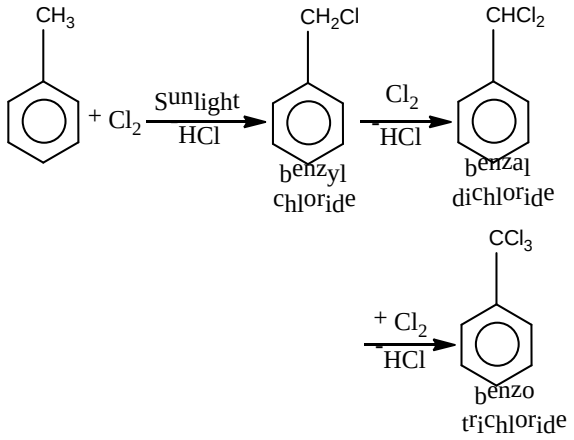
This is Wurtz reaction.

142 **(d)**

___do___

143 **(d)**

In presence of sunlight toluene undergoes aliphatic substitution with chlorine and give benzyl chloride, benzal chloride and benzo trichloride.



Assertion - Reasoning Type

This section contain(s) 8 questions numbered 1 to 8. Each question contains STATEMENT 1(Assertion) and STATEMENT 2(Reason). Each question has the 4 choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

a) Statement 1 is True, Statement 2 is True; Statement 2 **is** correct explanation for Statement 1
b) Statement 1 is True, Statement 2 is True; Statement 2 **is not** correct explanation for Statement 1
c) Statement 1 is True, Statement 2 is False
d) Statement 1 is False, Statement 2 is True

1 **Statement 1:** Acetylene is converted into formic acid with cold and alkaline $KMnO_4$
Statement 2: Acetylene is converted into formic acid with a rupture of triple bond at high temperature

2 **Statement 1:** Oxidation of toluene with chromyl chloride to get benzaldehyde is carried out in presence of acetic anhydride.
Statement 2: Presence of CH_3 group in toluene activates benzene ring.

3 **Statement 1:** Acetylene forms acetylide but ethylene does not.
Statement 2: Acetylene is lighter than air.

4 **Statement 1:** Acetylene is more reactive then ethylene
Statement 2: The acetylene, there is greater strain and hence is reactive. The strain disappears when addition occurs

5 **Statement 1:** The replacement of hydrogen atom by sulphonic acid group ($-SO_3H$) is known as sulphonation
Statement 2: Sulphonation follows free radical mechanism

6 **Statement 1:** 2,3-dimethyl but 2 ene is more stable than but 2 ene.
Statement 2: Tweleve hyper conjugation structure can be written for 2,3 dimethyl but 2ene while but 2 ene has only six.

7 **Statement 1:** Cycloalkanes decolourise the purple colour of dilute and cold $KMnO_4$ or red colour of bromine in carbon tetrachloride
Statement 2: Cycloalkenes undergo the electrophilic addition reactions which are characteristic of alkenes

8 **Statement 1:** The degree of unsaturation of Cyclohexane is 1
Statement 2: The number of degree of unsaturation in a hydrocarbon is given by $\frac{2n_1+2-n_2}{2}$; where n_1 = number of carbon atoms, n_2=number of hydrogen atoms

: ANSWER KEY :

1)	d	2)	b	3)	b	4)	a
5)	b	6)	a	7)	a	8)	b

: HINTS AND SOLUTIONS :

1 **(d)**

Acetylene is converted into formic acid with acidified $KMnO_4$

$$\begin{matrix} CH \\ \| \\ CH \end{matrix} + 3[O] + H_2O \xrightarrow[\text{(acidic)}]{KMnO_4} \underset{\text{formic acid}}{2HCOOH}$$

Acetylene is converted into oxalic acid with cold, dilute alkaline $KMnO_4$

$$\begin{matrix} CH \\ \| \\ CH \end{matrix} + 4[O] + H_2O \xrightarrow{\text{Alk}^{\cdot}\ KMnO_4} \underset{\text{oxalic acid}}{\begin{matrix} COOH \\ | \\ COOH \end{matrix}}$$

2 **(b)**

Oxidation of toluene with chromyl chloride gives benzaldehyde which react with acetic anhydride to give benzylidene acetate and thus, further oxidation of benzaldehyde to benzoic acid is checked by acetic anhydride. The benzylidene acetate on treatment with HCl regenerates benzaldehyde.

3 **(b)**

Acetylene reacts with ammonical. $AgNO_3$solution or ammonical Cu_2Cl_2 or sodamide to from an acetylide because it contains acidic hydrogens.

4 **(a)**

When carbon atoms are linked by double bond, the valency bonds undergo bending and are distorted from their normal directions. This bending produces strain in themolecule with the result is becomes unstable and hence more reactive

5 **(b)**

Lower alkenes donotundegosulphonation but higher members are sulphonated slowly when treated with fuming sulphuric acid at about 400°C

$$R - H + HOSO_3H \xrightarrow[\text{prolonged heating}]{SO_3} R - SO_3H + H_2O$$

8 **(b)**

The number of pairs of hydrogen atoms that a molecular formula lacks to be an alkane (C_nH_{2n+2}) is called degree of unsaturation

Matrix - Match Type

This section contain(s) 1 question(s). Each question contains Statements given in 2 columns which have to be matched. Statements (A, B, C, D) in **columns I** have to be matched with Statements (p, q, r, s) in **columns II**.

1. Match the following lists

Column-I	Column- II
(A) Benzene	(1) Phosgene
(B) Ethylene	(2) Silver mirror
(C) Acetaldehyde	(3) Mustard gas
(D) Chloroform	(4) $(4n+2)\pi$ electrons
	(5) Carbylamine

CODES :

	A	B	C	D
a)	4	3	2	1
b)	3	2	1	4
c)	2	4	5	3
d)	5	1	4	3

: ANSWER KEY :

1)	a

: HINTS AND SOLUTIONS :

1 (a)

Column I	Column II
Benzene	$(4n+2)\pi$-electrons
Ethylene	Mustard gas
Acetaldehyde	Silver mirror
Chloroform	Phosgene

Benzene has 6π-electrons, $i.e.$, it follows Huckel rule $(4n+2)\pi$-electrons. Ethylene reacts with S_2Cl_2 to give mustard gas (war gas).