विघ्न विचारत भीरु जन, नहीं आरम्भे काम, विपति देख छोड़े तुरंत मध्यम मन कर श्याम।
पुरुष सिंह संकल्प कर, सहते विपति अनेक, 'बना' न छोड़े ध्येय को, रघुबर राखे टेक।।

रचितः मानव धर्म प्रणेता
सद्गुरु श्री रणछोड़दासजी महाराज

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REACTION CHART FOR ALKANES

GMP

(1) R–C≡CH or R–CH=CH$_2$ $\xrightarrow[200-300°C]{H_2, Ni}$ Sabatier senderens reaction

(2) R–X $\xrightarrow[Red\ P-Hi,\ LiAlH_4]{Zn-Cu+HCl}$

(3) R–Mg–X $\xrightarrow[or\ NH_3\ or\ RNH_2]{+HOH\ or\ ROH}$

(4) RX $\xrightarrow[Wurtz\ reaction]{Na,\ dry\ ether}$

(5) RX $\xrightarrow[Frankland's\ reaction]{Zn}$

(6) R–C(=O)–Cl or ROH or R–C(=O)–R or RCHO $\xrightarrow{Red\ P / Hi}$

(7) R–C(=O)–R $\xrightarrow[Clemension's\ reduction]{Zn-Hg / Conc. HCl}$

(8) R–C(=O)–R $\xrightarrow[Wolf\ /\ Kishner\ reduction]{H_2N-NH_2}$

or

$(RCH_2CH_2)_3B$ $\xrightarrow{+H_2O}$

(9) RCOONa $\xrightarrow{NaOH+CaO}$

(10) RCOONa $\xrightarrow{Kolbe's\ electrolytic\ synthesis}$

→ R–H or R–R or C_nH_{2n+2} →

GR

(1) $\xrightarrow{X_2,\ h\nu\ or\ UV\ light\ or\ 400°C}$ RX

(2) $\xrightarrow{Nitration}$ R-NO_2

(3) $\xrightarrow{Sulphonation\ H_2S_2O_7}$ Alkyl Sulphonic acid

(4) $SO_2 + Cl_2$ $\xrightarrow[h\nu]{Reed\ reaction}$ RSO_2Cl

(5) $\xrightarrow[Isomerisation]{AlCl_3 / HCl}$ branched alkanes

(6) $\xrightarrow[500-700°C]{Pyrolysis}$ Alkenes + CH_4 or C_2H_6

(7) $\xrightarrow[+Al_2O_3\ 500°C]{Cr\ or\ Mo\ or\ V\ oxide}$ Aromatic compound

(8) $\xrightarrow[step\ up\ reaction]{CH_2N_2}$ Higher alkane

(9) $\xrightarrow[\Delta]{O_2}$ $CO_2 + H_2O$

Combustion

REACTION CHART FOR ALKENES

GMP

All of the following give $R{-}CH{=}CH_2$ or C_nH_{2n}:

(1) $R{-}CH_2{-}CH_2{-}OH \xrightarrow[-H_2O]{conc.\ H_2SO_4}$

(2) $R{-}CH_2{-}CH_2{-}X \xrightarrow[-HX]{alc.\ KOH}$

(3) $R{-}CH_2{-}CH\langle^{X}_{X} \xrightarrow[\text{for higher alkene}\ -X_2]{Zn\ dust}$

(4) $R-\underset{X}{\underset{|}{CH}}-\underset{X}{\underset{|}{CH_2}} \xrightarrow{Zn\ dust}$

(5) $R{-}C{\equiv}CH \xrightarrow[200\text{–}300°C]{Ni,\ H_2}$

(6) $\begin{matrix} RCH-COOK \\ | \\ RCH-COOK \end{matrix} \xrightarrow{\text{Kolbe's electrolytic synthesis}}$

(7) $(C_2H_5)_4N^+OH \xrightarrow{\Delta}$

(8) $R-\underset{O}{\underset{\|}{C}}-O-CH_2-CH_2-R \xrightarrow{Pyrolysis}$

(9) $R{-}H \xrightarrow{Pyrolysis}$

(10) $CH_2{=}CHCl \xrightarrow{CuR_2}$

$\longrightarrow$ $R{-}CH{=}CH_2$ or C_nH_{2n} $\longrightarrow$

GR

(1) $\xrightarrow[200\text{–}300°C]{H_2,\ Ni} R{-}CH_2{-}CH_3$

(2) $\xrightarrow{X_2} R{-}CHX{-}CH_2X$

(3) $\xrightarrow{HX} R{-}CHX{-}CH_3$

(4) $\xrightarrow{HBr,\ Peroxide} R{-}CH_2{-}CH_2Br$

(5) $\xrightarrow{HOCl} R{-}CH(OH){-}CH_2Cl$

(6) $\xrightarrow[+H_2O]{dil.\ H_2SO_4} R{-}CH_2(OH){-}CH_3$

(7) $\xrightarrow[Ag\ 300°C]{1/2\,O_2}$ R-CH-CH$_2$ (bridged by O, epoxide)

(8) $\xrightarrow{+CH_2N_2}$ R-CH-CH$_2$ (bridged by CH$_2$)

(9) $\xrightarrow{BH_3} (RCH_2CH_2)_3B$

(10) $\xrightarrow[HCo(CO)_4]{CO+H_2} R-\underset{CHO}{\underset{|}{CH}}-CH_3 + R-CH_2-\underset{CHO}{\underset{|}{CH_2}}$

(11) $\xrightarrow[\Delta]{O_2} CO_2 + H_2O$

(12) $\xrightarrow{O_SO_4} R-\underset{OH}{\underset{|}{CH}}-\underset{OH}{\underset{|}{CH_2}}$

(13) $\xrightarrow[1\%\ alkaline\ KMnO_4]{Bayer\ reagent} R-\underset{OH}{\underset{|}{CH}}-\underset{OH}{\underset{|}{CH_2}}$

(14) $\xrightarrow{strong\ oxidant} R-\underset{O}{\underset{\|}{C}}-OH + CO_2 + H_2O$

(15) $\xrightarrow[\text{Priles–chalev's reaction}]{Per\ acid}$ R-CH-CH$_2$ (bridged by O)

(16) $\xrightarrow{O_3+H_2O}$ Ozonolysis $\begin{matrix}R\\H\end{matrix}\rangle \underset{O}{\underset{\|}{C}} + \underset{O}{\underset{\|}{C}}\langle\begin{matrix}H\\H\end{matrix}$

(17) $\xrightarrow[200°C\ high\ P]{O_2}$ Polyalkene

(18) $\xrightarrow[500°C]{Cl_2}$ Substitution product

(19) $\xrightarrow[200\text{–}300°C]{Al_2(SO_4)_3}$ Isomerisation

(20) $\xrightarrow{acetic\ anhydride} R{-}CH_2{=}CH{-}COCH_3$
Methyl alkenyl ketone

(21) $\xrightarrow{Alkane}$ Higher alkane

REACTION CHART FOR ALKYNES

GMP

(1) $CH_2Br–CH_2Br \xrightarrow{\text{alc. KOH or } NaNH_2}$

(2) $CH_3–CHBr_2 \xrightarrow{\text{alc. KOH, } NaNH_2}$

(3) $CHCl_3 \xrightarrow[\Delta]{\text{Ag powder}}$

(4) $CHBr_2–CHBr_2 \xrightarrow[\Delta]{\text{Zn dust}}$

(5) $CHBr=CHBr \xrightarrow{Zn}$

(6) $CH_2=CH–Cl \xrightarrow{\text{alc. KOH, } NaNH_2}$

(7) $HC–COONa = HC–COONa \xrightarrow{\text{Kolbe's electrolytic synthesis}}$

(8) $CaC_2 \xrightarrow{H_2O}$

(9) $2C + H_2 \xrightarrow[\text{Berthelot's process}]{\text{electric arc, 1200°C}}$

(10) $CH_3–C≡CH \xrightarrow{\text{(i) Na (ii) R–X}}$

(10) $CH_3–C≡CH \xrightarrow{\text{(i) } CH_3MgI \text{ (ii) R–X}}$

$\rightarrow$ C_2H_2 $\rightarrow$

GR

(1) $\xrightarrow[Ni]{H_2} C_2H_4,\ C_2H_6$

(2) $\xrightarrow{X_2} C_2H_2X_4$

(3) $\xrightarrow[\text{Peroxide}]{HBr} CH_2BrCH_2Br$

(4) $\xrightarrow[\text{No Peroxide}]{HBr} CH_3–CHBr_2$

(5) $\xrightarrow{HOCl} Cl_2CHCHO$

(6) $\xrightarrow{HCN,\ Ba(CN)_2} CH_2=CHCN$

(7) $\xrightarrow{CH_3COOH,\ Hg^{+2}} CH_3CH(OCOCH_3)_2$

(8) $\xrightarrow[\text{(Kucherov's reaction)}]{Hg^{+2},\ 80°C,\ dil.\ H_2SO_4} CH_3CHO$

(9) $\xrightarrow{Conc.\ H_2SO_4} CH_3CH(HSO_4)_2$

(10) $\xrightarrow[\text{Cadet \& Bunsen reaction}]{AsCl_3} CHCl=CHAsCl_2$

(11) $\xrightarrow[HgSO_4]{C_2H_5OH / H_2O} CH_3CHO$

(12) $\xrightarrow[Ni(CO)_4]{CO + HOH} CH_2=CH–COOH$

(13) $\xrightarrow[Ni,\ 160°C]{CO + EtOH} CH_2=CH–COOEt$

(14) $\xrightarrow{NaNH_2} Na–C≡C–Na$

(15) $\xrightarrow[\text{(Tollen's Reagent)}]{AgNO_3 + NH_4OH} Ag–C≡C–Ag$

(16) $\xrightarrow{Cu_2Cl_2 + NH_4OH} Cu–C≡C–Cu$

(17) $\xrightarrow{\text{Combustion } O_2} CO_2 + H_2O$

(18) $\xrightarrow{\text{Bayer Reagent}} CHO–CHO \rightarrow HCOOH$

(19) $\xrightarrow[\text{Ozonolysis}]{O_3}$ H-C-C-H (ozonide: C–O–C bridge above, O–O below) $\xrightarrow{+H_2O} HCOOH$

(20) $\xrightarrow[\text{(Red hot iron tube)}]{\text{Trimerisation}}$ benzene

(21) $\xrightarrow[[Ni(CN)_2]]{\text{Trimerisation}} C_8H_8$ or 1,3,5,7-cyclo octa tetraene

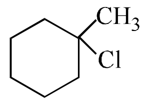
(22) $\xrightarrow[[Cu(NH_3)_2]^+]{\text{Dimerisation}}$ butenyne

(23) $\xrightarrow[\Delta]{S}$ CH=CH / CH=CH bridged by S (thiophene)

(24) $\xrightarrow[(BF_3–HgO)]{CH_3OH} CH(OCH_3)_2–CH_3$ methylal

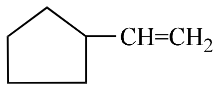
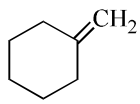
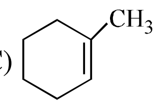
EXERCISE–I (A)

Q.1 In the given reaction

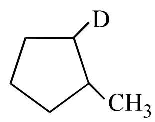
C_7H_{12} (A) $\xrightarrow{HCl}$ 

as major product

(A) is:

(A)  (B)  (C)  (D) All of these

Q.2 1-Methylcyclopentene can be converted into the given compound

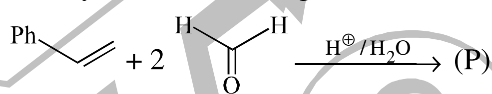


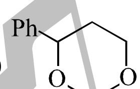
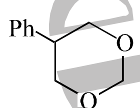
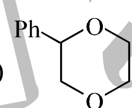
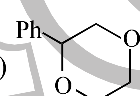
by the use of which of the following reagents?

(A) BD_3 followed by HCOOH (B) BH_3 followed HCOOD

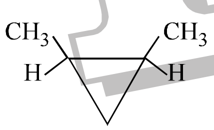
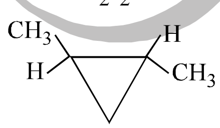
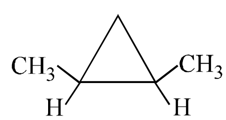
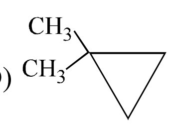
(C) BD_3 followed by HCOOD (D) BH_3 followed by $D-\overset{\overset{O}{||}}{C}-O-H$

Q.3 Identify (P) in the following reaction:



(A)  (B)  (C)  (D) 

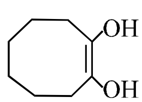
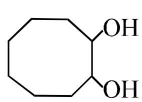
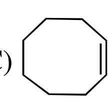
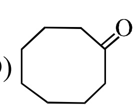
Q.4 The reaction of E-2-butene with CH_2I_2 and Zn–Cu Couple in either medium leads to formation of

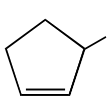
(A)  (B)  (C)  (D) 

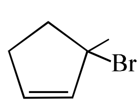
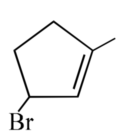
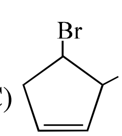
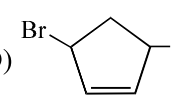
Q.5 (E)-3-bromo-3-hexene when treated with CH_3O^r in CH_3OH gives

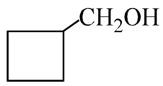
(A) 3-hexyne (B) 2-hexyne (C) 2,3-hexadiene (D) 2,4-hexadiene

Q.6 The reaction of cyclooctyne with $HgSO_4$ in the presence of aq. H_2SO_4 gives

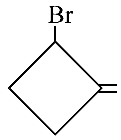
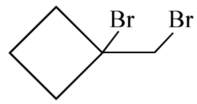
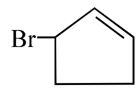
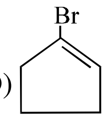
(A)  (B)  (C)  (D) 

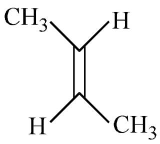
Q.7  + Br_2 $\xrightarrow{h\nu}$ mixture of product. Among the following which product will formed minimum amount.

(A)  (B)  (C)  (D) 

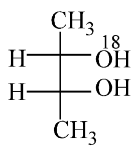
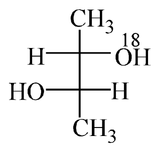
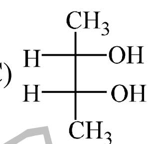
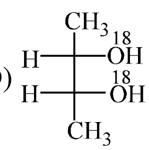
Q.8  $\xrightarrow[\Delta]{H_2SO_4}$ P (Major) $\xrightarrow{NBS}$ Q (Major)

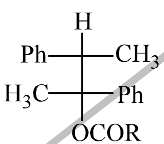
The structure of Q is

(A)  (B)  (C)  (D) 

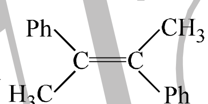
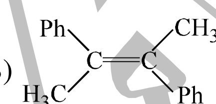
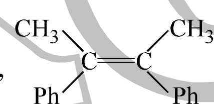
Q.9  $\xrightarrow[\text{(ii) } H_3O^{\oplus}]{\text{(i) } CH_3COO\overset{18}{O}H}$ X

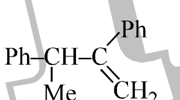
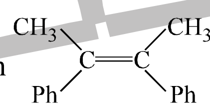
The probable structure of 'X' is

(A)  (B)  (C)  (D) 

Q.10  $\xrightarrow[\Delta]{}$ P(Alkene) $\xrightarrow[CCl_4]{Br_2}$ $\xrightarrow[\text{Acetone}]{NaI}$ Q (Alkene)

Alkene (P) & (Q) respectively are

(A) Both  (B)  , 

(C) Both  (D) Both 

Q.11 ozonolysis of CH_3–CH=C=CH_2 will give

(A) Only CH_3CHO (B) Only HCHO

(C) Only CO_2 (D) Mixture of CH_3CHO, HCHO & CO_2

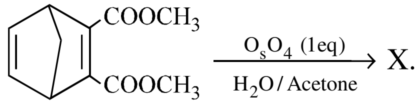
Q.12 O-xylene on ozonolysis will give

(A) $\begin{matrix} CHO \\ | \\ CHO \end{matrix}$ & $CH_3-\overset{O}{\overset{||}{C}}-CHO$

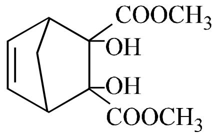
(B) $\begin{matrix} CH_3-C=O \\ | \\ CH_3-C=O \end{matrix}$ & $CH_3-\overset{O}{\overset{||}{C}}-CHO$

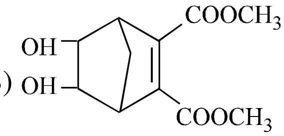
(C) $\begin{matrix} CH_3-C=O \\ | \\ CH_3-C=O \end{matrix}$ & $\begin{matrix} CHO \\ | \\ CHO \end{matrix}$

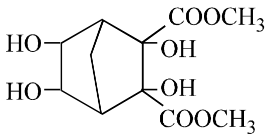
(D) $\begin{matrix} CH_3-C=O \\ | \\ CH_3-C=O \end{matrix}$, $CH_3-\overset{O}{\overset{||}{C}}-CHO$ & $\begin{matrix} CHO \\ | \\ CHO \end{matrix}$

Q.13 

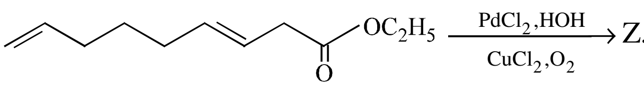
Identify 'X'.

(A) 

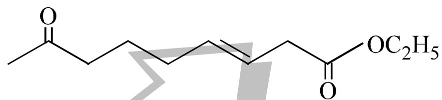
(B) 

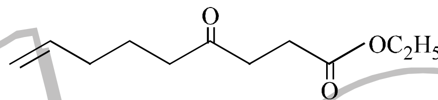
(C) 

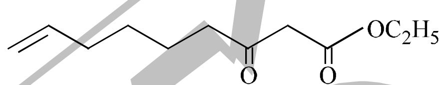
(D) Reaction will not occur

Q.14 

Identify Z.

(A) 

(B) 

(C) 

(D) All are correct

Q.15 $CH_3-C(CH_3)=C(CH_3)-CH_2-CH=CH_2 \xrightarrow[\text{(Acetone/water)}]{O_sO_4\text{(1equiv.)}} A$; Identify A

(A) $CH_3-C(CH_3)=C(CH_3)-CH_2-CH(OH)-CH_2(OH)$

(B) $CH_3-C(CH_3)(OH)-C(CH_3)(OH)-CH_2-CH=CH_2$

(C) $CH_3-CH(CH_3)-C(CH_3)(OH)-CH_2-CH(OH)-CH_3$

(D) Reaction will not occur

Q.16 1-Penten-4-yne reacts with bromine at – 80°C to produce:

(A) 4,4,5,5-Tetrabromopentene
(B) 1,2-Dibromo-1,4-pentadiene
(C) 1,1,2,2,4,5-hexabromopentane
(D) 4,5-dibromopentyne

Q.17 Compound (A) on oxidation with hot $KMnO_4 / OH^-$ gives two compound

$$CH_3-\underset{\underset{CH_3}{|}}{CH}-COOH \quad \& \quad CH_3-\overset{\overset{O}{||}}{C}-CH_2CH_2CH_3$$

compound A will have structure.

(A) $CH_3CH_2-\underset{\underset{CH_3}{|}}{C}=\underset{\underset{CH_3}{|}}{C}-CH_2CH_3$

(B) $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH=\underset{\underset{CH_3}{|}}{C}-CH_2CH_2CH_3$

(C) $CH_3\underset{\underset{CH_3}{|}}{CH}-C\equiv C-CH_3$

(D) $CH_3-\underset{\underset{CH_3}{|}}{CH}-C\equiv C-\underset{\underset{CH_3}{|}}{CH}-CH_3$

Q.18 Consider the following reaction

(A) $C_6H_{12} \xrightarrow{KMnO_4/OH^-/\Delta} C_5H_{10}O$

In the above reaction (A) will be

(A) $CH_3-CH_2-CH_2-CH_2-CH=CH_2$

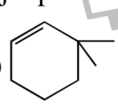
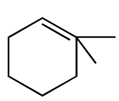
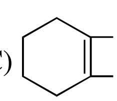
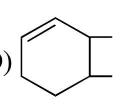
(B) $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-CH=CH_2$

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

(D) $CH_3CH_2CH_2-\underset{\underset{CH_3}{|}}{C}=CH_2$

Q.19 

Major product is:

(A) 
(B) 
(C) 
(D) 

Q.20 Number of required O_2 mole for complete combustion of one mole of propane –
(A) 7 (B) 5 (C) 16 (D) 10

Q.21 How much volume of air will be needed for complete combustion of 10 lit. of ethane –
(A) 135 lit. (B) 35 lit. (C) 175 lit. (D) 205 lit.

Q.22 When n-butane is heated in the presence of $AlCl_3/HCl$ it will be converted into –
(A) Ethane (B) Propane (C) Butene (D) Isobutane

Q.23 The reacting species of alc. KOH is –
(A) OH^- (B) OR^+ (C) OK^+ (D) RO^-

Q.24 The product of reaction between one mole of acetylene and two mole of HCHO in the presence of Cu_2Cl_2 –
(A) $HOCH_2-C\equiv C-CH_2OH$
(B) $H_2C=CH-C\equiv C-CH_2OH$
(C) $HC\equiv C-CH_2OH$
(D) None of these

Q.25 PMA polymer is formed by methyl acrylate, which is prepared as follows –

(A) $R-C\equiv CH \xrightarrow{CO+ROH}$ (B) $HC\equiv CH \xrightarrow[Ni(CO)_4]{CO+CH_3OH}$

(C) $HC\equiv CH \xrightarrow[Ni(CO)_4]{CO+H_2O}$ (D) None of these

Q.26 During the preparation of ethane by Kolbe's electrolytic method using inert electrodes the pH of the electrolyte –
(A) Increases progressively as the reaction proceeds
(B) Decreases progressively as the reaction proceeds
(C) Remains constant throughout the reaction
(D) May decrease of the the concentration of the electrolyte is not very high

Q.27 Ethylene forms ethylene chlorohydrin by the action of –
(A) Dry HCl gas (B) Dry chlorine gas
(C) Solution of chlorine gas in water (D) Dilute hydrochloric acid

Q.28 Anti–Markownikoff's addition of HBr is not observed in –
(A) Propene (B) But–2–ene (C) Butene (D) Pent–2–ene

Q.29 Which alkene on heating with alkaline $KMnO_4$ solution gives acetone and a gas, which turns lime water milky –
(A) 2–Methyl–2–butene (B) Isobutylene
(C) 1–Butene (D) 2–Butene

Q.30 Acetylene may be prepared using Kolbe's electrolytic method employing –
(A) Pot. acetate (B) Pot. succinate (C) Pot. fumarate (D) None of these

Q.31 $B \xleftarrow{Lindlar} R-C\equiv C-R \xrightarrow{Na/NH_3} A$
A and B are geometrical isomers (R–CH=CH–R) –
(A) A is trans, B is cis (B) A and B both are cis
(C) A and B both are trans (D) A is cis, B is trans

Q.32 Which is expected to react most readily with bromine –
(A) $CH_3CH_2CH_3$ (B) $CH_2=CH_2$ (C) $CH\equiv CH$ (D) $CH_3-CH=CH_2$

Q.33 By the addition of CO and H_2O on ethene, the following is obtained –
(A) Propanoic acid (B) Propanal (C) 2–Propenoic acid (D) None of the above

Q.34 An alkyne C_7H_{12} on reaction with alk. $KMnO_4$ and subsequent acidification with HCl yields a mixture of $\underset{\displaystyle CH_3}{CH_3-\underset{|}{C}HCOOH}$ + CH_3CH_2COOH. The alkyne is –
(A) 3–Hexyne (B) 2–Methyl–3–hexyne
(C) 2–Methyl–2–hexyne (D) 2–Methyl–2–hexene

Q.35 A compound (C_5H_8) reacts with ammonical $AgNO_3$ to give a white precipitate and reacts with excess of $KMnO_4$ solution to give $(CH_3)_2CH-COOH$. The compound is –
(A) $CH_2=CH-CH=CH-CH_3$ (B) $(CH_3)_2CH-C\equiv CH$
(C) $CH_3(CH_2)_2C\equiv CH$ (D) $(CH_3)_2C=C=CH_2$

Q.36 Which of the following reagents cannot be used to locate the position of triple bond in $CH_3–C≡C–CH_3$

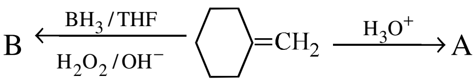
(A) Br_2 (B) O_3 (C) Cu_2^{2+} (D) $KMnO_4$

Q.37 $CH_3–CH_2–C≡CH \underset{B}{\overset{A}{\rightleftarrows}} CH_3C≡C–CH_3$

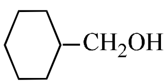
A and B are –

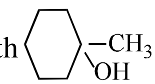
(A) alcoholic KOH and $NaNH_2$ (B) $NaNH_2$ and alcoholic KOH

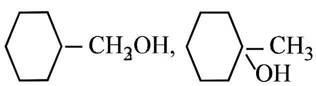
(C) $NaNH_2$ and Lindlar (D) Lindlar and $NaNH_2$

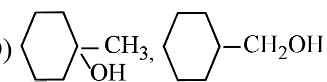
Q.38 

A and B are –

(A) Both 

(B) Both 

(C) 

(D) 

Q.39 $B \xleftarrow[H_2O_2,\ OH^-]{BH_3\ THF} CH_3–C≡CH \xrightarrow{HgSO_4/H_2SO_4} A$

A and B are –

(A) $CH_3CH_2CHO, CH_3-\overset{O}{\overset{||}{C}}-CH_3$ (B) $CH_3-\overset{O}{\overset{||}{C}}-CH_3\ CH_3CH_2CHO$

(C) CH_3CH_2CHO (both) (D) $CH_3-\underset{O}{\underset{||}{C}}-CH_3$ (both)

Q.40 $CH_3CH=CH_2 \xrightarrow[H_2O_2/OH^-]{B_2D_6}$ product X

X is –

(A) $CH_3-\underset{OH}{\underset{|}{CH}}-CH_2D$ (B) $CH_3-\underset{D}{\underset{|}{CH}}-CH_2OH$

(C) $CH_3-\underset{OD}{\underset{|}{CH}}-CH_3$ (D) none is correct

Q.41 $CH_2=CH–CH=CH_2 \xrightarrow{CCl_3Br}$ product. The major product is –

(A) $Br–CH_2–CH=CH–CH_2–CCl_3$ (B) $CH_2=CH-\underset{Br}{\underset{|}{CH}}-CH_2-CCl_3$

(C) $CH_2=CH-\underset{CCl_3}{\underset{|}{CH}}-CH_2-Br$ (D) None is correct

Q.42 Mixture of one mole each of ethene and propyne on reaction with Na will form H_2 gas at S.T.P. –
(A) 22.4 L (B) 11.2 L (C) 33.6 L (D) 44.8 L

Q.43 Dehydration of 2, 2, 3, 4, 4–pentamethyl–3–pentanol gave two alkenes A and B. The ozonolysis products of A and B are -

(A) A gives $(CH_3)_3C-\overset{\overset{\displaystyle O}{\|}}{C}-C(CH_3)_3$ and HCHO

B gives $CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_2-C(CH_3)_3$ and HCHO

(B) A gives $(CH_3)_3C-\overset{\overset{\displaystyle O}{\|}}{C}-C(CH_3)_3$ and HCHO

B gives $CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-\underset{\underset{\displaystyle CH_3}{|}}{\overset{\overset{\displaystyle CH_3}{|}}{C}}-C(CH_3)_3$ and HCHO

(C) A gives $(CH_3)_3C-\overset{\overset{\displaystyle O}{\|}}{C}-CH(CH_3)_2$ and HCHO

B gives $(CH_3)-CH_2-\overset{\overset{\displaystyle O}{\|}}{C}-C(CH_3)_3$ and CH_3CH_2CHO

(D) None of these

Q.44 $CH\equiv CH \xrightarrow[Cu_2Cl_2]{NH_4Cl}$ product

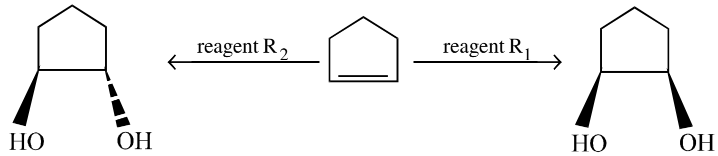
Product is –
(A) Cu–C≡C–Cu (B) CH_2=CH–C≡CH (C) CH≡C–Cu (D) Cu–C≡C–NH_4

Q.45 Alkene A $\xrightarrow{O_3/H_2O}$ $CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3 + CH_3COOH + CH_3-\underset{\underset{\displaystyle O}{\|}}{C}-COOH$

A can be –

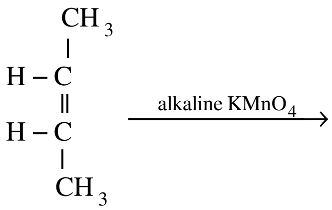
(A) $CH_3-\overset{\overset{\displaystyle CHCH_3}{\|}}{C}-CH=C\begin{matrix} / CH_3 \\ \backslash CH_3 \end{matrix}$ (B) $CH_3-\overset{\overset{\displaystyle C(CH_3)_2}{\|}}{C}-CH=HC-CH_3$

(C) Both correct (D) None is correct

Q.46 

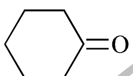
R_1 and R_2 are –

(A) Cold alkaline $KMnO_4$, OsO_4/H_2O_2 (B) Cold alkaline $KMnO_4$, HCO_3H
(C) Cold alkaline $KMnO_4$, $CH_3–O–O–CH_3$ (D) $C_6H_5CO_3H$, HCO_3H

Q.47 

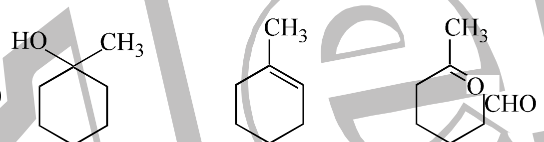
A, which is true about this reaction?

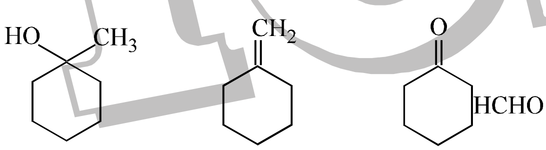
(A) A is meso 2, 3–butan–di–ol formed by *syn* addition
(B) A is meso 2, 3–butan–di–ol formed by *anti* addition
(C) A is a racemic mixture of d and *l*, 2, 3–butan–di–ol formed by anti addition
(D) A is a racemic mixture of d and *l* 2,3–butan–di–ol formed by syn addition

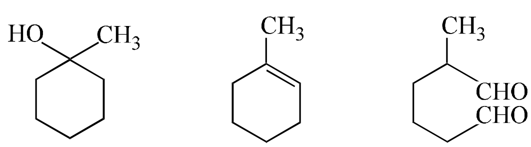
Q.48  $+ CH_3MgBr \xrightarrow{H_3O^+} A \xrightarrow{Con.H_2SO_4} B \xrightarrow{O_3/H_2O/Zn} C$

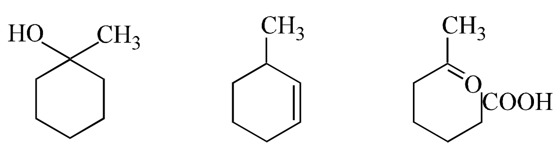
A, B and C are –

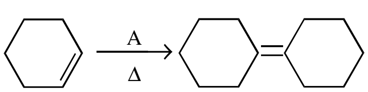
A B C

(A) 

(B) 

(C) 

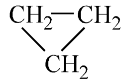
(D) 

Q.49 

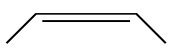
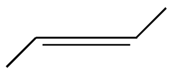
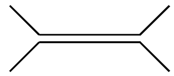
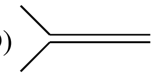
A can be –

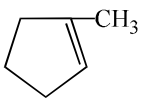
(A) Conc. H_2SO_4 (B) alcoholic KOH (C) Et_3N (D) t-BuOK

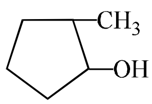
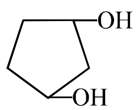
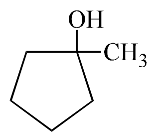
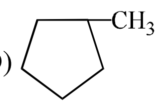
Q.50 $BrCH_2–CH_2–CH_2Br$ reacts with Na in the presence of ether at 100 °C to produce –

(A) $BrCH_2–CH=CH_2$ (B) $CH_2=C=CH_2$ (C)  (D) All of these

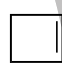
Q.51 Which has least heat of hydrogenation –

(A)  (B)  (C)  (D) 

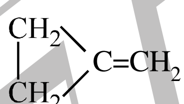
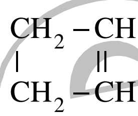
Q.52  $\xrightarrow[(2)\ NaBH_4/NaOH/H_2O]{(1)\ Hg(OAc)_2/H_2O/THF}$ A. A is –

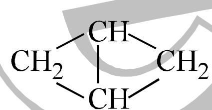
(A)  (B)  (C)  (D) 

Q.53 An organic compound of molecular formula C_4H_6, (A), forms precipitates with ammoniacal silver nitrate and ammoniacal cuprous chloride. 'A' has an isomer 'B', one mol of which reacts with one mol of Br_2 to form 1, 4-dibromo-2-butene. Another isomer of A is 'C', one mole of C reacts with only 1 mol. of Br_2 to give vicinal dibromide. A, B & C are

(A) $CH_3–CH_2–C≡CH$ and $CH_2=CH–CH=CH_2$; 

(B) $CH_3–C≡C–CH_3$ and $CH_3–CH=C=CH_2$; $CH_3–C≡C–CH_3$

(C)  and  ; $CH_2 = CH–CH=CH_2$

(D) $CH_3–C≡C–CH_3$ and  ; $CH_2 = CH–CH = CH_2$

Q.54 $\underset{cis}{CH_3–CH=CH–CH_3} \xrightarrow{x}$ product is Y (non–resolvable) then X can be –

(A) Br_2 water (B) HCO_3H

(C) Cold alkaline $KMnO_4$ (D) all of the above

Q.55 Electrophilic addition reaction is not shown by

(A) $CH_2=\underset{\displaystyle CH_3}{\underset{|}{C}}-CH_3$ and Br_2 (B) $CH≡CH_2$ and HO–Cl

(C) $CH_3–C≡CH$ and CH_3MgBr (D) $CH_2=CH_2$ and dil. H_2SO_4 solution

Q.56 A mixture of CH_4, C_2H_4 and C_2H_2 gaseous are passed through a Wolf bottle containing ammonical cuprous chloride. The gas coming out is

(A) Methane (B) Acetylene

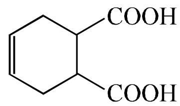
(C) Mixture of methane and ethylene (D) original mixture

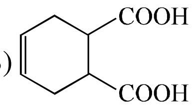
Q.57 In the presence of strong bases, triple bonds will migrate within carbon skeletons by the

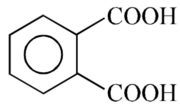
(A) removal of protons (B) addition of protons

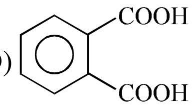
(C) removal and readdition of protons (D) addition and removal of protons.

Q.58 $CH_2=CH-CH=CH_2 + \begin{matrix} CHCOOH \\ \parallel \\ CHCOOH \end{matrix} \xrightarrow{\Delta}$ product X by reaction R. X and R are

(A)  Diels Alder

(B)  Friedel-Crafts

(C)  Diels Alder

(D)  Friedel-Crafts

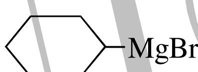
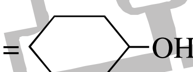
Q.59 For the ionic reaction of hydrochloric acid with the following alkenes, predict the correct sequence of reactivity as measured by reaction rates:
(I) $ClCH=CH_2$ (II) $(CH_3)_2.C=CH_2$ (III) $OHC.CH=CH_2$ (IV) $(NC)_2C=C(CN)_2$
(A) IV > I > III > II (B) I > IV > II > III (C) III > II > IV > I (D) II > I > III > IV

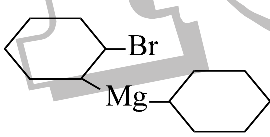
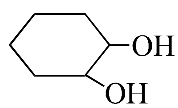
Q.60 The addition of bromine to 2-cyclohexenyl benzoate in 1,2-dichloroethane produces _____ dibromo derivatives:
(A) 2 (B) 3 (C) 4 (D) 6

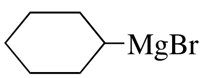
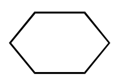
Q.61 How many products will be formed when methylenecyclohexane reacts with NBS?
(A) 3 (B) 1 (C) 2 (D) 4

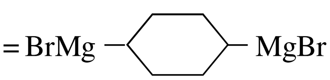
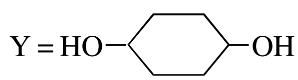
Q.62  Br $\xrightarrow{Mg/dry\ ether}$ (X) $\xrightarrow{CH_3-\overset{O}{\overset{\parallel}{C}}-NH_2}$ (Y)

The structures of (X) and (Y) respectively are

(A) X =  ; Y = 

(B) X =  ; Y = 

(C) X =  ; Y = 

(D) X =  ; Y = 

EXERCISE–I (B)

Q.1 $A \xrightarrow{HgSO_4 / H_2SO_4}$; $A \xrightarrow[H_2O_2/OH^-]{BH_3/THF}$ } B

B is identical when A is –

(A) H—≡—H (B) —≡—H (C) —≡— (D) ⁄—≡—H

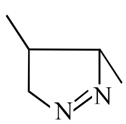
Q.2 An alkene on ozonolysis yields only ethanal. There is an isomer of this which on ozonolysis yields:

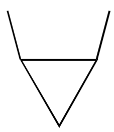
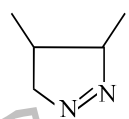
(A) propanone (B) ethanal

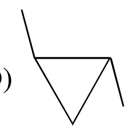
(C) methanal (D) only propanal

Q.3 $CH_3– CH = CH–CH_3 + CH_2N_2 \xrightarrow{\Delta} A$

A can be

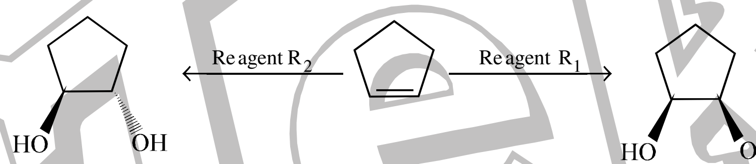
(A) 

(B) 
(C) 

(D) 

Q.4 Aqueous solution of potassium propanoate is electrolysed. Possible organic products are:

(A) n-Butane (B) $C_2H_5COOC_2H_5$ (C) $CH_3–CH_3$ (D) $CH_2=CH_2$

Q.5 

R_1 and R_2 are:

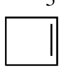
(A) cold alkaline $KMnO_4$, OsO_4 / H_2O_2 (B) OsO_4 / $NaHSO_3$; Ag_2O , $H_3O^{\oplus}$

(C) cold alkaline $KMnO_4$, $C_6H_5CO_3H / H_3O^{\oplus}$ (D) $C_6H_5CO_3H$; OsO_4 / $NaHSO_3$

Q.6 (A) $C_4H_6 \xrightarrow{H_2/Pt}$ (B) $C_4H_8 \xrightarrow{O_3/H_2O} CH_3COOH$

Hence A and B are

(A) $CH_3C \equiv CCH_3$, $CH_3CH = CHCH_3$ (B) $CH_2 = CHCH_3 = CH_2$, $CH_3CH = CHCH_3$

(C) , $CH_3CH = CHCH_3$ (D) None

Q.7 Which is / are true statements/ reactions?

(A) $Al_4C_3 + H_2O \longrightarrow CH_4$ (B) $CaC_2 + H_2O \longrightarrow C_2H_2$

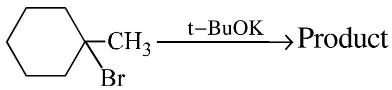
(C) $Mg_2C_3 + H_2O \longrightarrow CH_3C \equiv CH$ (D) $Me_3C–H + KMnO_4 \longrightarrow Me_3C–OH$

Q.8 $Ph-\underset{\underset{O}{\parallel}}{C}-CH_3 \xrightarrow{A} Ph–CH_2–CH_3$

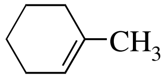
A could be:

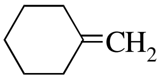
(A) NH_2NH_2, glycol/$OH^–$ (B) Na(Hg)/conc. HCl

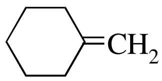
(C) Red P/HI (D) $\underset{\underset{SH}{|}}{CH_2}-\underset{\underset{SH}{|}}{CH_2}$; Raney Ni – H_2

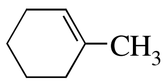
Q.9 

which is / are correct statements about the product:

(A)  is an endocyclic Saytzeff product

(B)  is an exocyclic Saytzeff product

(C)  is an exocyclic Hoffmann product

(D)  is an endocyclic Hoffmann product

Q.10 $CH_2 = CHCH_2CH = CH_2 \xrightarrow{NBS} A$, A can be

(A) $CH_2 = CH\underset{\underset{Br}{|}}{CH}CH = CH_2$

(B) $CH_2=CHCH=CH–CH_2Br$

(C) $CH_2 = CH\,CH_2\,CH = CHBr$

(D) $CH_2 = CH\,CH_2\,\underset{\underset{Br}{|}}{C} = CH_2$

Q.11 Which are correct statements?

(A) meso-2, 3-dibromo-butane on reaction with NaI / acetone gives trans-2-butene

(B) d-or *l*- 2, 3-dibromobutane on reaction with NaI/acetone gives cis-2-butene

(C) meso-2, 3-dibromo-butane on reaction with NaI / acetone gives cis-2-butene

(D) d-or *l*- 2, 3-dibromobutane on reaction with NaI/acetone gives trans-2-butene

Q.12 $Ph–CH=CH_2 + BrCCl_3 \xrightarrow{peroxide}$

Product is:

(A) $Ph–\overset{H}{\underset{Br}{C}}–CH_2CCl_3$

(B) $Ph–\overset{H}{\underset{CCl_3}{C}}–CH_2Br$

(C) $Ph–\overset{Br}{\underset{H}{C}}–CH_2CCl_3$

(D) $Ph–\overset{CCl_3}{\underset{H}{C}}–CH_2Br$

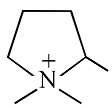
Q.13 Which of the following elimination reactions will occur to give but-1-ene as the major product?

(A) $CH_3.CHCl.CH_2.CH_3 + KOH \xrightarrow{EtOH}$

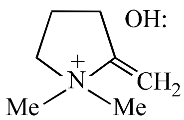
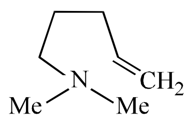
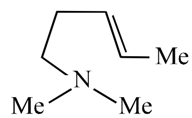
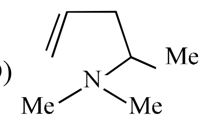
(B) $CH_3.\underset{\underset{+}{N}Me_3}{\underset{|}{CH_2}}.CH.CH_3 + NaOEt \xrightarrow[\Delta]{EtOH}$

(C) $CH_3.CH_2.CHCl.CH_3 + Me_3CoK \xrightarrow{\Delta}$

(D) $CH_3.CH_2.CH(OH).CH_3 + \text{conc. } H_2SO_4 \xrightarrow[\Delta]{}$

Q.14  $\bar{O}H$

The above compound undergoes ready elimination on heating to yield which of the following products?

(A)  (B)  (C)  (D) 

Q.15 Which of the following will give same product with HBr in presence or absence of peroxide.

(A) Cyclohexene
(B) 1-methylcyclohexene
(C) 1,2-dimethylcyclohexene
(D) 1-butene

Q.16 The ionic addition of HCl to which of the following compounds will produces a compound having Cl on carbon next to terminal.

(A) $CF_3.(CH_2)_3.CH=CH_2$
(B) $CH_3.CH=CH_2$
(C) $CF_3.CH=CH_2$
(D) $CH_3.CH_2CH=CH.CH_3$

Q.17 Select true statement(s):

(A) I_2 does not react with ethane at room temperature even though I_2 is more easily cleaved homolytically than the other halogens.
(B) Stereochemical outcome of a radical substitution and a radical addition reaction is identical.
(C) The rate of bromination of methane is decreased if HBr is added to the reaction mixture.
(D) Allylic chloride adds halogens faster than the corresponding vinylic chloride.

Q.18 Select true statement(s):

(A) Instead of radical substitution, cyclopropane undergoes electrophilic addition reactions in sun light.
(B) In general, bromination is more selective than chlorination.
(C) The 2,4,6-tri-tert, butylphenoxy radical is resistant to dimerization.
(D) The radical-catalysed chlorination, $ArCH_3 \rightarrow ArCH_2Cl$, occurs faster when Ar = phenyl than when Ar = p-nitrophenyl.

Q.19 Nitrene is an intermediate in one of the following reactions:

(A) Schmidt rearrangement
(B) Beckmann rearrangement
(C) Baeyer-Villiger oxidation
(D) Curtius reaction

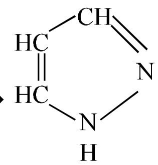
Q.20 Which reagent is the most useful for distinguishing compound I from the rest of the compounds

$CH_3CH_2C\equiv CH$	$CH_3C\equiv CCH_3$	$CH_3CH_2CH_2CH_3$	$CH_3CH=CH_2$
I	II	III	IV

(A) alk. $KMnO_4$
(B) Br_2/CCl_4
(C) Br_2/CH_3COOH
(D) Ammonical $AgNO_3$

Q.21 Indicate among the following the reaction **not correctly** formulated.

(A) $CH_2=CH-CH_3 \xrightarrow[\text{UV light}]{+SO_2Cl_2} CH_2Cl-CHCl-CH_3$

(B) $HC\equiv CH + CH_2N_2 \longrightarrow$ 

(C) $(CH_3)_3CH + Cl_2 \xrightarrow[\text{halogenation}]{\text{photo–}} (CH_3)_3C-Cl$ as major product

(D) $CH_3-C\equiv C-CH_2-CH_2-CH_3 \xrightarrow[\text{in } NH_3\text{ (liq)}]{Na}$ $\underset{CH_3}{\overset{H}{\diagdown}}C=C\underset{CH_2-CH_2-CH_3}{\overset{H}{\diagup}}$

Q.22

List I	List II
(A) n-Hexane $\xrightarrow{Cr_2O_3-Al_2O_3,\Delta}$	(1) Substitution reaction
(B) $CH\equiv CH \xrightarrow[\text{Red hot Fe tube}]{}$	(2) Elimination reaction
(C) $CH_3-\underset{CH_3}{\overset{CH_3}{\overset{\mid}{\underset{\mid}{C}}}}-X \longrightarrow$ aq.	(3) Aromatisation
(D) $CH_3-CH_2-X \longrightarrow$ alc. KOH	(4) Cyclization

Q.23

List I	List II
(A) $CH_3-\underset{\underset{CH_3}{\mid}}{C}=CH_2 \xrightarrow[\text{(ii) } H_2O_2/\overset{\ominus}{O}H]{\text{(i) } BH_3}$	(1) $CH_3-CH_2-CH=CH_2$
(B) $CH_3-\underset{\underset{CH_3}{\mid}}{C}=CH_2 \xrightarrow[\text{(ii) } NaBH_4]{\text{(i) } Hg(OAc)_2/HOH}$	(2) $CH_3-CH=CH-CH_3$
(C) $CH_3-CH_2-\overset{\overset{Cl}{\mid}}{CH}-CH_3 \xrightarrow{CH_3ONa/\Delta}$	(3) $CH_3-\underset{\underset{CH_3}{\mid}}{CH}-CH_2OH$
(D) $CH_3-CH_2-\overset{\overset{Cl}{\mid}}{CH}-CH_3 \xrightarrow[\Delta]{(CH_3)_3CONa}$	(4) $CH_3-\underset{\underset{CH_3}{\mid}}{\overset{\overset{OH}{\mid}}{C}}-CH_3$

Codes:

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

Q.24 **List I** | **List II**

(A) Walden Inversion — (1) Cis addition

(B) Racemic mixture — (2) Trans addition

(C) Alkene $\xrightarrow[\text{Reagent}]{\text{Baeyer}}$ — (3) SN_1 reaction

(D) Alkene $\xrightarrow{Br_2}$ — (4) SN_2 reaction

Codes:

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

Q.25 **List I** | **List II**

(A) $CH_3–C≡C– CH_3 \longrightarrow$ cis-2-butene — (1) $Na/NH_3(l)$

(B) $CH_3 - C \equiv C - CH_3 \longrightarrow$ trans-2-butene — (2) $H_2/Pd/BaSO_4$

(C) $CH_3C≡C–CH_3 \longrightarrow$ 1-Butyne — (3) alc. KOH, Δ

(D) $CH_3–CH_3–C≡CH \longrightarrow$ 2-Butyne — (4) $NaNH_2$, Δ

Codes:

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

Q.26 **List I** | **List II**

(A) RCOONa $\xrightarrow{\text{electrolysis}}$ R–R — (1) Corey-Housh reaction

(B) $R–CH_2–COOH \xrightarrow[\Delta]{\text{Soda lime}} R–CH_3$ — (2) Kolbe electrolysis

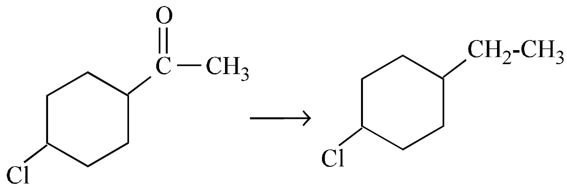
(C) RCOOH $\xrightarrow[\text{(ii)}Cl_2/\Delta]{\text{(i)}AgNO_3}$ R–Cl — (3) Oakwood degradration

(D) $R'–X + R_2CuLi \longrightarrow R–R'$ — (4) Hunsdiecker reaction

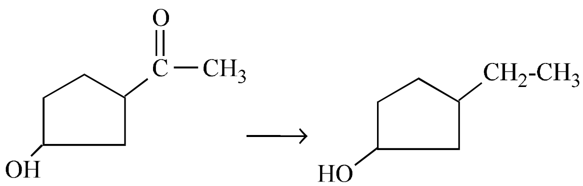
Codes:

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

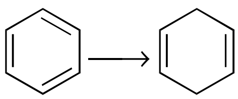
Q.27 **List I** **List II**

(A) 

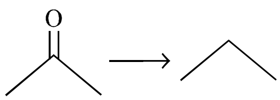
(1) Birch reduction

(B) 

(2) Stephen's reduction

(C) 

(3) Wolf-Kishner reduction

(D) 

(4) Clemmensen reduction

Q.28 **List I** **List II**

(A) n-Hexane ⟶ Benzene
(B) CH≡CH ⟶ Benzene
(C) $CH_3-(CH_2)_6-CH_3$ ⟶ 2,2,3,3 tetramethyl butane
(D) CH_3-CH_2-X ⟶ n-Butane

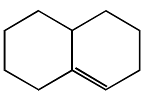
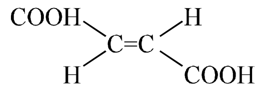
(1) Wurtz reaction
(2) Coupling of reactants is taking place
(3) $AlCl_3$ + HCl at 300°C
(4) Polymerisation
(5) Aromatic procducts is formed
(6) Zn + Δ used as reagent
(7) Al_2O_3 at high temperature

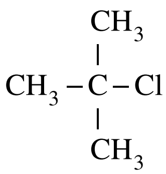
Q.29 Match List-I with List-II and select the correct answer using the codes given below the lists:

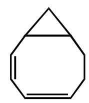
	List-I (Reaction)		**List-II (Reagents)**
(A)	$CH_3-CH=CH_2 \rightarrow CH_3-CHBr-CH_3$	(P)	HBr
(B)	$CH_3-CH=CH_2 \rightarrow CH_3-CH_2-CH_2Br$	(Q)	Br_2
(C)	$CH_3-CH=CH_2 \rightarrow BrCH_2-CH=CH_2$	(R)	HBr / Peroxide
(D)	$CH_3-CH=CH_2 \rightarrow CH_3-CHBr-CH_2Br$	(S)	NBS

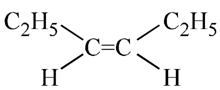
EXERCISE–II

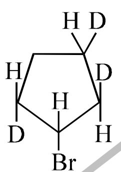
Q.1 Give the product of

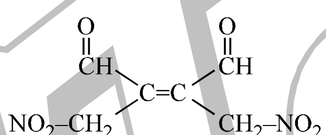
(a)  $\xrightarrow[THF]{BH_3}$ A $\xrightarrow{H_2O_2}$ B (b)  $\xrightarrow[2.\ D_2O_2,\ DO^-]{1.\ BD_3.THF}$

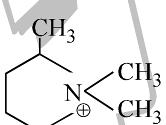
Q.2  $\xrightarrow{LiAlH_4}$?

Q.3 What are the ozonolysis products of 

Q.4  $\xrightarrow[2.\ H_2O/H^+]{1.\ CF_3CO_3H}$ A + B. What are A and B?

Q.5  $\xrightarrow[Alc.]{NaOH}$ A. Write the structure of A.

Q.6  $\xrightarrow{NH_2-NH_2/H_2O_2}$ A. Write the structure of A

Q.7  $\xrightarrow[\Delta]{^-OH}$ A. Write the structure of major product A.

Q.8 Give the structure of the alkene that yields on ozonolysis

(i) $CH_3CH_2CH_2$ CHO & HCHO

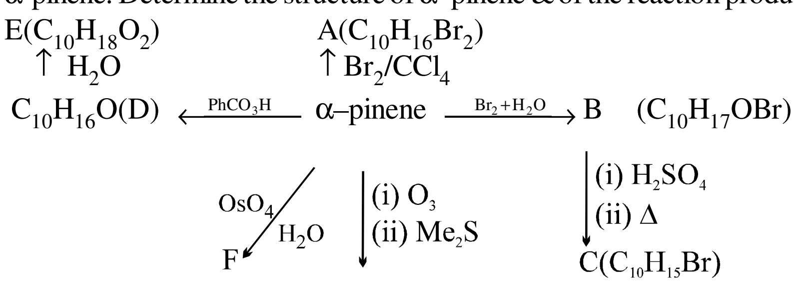
(ii) $C_2H_5COCH_3$ & $CH_3CH(CH_3)$ CHO

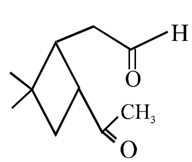
(iii) Only $CH_3CO.CH_3$

(iv) CH_3.CHO & HCHO & OHC.CH_2.CHO

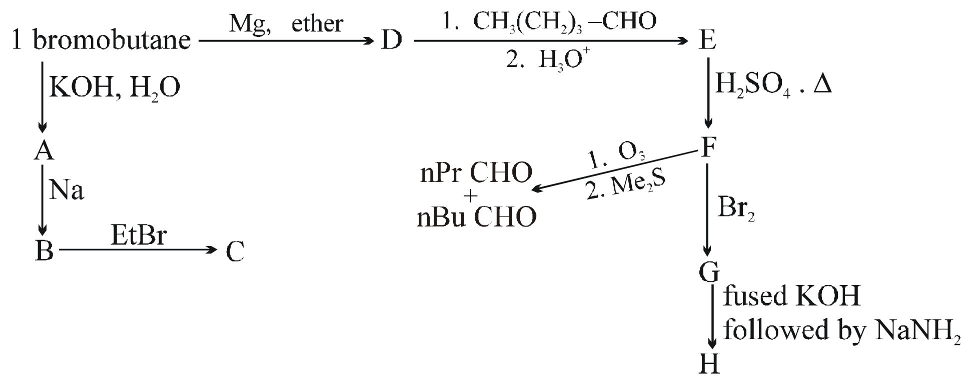
(v) Only OHC–$CH_2CH_2CH_2$–CHO.

Q.9 One of the constituent of turpentine is α-pinene having molecular formula $C_{10}H_{16}$. The following scheme give reaction of α-pinene. Determine the structure of α–pinene & of the reaction products A through E.

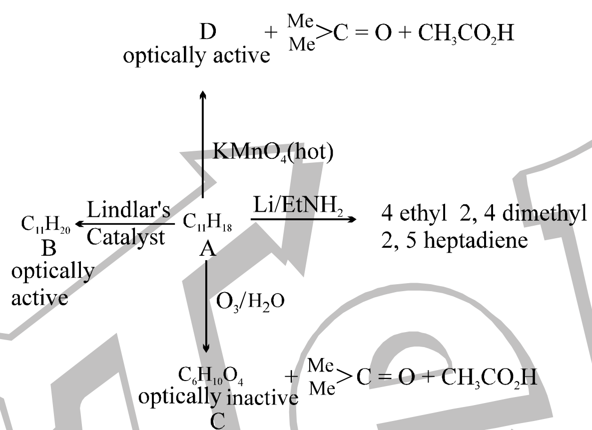




Q.10 Propose structures for intermediates & products A to K



Q.11 Identify the following (A to D).

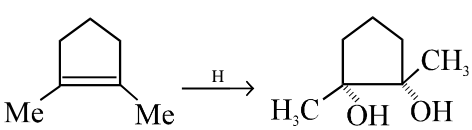


Q.12 What are A to K for the following reactions

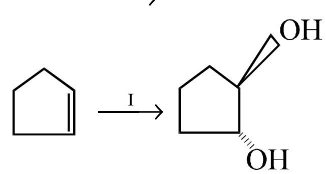
(i) $PhC \equiv CH + CH_3MgX \rightarrow A \xrightarrow{ArCH_2Cl} B \xrightarrow{Li/NH_3} C.$

(ii) $PhCH_2CH_2CH_3 + Br_2 \xrightarrow{h\gamma} D \xrightarrow[KOH]{alcoholic} E \xrightarrow{\text{cold dil. } KMnO_4} F \xrightarrow{\text{hot } KMnO_4} G$

(iii)

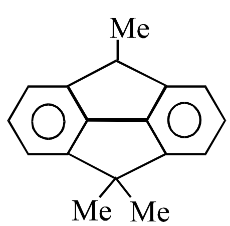


(iv)



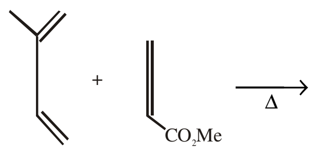
(v) $CF_3-CH=CH_2 \xrightarrow{HBr} J$

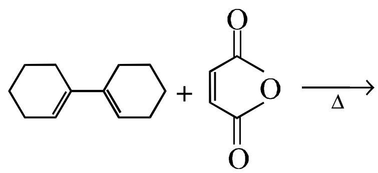
(vi)

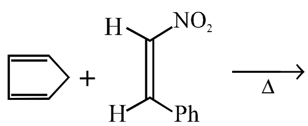


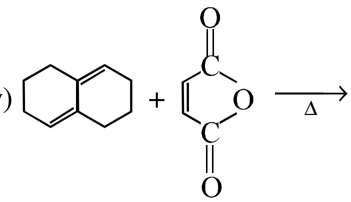
$\xrightarrow{NBS} K$

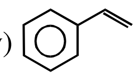
Q.13 What will be the product in the following reaction

(i) 

(ii) 

(iii) 

(iv) 

(v)  $+ \ Br_2 \longrightarrow A \xrightarrow[2.\ CH_3I]{1.\ NaNH_2 (3equiv.)\ NH_3} B$

Q.14 (i) Compare the reaction of $CH_2 = CH_2$ & $CF_2 = CF_2$ with NaOEt in EtOH
(ii) $CCl_2 = CCl_2$ does not decolourise Br_2 solution - explain.

Q.15 Account for the collowing facts
(i) Ozonolysis if carried out in MeOH solvent a hydroxy peroxy ether is formed as unexpected product.
(ii) When 2, 3 dimethyl 2 butene is treated with O_3 in presence of HCHO in CH_2Cl_2 medium, an ozonide other than that expected of the starting alkene is formed. Identify the unexpected ozonide.

Q.16 Explain the following:
(i) 1, 2 shift does not take place during oxymericuration demercuration. Why?
(ii) Halogneation of alkene is anti addition but not syn addition. Why?
(iii) Anti markovnikov addition is not applicable for HCl. Why?
(iv) 1,4–addition takes place in butadi-ene. Why?
(v) C–H bond is stronger than C–C bond but in chlorination C–H bonds get cleaved but not C–C bond. Why?

Q.17 Conversion:
(i) $C_2H_2 \longrightarrow$ racemic 2, 3 dibromobutane (ii) 2 butyne $\longrightarrow$ 2 pentyne
(iii) Ethyne $\longrightarrow$ Acetone (iv) Methane $\longrightarrow$ n Butane (v) Ethene $\longrightarrow$ Propionic Acid

Q.18 Conversion:
(i) $C_2H_2 \longrightarrow$ ethylidene diacetate (ii) $C_2H_2 \longrightarrow$ Butyne diol
(iii) $C_2H_2 \longrightarrow$ m nitroaniline (iv) cis but 2 ene $\longrightarrow$ Trans but 2 ene

Q.19 Outline a stereospecific synthesis of meso 3, 4 dibromohexane from ethyne.

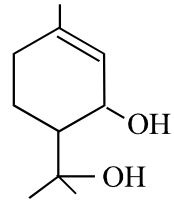
Q.20 How can you convert
(a) Ethane in to meso 2, 3 dimethyl oxiran
(b) CaC_2 into 1, 3, 5 hexatriene
(c) Trimethylsecbutyl amonium hydroxide into 1,4-butan-dial
(d) Cyclo hexanol into trans cyclo hexane-1, 2-diol

Q.21 How will you conver
(a) Hexane dial in to 1,3,5 hexatriene
(b) 1-methyl propyl ethanoate into 1,4-dichloro-2-butene

Q.22 Explain the mechanism of following conversion.

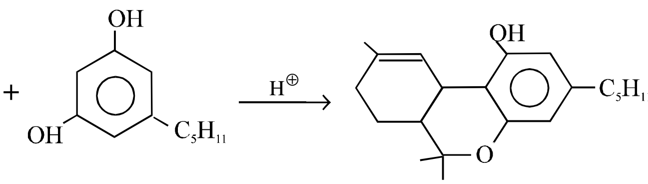
$Me_2C = CH - CH_2CH_2CMe = CHCHO + H_3O^+ \longrightarrow$

Citral



Q.23 When citral is allowed to react in presence of dilute acid with olivetol, there is obtained a mixture of products, one of which is drug marijuana. Reaction is as follows.

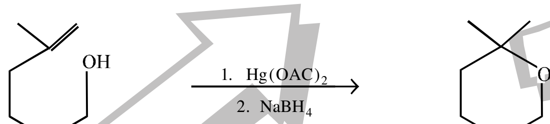
$Me_2C = CH - CH_2–CH_2–CMe=CH–CHO +$



(marijuana)

Explain the mechanism.

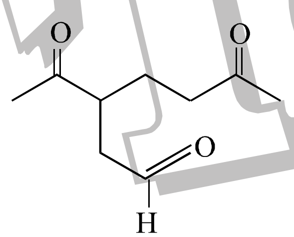
Q.24 The following cyclisation has been observed in the oxymercuration & demercuration of this unsaturated alcohol. Propose a mechanism for this reaction.



Q.25 Write the structural formula of limonene from the following observation:

(a) Limonene when treated with excess H_2 & Pt catalyst, the product formed is 1 isopropyl · 4 methyl cyclohexane

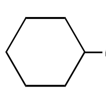
(b) When it is treated with O_3 & then Zn/H_2O the products of the reaction are HCHO & following compound



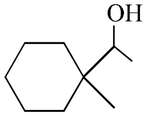
Q.26 (a) $MeCH_2–C≡CBr + CH≡CMe \xrightarrow{Cu^+} A$

(b) $\underset{\displaystyle CH_2}{\overset{Cl}{|}} - CHCl_2 \xrightarrow{\bar{O}H} B$

(c) $CH_2 = CH - \overset{OH}{\overset{|}{CH}} - CH = CH - CH_3 \xrightarrow[H_2SO_4]{MeOH} C$

(d)  $–C≡CH \xrightarrow[H_2SO_4/H_2O]{Hg^{2+}} D$

(e) $Cl_3C–CH=CH_2 \xrightarrow{HOBr} E$

(f) 

$\xrightarrow{H^{\oplus}} F \xrightarrow{O_3ZnH_2O} G$

Q.27 Acetylene is acidic but it does not react with NaOH or KOH. Why?

Q.28 $CH{\equiv}C{-}CH_2{-}CH{=}CH_2$, adds up HBr to give $CH{\equiv}C{-}CH_2{-}CHBr{-}CH_3$ while $CH{\equiv}C{-}CH{=}CH_2$ adds up HBr to give $CH_2{=}C \,.\, Br \,.\, CH{=}CH_2$.

Q.29 Chlorination of ethane to ethyl chloride is more practicable than the chlorination of n-pentane to 1-chloropentane.

Q.30 Why n-pentane has higher boiling point than neopentane?

EXERCISE–III

Q.1 0.37 gm of ROH was added to CH_3MgI and the gas evolved measured 112 cc at STP. What is the molecular wt. of ROH ? On dehydration ROH gives an alkene which on ozonolysis gives acetone as one of the products. ROH on oxidation easily gives an acid containing the same number of carbon atoms. Gives the structures of ROH and the acid with proper reasoning.

Q.2 An alkane A (C_5H_{12}) on chlorination at 300^0 gives a mixture four different mono chlorinated derivatives B, C, D and E. Two of these derivatives give the same stable alkene F on dehydrohalogenation, On oxidation with hot alkaline $KMnO_4$ followed by acidification of F gives two products G and H. Give structures of A to H with proper reasoning.

Q.3 There are six different alkene A, B, C, D, E and F. Each on addition of one mole of hydrogen gives G which has the lowest molecular wt hydrocarbon containing only one asymmetric carbon atom. None of the above alkene give acetone as a product on ozonolysis. Give the structures of A to F. Identify the alkenes that is likely to give a ketone containing more than five carbon atoms on treatment with a warm conc. solution of alkaline $KMnO_4$.

Q.4 3, 3–dimethyl–1–butene and HI react to give two products, $C_6H_{13}I$. On reaction with alc. KOH one isomer, (I) gives back 3,3–dimethyl–1–butene the other (J) gives an alkene that is reductively ozonized to $Me_2C{=}O$. Give the structures of (I) and (J) and explain the formation of the later.

Q.5 Three isomeric alkenes A, B and C, C_5H_{10} are hydrogenated to yield 2–methylbutane A and B gave the same 3^0 ROH on oxymercuration – demercuration. B and C give different 1^0 ROH's on hydroboration -oxidation. Supply the structures of A, B & C.

Q.6 Two isomeric alkyl bromides A and B ($C_5H_{11}Br$) yield the following results in the laboratory. A on treatment with alcoholic KOH gives C and D (C_5H_{10}). C on ozonolysis gives formaldehyde and 2 methyl propanal. B on treatment with alcoholic KOH gives only C (C_5H_{10}). Deduce the structures of A, B, C and D. Ignore the possibility of geometrical and optical isomerism.

Q.7 Give the structure of A, B and C.

(a) A (C_4H_8) which adds on HBr in the presence and in the absence of peroxide to give the same product C_4H_9Br.

(b) B (C_4H_8) which when treated with H_2SO_4 / H_2O give ($C_4H_{10}O$) which cannot be resoslved into optical isomers.

(c) C (C_6H_{12}), an optically active hydrocarbon on catalytic hydrogenation gives an optically inactive compound C_6H_{14}.

Q.8 An alkylhalide, X, of formula $C_6H_{13}Cl$ on treatment with potassium tertiary butoxide gives two isomeric alkenes Y and Z (C_6H_{12}). Both alkenes on hydrogenation gives 2, 3–dimethylbutane predict the structures of X, Y and Z.

Q.9 Identify a chiral compound C, $C_{10}H_{14}$, that is oxidized with hot $KMnO_4$ to Ph COOH, and an achiral compound D, $C_{10}H_{14}$, inert to oxidation under the same conditions.

Q.10 C_7H_{14} (A) decolorises Br_2 in CCl_4 and reacts with $Hg(OAC)_2$ in THF. H_2O followed by reduction with $NaBH_4$ to produced a resolvable compound B. (A) undergoes reductive ozonolysis to give the same compound (C) obtained by oxidation of 3–hexanol with $KMnO_4$. Identity A, B and C compound D, and isomers of A reacts with BH_3. THF and then H_2O_2/OH to give chiral E. Oxidation of E with $KMnO_4$ or acid dichromate affords a chiral carboxylic acid F. Reductive Ozonolysis of D, gives the same compound G which is obtained by oxidation of 2–methyl–3pentanol with $KMnO_4$ identify D, E, F and G.

Q.11 Three compounds A, B and C are isomers of the formula C_5H_8. All of them decolorises bromine in CCl_4 and gives a positive test with Baeyer's reagent. All the three compounds dissoslve in conc. H_2SO_4. Compound A gives a white ppt. with ammonical silver nitrate whereas B and C do not. On hydrogenation in presence of Pt catalyst, A and B both yield n–pentane whereas C gives a product of formula C_5H_{10}. On oxidation with hot alkaline $KMnO_4$ (B) gives acetic acid and CH_3CH_2COOH. Identify A, B & C.

Q.12 An unsaturated hydrocarbon (A) C_6H_{10} readily gives (B) on treatment with $NaNH_2$ in liquid NH_3. When (B) is allowed to react with 1–chloropropane a compound (C) is obtained. On partial hydrogenation in the presence of lindlar's catalyst, (C) gives (D), C_9H_{18}. On ozonolysis, (D) gives 2, 2–dimethylpropanal and 1–butanal with proper reasoning give the structures of (A) (B), (C) and (D).

Q.13 A hydrocarbon A, of the formula C_8H_{10}, on ozonolysis gives compound B ($C_4H_6O_2$) only. The compound B can also be obtained from the alkylbromide (C_3H_5Br) upon treatment with magnesium in dry ether, followed by carbondioxide and acidification. Identify A, B and C and also give equations for the reactions.

Q.14 An organic compound (A), C_6H_{10} on reduction first gives (B), C_6H_{12} and finally (C), C_6H_{14}. (A) on ozonolysis followed by hydrolysis gives two aldehydes (D), C_2H_4O and (E) $C_2H_2O_2$. Oxidation of (B) with acidified $KMnO_4$ gives the acid (F), $C_4H_8O_2$. Determine the structures of the compounds (A) to (F) with proper reasoning.

Q.15 Compound A (C_6H_{12}) is treated with Br_2 to form compound B ($C_6H_{12}Br_2$). On treating B with alcoholic KOH followed by $NaNH_2$ the compound C (C_6H_{10}) is formed. C on treatment with H_2/Pt forms 2-methylpentane. The compound 'C' does not react with ammonical Cu_2Cl_2 or $AgNO_3$. When A is treated with cold $KMnO_4$ solution, a diol D is formed which gives two acids E and F when heated with $KMnO_4$ solution. Compound E is found to be ethanoic acid. Deduce the structures from A to F.

Q.16 An optically active hydrocarbon (A), C_8H_{12} gives an optically inactive compound (B) after hydrogenation. (A) gives no ppt. with $Ag(NH_3)_2^+$ and gives optically inactive (C), C_8H_{14} with H_2 in presence of Pd / $BaSO_4$. Determine the structures, give suitable names for A, B, C & give your reasoning.

Q.17 A organic compound A having carbon and hydrogen, adds one mole of H_2 in presence of Pt catalyst to form normal hexane. On vigorous oxidation with $KMnO_4$, it gives a simple carboxylic acid containing 3 carbon atoms. Assign the structure to A.

Q.18 An organic compound A, C_6H_{10} , on catalytic reduction first gives B, C_6H_{12} , and finally C, C_6H_{14}. A on ozonolysis followed by hydrolysis gives two aldehydes D, C_2H_4O and E, $C_2H_2O_2$. Oxidation of B with acidified $KMnO_4$ gives acid F.

Q.19 A hydrocarbon has 88.89% carbon and 11.11% hydrogen. 0.405 g sample of the hydrocarbon occupies 229.54 ml at 100°C and 1 atm pressure. It decolourises potassium permanganate solution and bromine water without evolving hydrobromic acid. It gave no precipitate with either ammoniacal silver nitrate or cuprous chloride solution. When it reacts with dilute H_2SO_4 in presence of mercuric sulphate, under appropriate conditions, methyl ethyl ketone is formed. What is the hydrocarbon. Write the structural formulae of the eight possible isomer of this compound.

Q.20 6g sample of a natural gas consisting of methane (CH_4) and ethylene (C_2H_4) was burned with excess of oxygen and 17.2g of carbon dioxide and some water was obtained as products. What percent by weight of the sample was ethylene.

EXERCISE–IV (A)

Q.1 Alcoholic solution of KOH is a specific reagent for – **[IIT '90]**
(A) Dehydration (B) Dehydrogenation
(C) Dehydro halogenation (D) Dehalogenation

Q.2 Of the following, unsaturated hydrocarbons are – **[IIT '90]**
(A) ethyne (B) cyclohexane (C) n–propane (D) ethene

Q.3 1-chlorobutane on reaction with alcoholic potash gives – **[IIT '91]**
(A) 1–butene (B) 1–butanol (C) 2–butene (D) 2–butanol

Q.4 The hybridisation of carbon atoms in C–C single bond of $HC{\equiv}C{-}CH{=}CH_2$ is – **[IIT '91]**
(A) sp^3–sp^3 (B) sp^2–sp^3 (C) sp–sp^2 (D) sp^2–sp^2

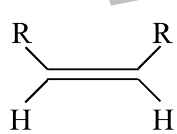
Q.5 The product(s) obtained via oxymercuation ($HgSO_4 + H_2SO_4$) of 1–butyne would be –
(A) $CH_3-CH_2-\underset{\underset{O}{\|}}{C}-CH_3$ (B) CH_3–CH_2–CH_2–CHO
(C) CH_3–CH_2–CHO + HCHO (D) CH_3–CH_2–COOH + HCOOH

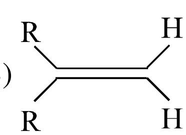
Q.6 When cyclohexane is poured on water, it floats, because – **[IIT '97]**
(A) Cyclohexane is in 'boat' form (B) Cyclohexane is in 'chair' form
(C) Cyclohexane is in 'crown' form (D) Cyclohexane is less dense than water

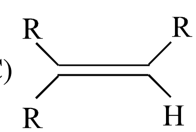
Q.7 Which of the following compounds will show geometrical isomerism? **[IIT '98]**
(A) 2–butene (B) Propene (C) 1–phenylpropene (D) 2–methyl–2–butene

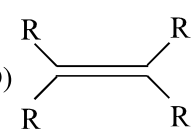
Q.8 In the compound $CH_2{=}CH{-}CH_2{-}CH_2{-}C{\equiv}CH$, the C_2–C_3 bond is of the type – **[IIT '99]**
(A) sp–sp^2 (B) sp^3–sp^3 (C) sp–sp^3 (D) sp^2–sp^3

Q.9 Which one of the following alkenes will react fastest with H_2 under catalytic hydrogenation condition – **[IIT '2000]**

(A) 

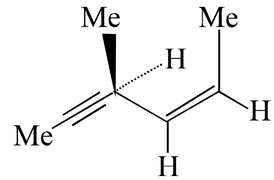
(B) 

(C) 

(D) 

Q.10 Propyne and propene can be distinguished by – **[IIT '2000]**
(A) conc. H_2SO_4 (B) Br_2 in CCl_4 (C) dil. $KMnO_4$ (D) $AgNO_3$ in ammonia

Q.11 In the presence of peroxide, hydrogen chloride and hydrogen iodide do not give anti–Markovnikov addition to alkene because – **[IIT S'2001]**
(A) both are highly ionic
(B) one is oxidising and the other is reducing
(C) one of the step is endothermic in both the cases
(D) All the steps are exothermic in both cases

Q.12 

Hydrogenation of the above compound in the presence of poisoned paladium catalyst gives –

(A) An optically active compound (B) An optically inactive compound **[IIT '2001]**

(C) A racemic mixture (D) A diastereomeric mixture

Q.13 The reaction of propene with HOCl proceeds via the addition of – **[IIT '2001]**

(A) H^+ in first step (B) Cl^+ in first step

(C) OH^- in first step (D) Cl^+ and OH^- in single step

Q.14 The nodal plane in the π–bond of ethene is located in – **[IIT '2002]**

(A) the molecular plane

(B) a plane parallel to the molecular plane

(C) a plane perpendicular to the molecular plane which contains the carbon–carbon σ–bond at right angle

(D) a plane perpendicular to the molecular plane which contains the carbon–carbon σ–bond

Q.15 Consider the following reactions – **[IIT '2002]**

$H_3C-\underset{|\atop D}{CH}-\underset{|\atop CH_3}{CH}-CH_3 + \dot{Br} \rightarrow$ 'X' + HBr

Identify the structure of the major product 'X'

(A) $H_3C-\underset{|\atop D}{CH}-\underset{|\atop CH_3}{CH}-\dot{C}H_2$ (B) $H_3C-\underset{|\atop D}{CH}-\underset{|\atop CH_3}{\dot{C}}-CH_3$

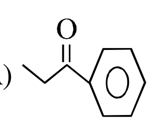
(C) $H_3C-\underset{|\atop D}{\dot{C}}-\underset{|\atop CH_3}{CH}-CH_3$ (D) $H_3C-\dot{C}H-\underset{|\atop CH_2}{CH}-CH_3$

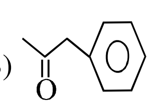
Q.16 Identify a reagent from the following list which can easily distinguish between 1–butyne and 2-butyne- **[IIT '2002]**

(A) bromine, CCl_4 (B) H_2, Lindlar catalyst

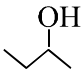
(C) dilute H_2SO_4, $HgSO_4$ (D) ammonical Cu_2Cl_2 solution

Q.17 $C_6H_5–C\equiv C–CH_3 \xrightarrow[H_2SO_4]{HgSO_4} A$ **[IIT '2003]**

(A) 

(B) 

(C) $C_6H_5-\underset{|\atop OH}{C}=CHCH_3$ (D) $C_6H_5-CH=\underset{|\atop OH}{C}-CH_3$

Q.18  $\xrightarrow[-H_2O]{H^+}$ $\underset{\text{(mixture)}}{x}$ $\xrightarrow{Br_2}$ 5 compounds of molecular formula $C_4H_8Br_2$

Number of compounds in X will be: **[IIT '2003]**

(A) 2 (B) 3 (C) 4 (D) 5

Q.19 2–hexyne can be converted into trans–2–hexene by the action of : **[IIT '2004]**

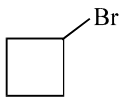
(A) H_2–Pd-$BaSO_4$ (B) Li in liq. NH_3 (C) H_2–PtO_2 (D) $NaBH_4$

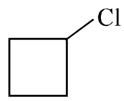
Q.20 When Phenyl Magnesium Bromide reacts with tert. butanol, which of the following is formed?

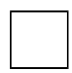
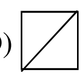
(A) Tert. butyl methyl ether (B) Benzene

(C) Tert. butyl benzene (D) Phenol **[IIT '2005]**

Q.21 1–bromo–3–chlorocyclobutane when treated with two equivalents of Na, in the presence of ether which of the following will be formed? **[IIT '2005]**

(A) 

(B) 

(C) 
(D) 

Q.22 Cyclohexene is best prepared from cyclohexanol by which of the following:

(A) conc. H_3PO_4 (B) conc. HCl/$ZnCl_2$ (C) conc. HCl (D) conc. HBr

[IIT '2005]

Q.23 CH_3–CH=CH_2 + NOCl $\rightarrow$ P **[IIT 2006]**

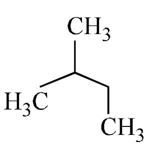
Identify the adduct.

(A) $CH_3-\underset{\displaystyle Cl}{\underset{|}{C}H}-\underset{\displaystyle NO}{\underset{|}{C}H_2}$

(B) $CH_3-\underset{\displaystyle NO}{\underset{|}{C}H}-\underset{\displaystyle Cl}{\underset{|}{C}H_2}$

(C) $CH_3-CH_2-\overset{\displaystyle NO}{\overset{|}{\underset{\displaystyle Cl}{\underset{|}{C}H}}}$

(D) $\underset{\displaystyle NO}{\underset{|}{C}H_2}-CH_2-\underset{\displaystyle Cl}{\underset{|}{C}H_2}$

Q.24 

$\xrightarrow{Cl_2,\,h\nu}$ N(isomeric products) $C_5H_{11}Cl$ $\xrightarrow{\textit{fractional distillation}}$ M(isomeric products)

What are N and M?

(A) 6, 6 (B) 6, 4 (C) 4, 4 (D) 3, 3 **[IIT 2006]**

EXERCISE–IV (B)

Q.1 $(CH_3)_2\overset{\overset{\large Cl}{|}}{C}-CH_2CH_3 \xrightarrow{\text{alc. KOH}} ?$ **[IIT 1992]**

Q.2 $C_6H_5CH_2\underset{\underset{\large Br}{|}}{C}HCH_3 \xrightarrow[\text{heat}]{\text{alc. KOH}} ? \xrightarrow{\text{HBr}} ?$ **[IIT 1993]**

Q.3 $C(C_6H_{12})$, an optically active hydrocarbon which on catalytic hydrogenation gives an optically inactive compound, C_6H_{14}. **[IIT 1993]**

Q.4 Draw the stereochemical structure of the product in the following reactions. **[IIT 1994]**

$R–C\equiv C–R \xrightarrow[\text{Lindlar catalyst}]{H_2}$

Q.5 Write down the structures of the stereoisomers formed when cis–2–butene is reacted with bromine. **[IIT 1995]**

Q.6 An organic compound $E(C_5H_8)$ on hydrogenation gives compound $F(C_5H_{12})$. Compound E on ozonolysis gives formaldehyde and 2–ketopropanal. Deduce the structure of compound E. **[IIT 1995]**

Q.7 Give the structures of the major organic products from 3–ethyl–2–pentene under each of the following reaction conditions. **[IIT 1996]**

(a) HBr in the presence of peroxide (b) Br_2/H_2O

(c) $Hg(OAc)_2/H_2O$; $NaBH_4$

Q.8 An alkyl halide, (X) of formula $C_6H_{13}Cl$ on treatment with potassium tertiary butoxide gives two isomeric alkenes (Y) and (Z) (C_6H_{12}). Both alkenes on hydrogenation give 2, 3–dimethylbutane. Predict the structures of (X), (Y) and (Z) **[IIT 1996]**

Q.9 3,3–Dimethyl–butan–2–ol loses a molecule of water in the presence of concentrated sulphuric acid to give tetramethylethylene as a major product. Suggest a suitable mechanism. **[IIT 1996]**

Q.10 One mole of the compound A (molecular formula C_8H_{12}), incapable of showing stereoisomerism, reacts with only one mole of H_2 on hydrogenation over Pd. A undergoes ozonolysis to give a symmetrical diketone B $(C_8H_{12}O_2)$. What are the structure of A and B? **[IIT 1997]**

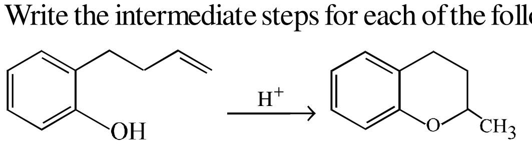
Q.11 Compound (A) C_6H_{12} gives a positive test with bromine in carbon tetrachloride. Reaction of (A) with alkaline $KMnO_4$ yields only (B) which is the potassium salt of an acid. Write structure formulae and IUPAC name of (A) and (B). **[IIT 1997]**

Q.12 The central carbon–carbon bond in 1,3–butadiene is shorter than that of n–butane. Why? **[IIT 1998]**

Q.13 Write the intermediate steps for each of the following reaction **[IIT 1998]**

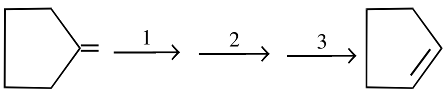
$C_6H_5CH(OH)C\equiv CH \rightarrow C_6H_5CH{=}CHCHO$

Q.14 Write the intermediate steps for each of the following reaction. **[IIT 1998]**

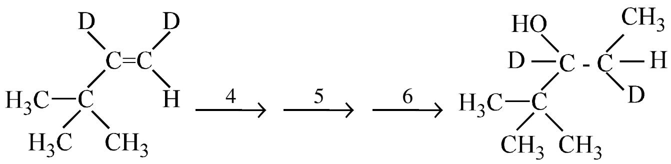


Q.15 Discuss the hybridisation of carbon atoms in allene (C_3H_4) and show the π–orbital overlaps. **[IIT 1999]**

Q.16 Complete the following – **[IIT 1999]**

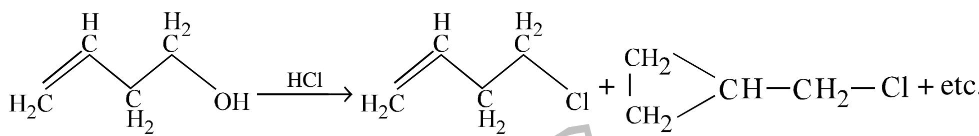


Q.17 Complete the following – **[IIT 1999]**



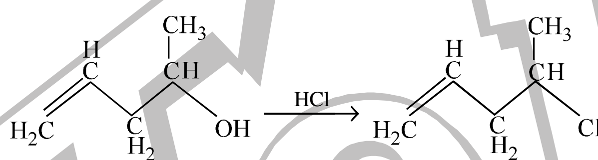
Q.18 Explain briefly the formation on the products giving the structures of the intermediates. **[IIT 1999]**

(i)



But

(ii)



Explain the non formation of cyclic product in (ii)

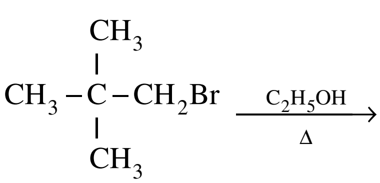
Q.19 Carry out the following transformation in not more than three steps. **[IIT 1999]**

$$CH_3-CH_2-C\equiv C-H \rightarrow CH_3-CH_2-CH_2-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3$$

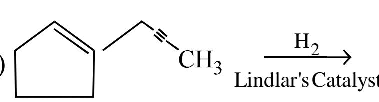
Q.20 $CH_2{=}CH^-$ is more basic than $HC\equiv C^-$ **[IIT 2000]**

Q.21 What would be the major product in each of the following reactions? **[IIT 2000]**

(i)



(ii)



Q.22 On reaction with 4N alcoholic KOH at 175 °C 1–pentyne is slowly converted into equilibrium mixture of 1.3% 1–pentyne (A), 95.2% 2–pentyne (B) and 3.5% 1,2–pentadiene (C). Give the suitable mechanism of formation of A, B and C with all intermediates. **[IIT 2001]**

Q.23 Identify X, Y and Z in the following synthetic scheme and write their structures. Is the compound Z optically active? Justify your answer. **[IIT 2002]**

$$CH_3CH_2C\equiv C-H \xrightarrow[\text{(ii)}\,CH_3CH_2Br]{\text{(i)}\,NaNH_2} X \xrightarrow{H_2/Pd-BaSO_4} Y \xrightarrow{\text{alkaline } KMnO_4} Z$$

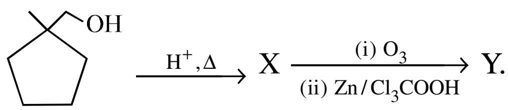
Q.24 A biologically active compound, Bombykol ($C_{16}H_{30}O$) is obtained from a natural source. The structure of the compound is determined by the following reactions.

(a) On hydrogenation, Bombykol gives a compound A, $C_{16}H_{34}O$, which reacts with acetic anhydride to give an ester.

(b) Bombykol also reacts with acetic anhydride to give another ester, which on oxidative ozonolysis (O_3/H_2O_2) gives a mixture of butanoic acid, oxalic acid and 10-acetoxy decanoic acid.

Determine the number of double bonds in Bombykol. Write the structures of compound A and Bombykol. How many geometrical isomers are possible for Bombykol? **[IIT 2002]**

Q.25 If after complete ozonolysis of one mole of monomer of natural polymer gives two moles of CH_2O and one mole of $O=\underset{|}{\overset{CH_3}{C}}-CH=O$. Identify the monomer and draw the all-cis structure of natural polymer. **[IIT 2005]**

Q.26


Identify X and Y. **[IIT 2005]**

ANSWER KEY

EXERCISE–I (A)

Q.1	D	Q.2	B	Q.3	A	Q.4	B	Q.5	A	Q.6	D	Q.7	C
Q.8	C	Q.9	A	Q.10	C	Q.11	D	Q.12	A	Q.13	B	Q.14	A
Q.15	B	Q.16	D	Q.17	B	Q.18	D	Q.19	A	Q.20	B	Q.21	C
Q.22	D	Q.23	A	Q.24	A	Q.25	B	Q.26	A	Q.27	C	Q.28	B
Q.29	B	Q.30	C	Q.31	A	Q.32	D	Q.33	A	Q.34	B	Q.35	B
Q.36	A	Q.37	A	Q.38	D	Q.39	B	Q.40	B	Q.41	A	Q.42	B
Q.43	B	Q.44	B	Q.45	C	Q.46	B	Q.47	A	Q.48	A	Q.49	A
Q.50	C	Q.51	C	Q.52	C	Q.53	A	Q.54	C	Q.55	C	Q.56	C
Q.57	C	Q.58	A	Q.59	D	Q.60	A	Q.61	A	Q.62	C		

EXERCISE–I (B)

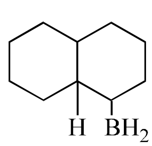
Q.1	A,C	Q.2	A,C	Q.3	A,B,C,D	Q.4	A,B,C,D
Q.5	B,C	Q.6	A,B	Q.7	A,B,C	Q.8	A,B,C,D
Q.9	A,C	Q.10	A,B	Q.11	A,B	Q.12	A,C
Q.13	B,C	Q.14	B,C,D	Q.15	A,C	Q.16	A,B,D
Q.17	A,C,D	Q.18	B,C,D	Q.19	A,D	Q.20	D
Q.21	A,C,D	Q.22	(A) 3,4 ; (B) 3,4 ; (C) 1,2 ; (D) 2			Q.23	(c)
Q.24	(c)	Q.25	(d)	Q.26	(a)		

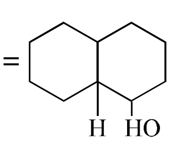
Q.27 (A) 4; (B) 3; (C) 1; (D) 3,4

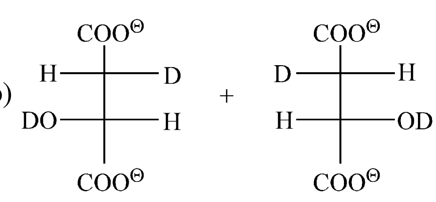
Q.28 (A)5,7 ; (B) 4,5 ;(C) 3 ; (D) 1,2,6

Q.29 (A) P; (B) R; (C) S; (D) Q

EXERCISE–II

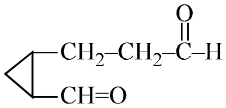
Q.1 (a) (A) = 

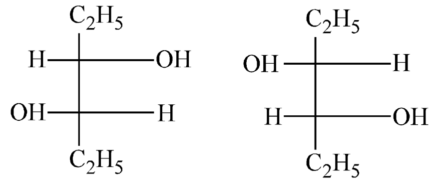
, (B) = 

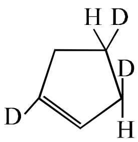
(b) 

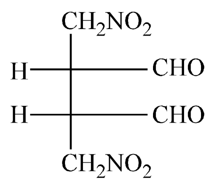
TEKO CLASSES, Director : SUHAG R. KARIYA (S. R. K. Sir) PH: (0755)- 32 00 000, 0 98930 58881 , BHOPAL

Q.2 $CH_3-\underset{}{\overset{CH_3}{\overset{|}{C}}}=CH_2$

Q.3  + $O=CH-CH=O$

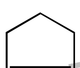
Q.4 A + B are two enatiomers 

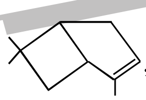
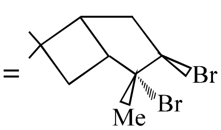
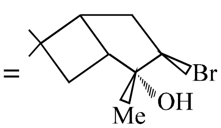
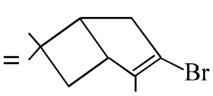
Q.5 

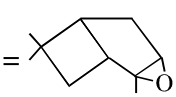
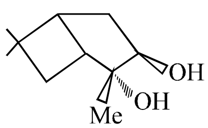
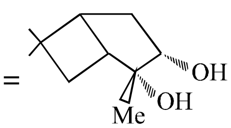
Q.6 

Q.7 $CH_2=CH-CH_2-CH_2-CH_2-\underset{CH_3}{\underset{|}{N}}-CH_3$

Q.8 (i) C–C–C–C=C, (ii) $C-C-\underset{C}{\underset{|}{C}}=C-\overset{C}{\overset{|}{C}}-C$, (iii) $C-\underset{C}{\underset{|}{C}}=\underset{C}{\underset{|}{C}}-C$, (iv) C–C=C–C–C=C,

(v) 

Q.9 α-pinene → , (A) = , (B) = , (C) = 

(D) = , (E) = , (F) = 

Q.10 (A) $\overset{OH}{\overset{|}{C}}-C-C-C$, (B) $\overset{ONa}{\overset{|}{C}}-C-C-C$, (C) C–C–C–C–O–C–C, (D) BrMg–C–C–C–C

(E) $C-C-C-C-\underset{OH}{\underset{|}{C}}-C-C-C-C$, (F) C–C–C–C=C–C–C–C–C ,

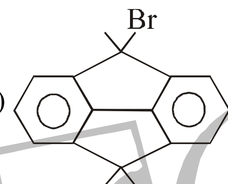
(G) $C-C-C-\underset{Br}{\underset{|}{C}}-\overset{Br}{\overset{|}{C}}-C-C-C-C$, (H) C–C–C–C≡C–C–C–C–C

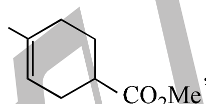
Q.11 (A) $C-C(C)=C-C(C)(C-C)-C\equiv C-C$, (B) cis $C-C(C)=C-C(C)(C-C)-C=C-C$, (C) $HOOC-C(C)(C-C)-COOH$,

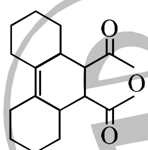
(D) $H-C(C)(C-C)-COOH$

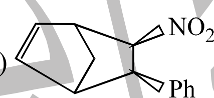
Q.12 (A) $PhC\equiv CMgx$, (B) $Ph-C\equiv C-CH_2Ar$, (C) $Ph(H)C=C(H)CH_2-Ar$, (D) $Ph-CH(Br)-Et$,

(E) $Ph-CH=CH-Me$ trans, (F) $Ph-CH(OH)-CH(OH)-Me$ (threo mix.), (G) $Ph-COOH$

(H) cold dil. $KMnO_4$, (I) HCO_3H, (J) $CF_3CH_2CH_2Br$, (K) 

Q.13 (i) 

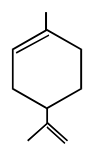
, (ii) 

, (iii) 

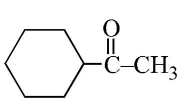
, (iv) no reaction

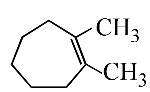
(v) (A) $Ph-CH(Br)-CH_2-Br$, (B) $Ph-C\equiv C-CH_3$

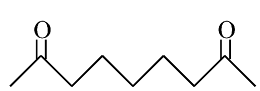
Q.14 (i) II is faster , (ii) unstable intermediate

Q.25 

Q.26 (A) $MeCH_2-C\equiv C-C\equiv CMe$, (B) $CH_2=CCl_2$, (C) $CH_2=CH-CH=CH-CH(O-CH_3)-CH_3$

(D) 

, (E) $CCl_3-CH(Br)-CH(OH)-CH_3$ (F) 

, (G) 

EXERCISE–III

Q.1 H_3C \> CH– CH_2OH (with a second H_3C on the same CH, drawn below)

Q.2

(A)
CH_3
|
CH_3–CH–CH_2CH_3

(B)
CH_3
|
H_3C–CH–CH_2CH_2Cl

(C)
CH_3
|
H_3C–CH–CH–CH_3
|
Cl

(D)
CH_3
|
CH_3–C–CH_2CH_3
|
Cl

(E)
CH_3
|
$ClCH_2$– CH–CH_2CH_3

(F)
CH_3
|
H_3C–C=CH–CH_3

(G) CH_3COCH_3

(H) CH_3COOH

Q.3

(A)
$CH_2CH_2CH_3$
|
CH_2=C–CH_2CH_3

(B)
$CHCH_2CH_3$
||
CH_3– CCH_2CH_3

(C)
CH=CH–CH_3
|
CH_3–CH–CH_2CH_3

(D)
CH_2–CH=CH_2
|
CH_3–CH–CH_2CH_3

(E)
$CH_2CH_2CH_3$
|
CH_3–C=CH–CH_3

(F)
$CH_2CH_2CH_3$
|
CH_3–CH–CH=CH_2

(G)
$CH_2CH_2CH_3$
|
H_3C–C–CH_2CH_3
|
H

Q.4

(I)
CH_3
|
CH_3CH–C–CH_3
| |
I CH_3

(J)
CH_3 CH_3
| |
CH_3–C – CH–CH_3
|
I

Q.5

(A)
CH_3–C=CH–CH_3
|
CH_3

(B)
CH_2=CCH_2CH_3
|
CH_3

(C) CH_2=CHCH$(CH_3)_2$

Q.6

(A)
Br
|
CH_3–CH–CH \< CH_3, CH_3

(B)
CH_2Br–CH_2–CH–CH_3
|
CH_3

(C)
CH_2=CH–CH–CH_3
|
CH_3

(D)
CH_3CH=C–CH_3
|
CH_3

Q.7

(A) CH_3–CH=CH–CH_3

(B) C, C \> C=C

(C)
CH=CH_2
|
CH_3–C^* –H
|
CH_2CH_3]

Q.8

(X)
CH_3–CCl–CH–CH_3
| |
CH_3 CH_3

(Y)
CH_2=C — CH–CH_3
| |
CH_3 CH_3

(Z)
CH_3–C = C–CH_3
| |
CH_3 CH_3

Q.9 (A) $PhCH(CH_3)CH_2CH_3$ (B) $PhC(CH_3)_3$

Q.10

(A) $CH_3–CH_2–C(=CH_2)–CH_2–CH_2CH_3$ (B) $CH_3CH_2–C(OH)(CH_3)–CH_2CH_2CH_3$ (C) $CH_3CH_2–C(=O)–CH_2CH_3$

(D) $CH_3–CH(CH_3)–C(=CH_2)–CH_2CH_3$ (E) $CH_3CH(CH_3)–CH(CH_2OH)–CH_2CH_3$ (F) $CH_3–CH(CH_3)–CH(CO_2H)–CH_2–CH_3$

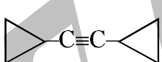
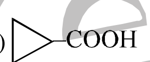
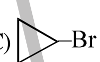
(G) $CH_3–CH(CH_3)–C(=O)–CH_2–CH_3$

Q.11 (A) $CH_3CH_2CH_2–C≡CH_3$ (B) $CH_3CH_2C≡C–CH_3$ (C) Cyclopentene

Q.12

(A) $CH_3–C(CH_3)_2–C≡CH$ (B) $H_3C–C(CH_3)_2–C≡C^- Na^+$

(C) $H_3C–C(CH_3)_2–C≡C–CH_2CH_2CH_3$ (D) $H_3C–C(CH_3)_2–C=CH–CH_2CH_2CH_3$

Q.13 (A)  (B)  (C) 

Q.14 (A) $CH_3–CH=CH–CH=CH–CH_3$ (B) $CH_3CH_2CH_2CH=CHCH_3$ (C) $CH_3CH_2CH_2CH_2–CH_2CH_3$
(D) CH_3CHO (E) CHO–CHO (F) $CH_3CH_2CH_2COOH$

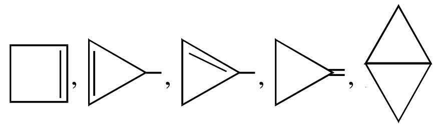
Q.15 (A) $CH_3–CH=CH–CH(CH_3)–CH_3$ (B) $CH_3–CH(Br)–CH(Br)–CH(CH_3)–CH_3$ (C) $CH_3–C≡C–CH(CH_3)–CH_3$
(D) $CH_3–CH(OH)–CH(OH)–CH(CH_3)–CH_3$ (E) CH_3COOH (F) $H_3C–CH(CH_3)–COOH$

Q.16 $CH_3–C(H)=C(H)–C(H)(CH_3)–C≡C–CH_3$

Q.17 $CH_3CH_2CH=CHCH_2CH_3$

Q.18 (A) $CH_3–CH=CH–CH=CH–CH_3$, (B) $CH_3–CH_2–CH=CH–CH_2–CH_3$,

(C) $CH_3–CH_2–CH_2–CH_2–CH_2–CH_3$, (D) CH_3CHO, (E) CHO–CHO, (F) CH_3CH_2COOH

Q.19 Isomer are : C≡C–C–C, C=C–C=C, C=C=C–C, 

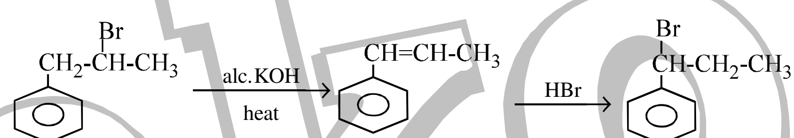
Q.20 23.7

EXERCISE–IV (A)

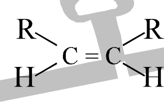
Q.1	C	Q.2	A,D	Q.3	A	Q.4	C	Q.5	A
Q.6	D	Q.7	A,C	Q.8	D	Q.9	A	Q.10	D
Q.11	C	Q.12	B	Q.13	B	Q.14	A	Q.15	B
Q.16	D	Q.17	A	Q.18	B	Q.19	B	Q.20	B
Q.21	D	Q.22	A	Q.23	A	Q.24	B		

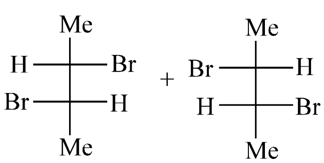
EXERCISE–IV (B)

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

Q.2 

Q.3 $CH_3-CH_2-\underset{CH_3}{\underset{|}{\overset{H}{\overset{|}{C}}}}-CH=CH_2$ (C_6H_{12})

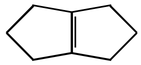
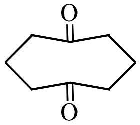
Q.4 

Q.5 

Q.6 **(E)** $CH_3-\overset{CH_2}{\overset{\|}{C}}-\overset{CH_2}{\overset{\|}{CH}}$

Q.7 (a) $(CH_3–CH_2)\ CH-\overset{Br}{\overset{|}{CH}}-CH_3$; (b) $(CH_3–CH_2)_2\ \overset{OH}{\overset{|}{C}}-\underset{Br}{\underset{|}{CH}}-CH_3$; (c) $(C_2H_5)_3C–OH$

Q.8 $CH_3-\underset{Cl}{\underset{|}{\overset{CH_3}{\overset{|}{C}}}}-\overset{CH_3}{\overset{|}{CH}}-CH_3$; **(Y)** $CH_2=\overset{CH_3}{\overset{|}{C}}-\overset{CH_3}{\overset{|}{C}}-CH_3$; **(Z)** $CH_3-\overset{CH_3}{\overset{|}{C}}=\overset{CH_3}{\overset{|}{C}}-CH_3$

Q.10 **(A)**  **(B)** 

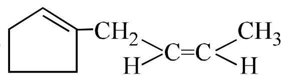
Q.11 **(A)** $CH_3–CH_2–CH=CH–CH_2–CH_3$ **(B)** CH_3CH_2COOK

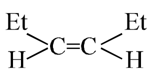
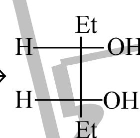
Q.16 1 → ozonolysis ; 2 → $LiAlH_4$; 3 → H_2SO_4

Q.17 (4) → HO–Cl ; (5) → CH_3MgCl ; (6) → H_2O/H^+

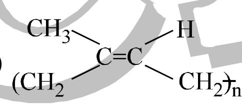
Q.19 (1) $NaNH_2$, (2) Me–I, (3) $HgSO_4$ dil H_2SO_4

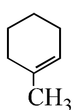
Q.20 higher electronegativity of sp carbon

Q.21 (i) $CH_3-C(CH_3)(O-C_2H_6)-CH_2-CH_3$ (ii) 

Q.23 **(X)** → Et–C≡C–Et **(Y)** →  **(Z)** →  Z is meso so optically inactive.

Q.24 Bombykol :- HO–C–C–C–C–C–C–C–C–C–C=C–C=C–C–C–C
(A) :- $HO-(CH_3)_{15}CH_3$ 4 geometrical isomers are possible

Q.25 (a) $CH_2=C(CH_3)-CH=CH_2$ (b) 

Q.26 (X)  , (Y) $CH_3-\overset{O}{\overset{||}{C}}-(CH_2)_4-CH=O$