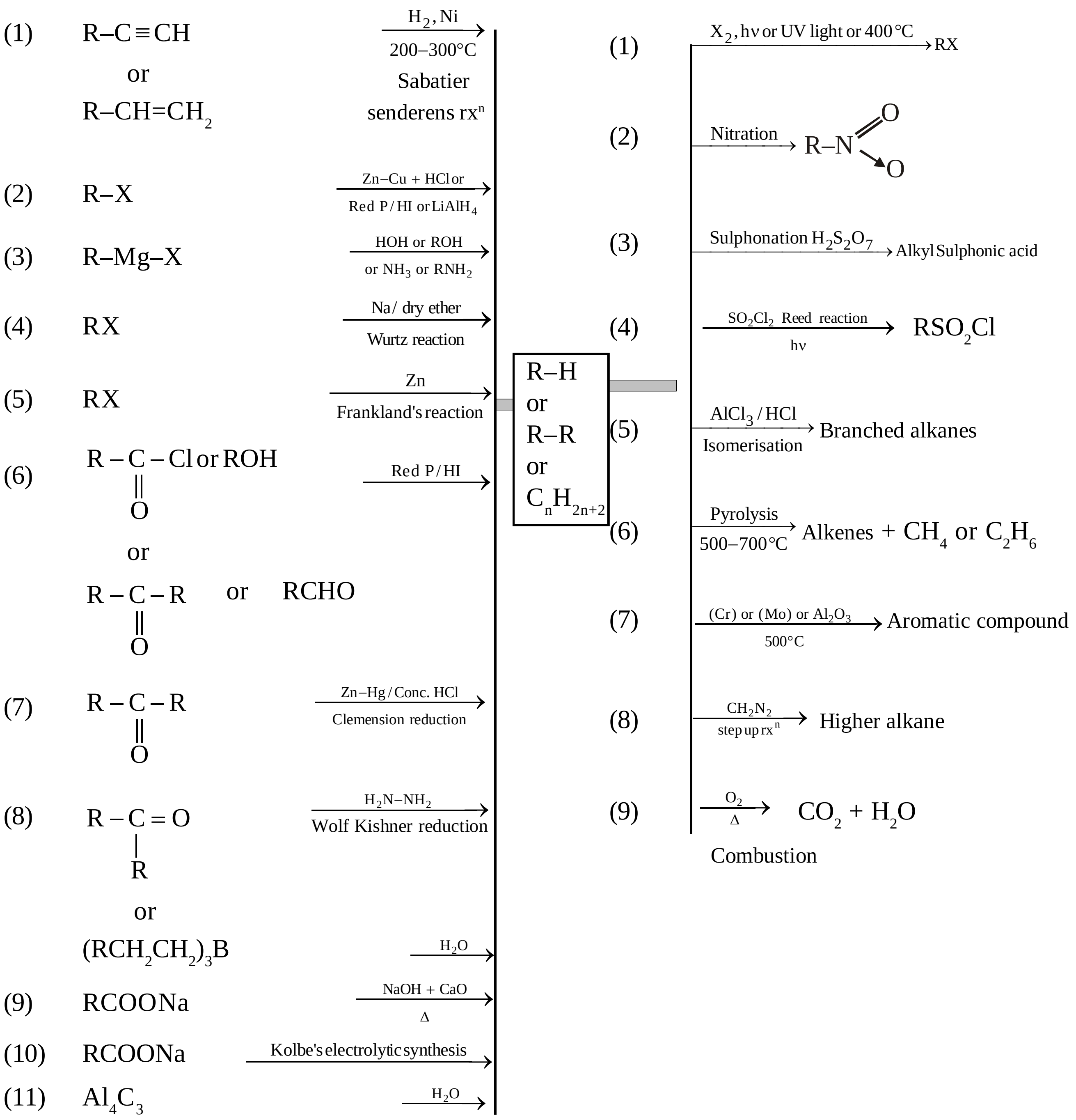
HYDROCARBON

REACTION CHART FOR ALKANES

GMP **GR**



GMP

(1) $R-C\equiv CH$ or $R-CH=CH_2$ $\xrightarrow[200-300°C]{H_2, Ni}$ Sabatier senderens rx^n

(2) $R-X$ $\xrightarrow[\text{Red P/HI or } LiAlH_4]{\text{Zn–Cu + HCl or}}$

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

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

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

(6) $R-\underset{\underset{O}{\|}}{C}-Cl$ or ROH or $R-\underset{\underset{O}{\|}}{C}-R$ or $RCHO$ $\xrightarrow{\text{Red P/HI}}$

(7) $R-\underset{\underset{O}{\|}}{C}-R$ $\xrightarrow[\text{Clemension reduction}]{\text{Zn–Hg/Conc. HCl}}$

(8) $R-\underset{\underset{R}{|}}{C}=O$ $\xrightarrow[\text{Wolf Kishner reduction}]{H_2N-NH_2}$ or $(RCH_2CH_2)_3B$ $\xrightarrow{H_2O}$

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

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

(11) Al_4C_3 $\xrightarrow{H_2O}$

$R-H$ or $R-R$ or C_nH_{2n+2}

GR

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

(2) $\xrightarrow{\text{Nitration}}$ $R-N$ (=O, →O)

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

(4) $\xrightarrow[h\nu]{SO_2Cl_2 \text{ Reed reaction}}$ RSO_2Cl

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

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

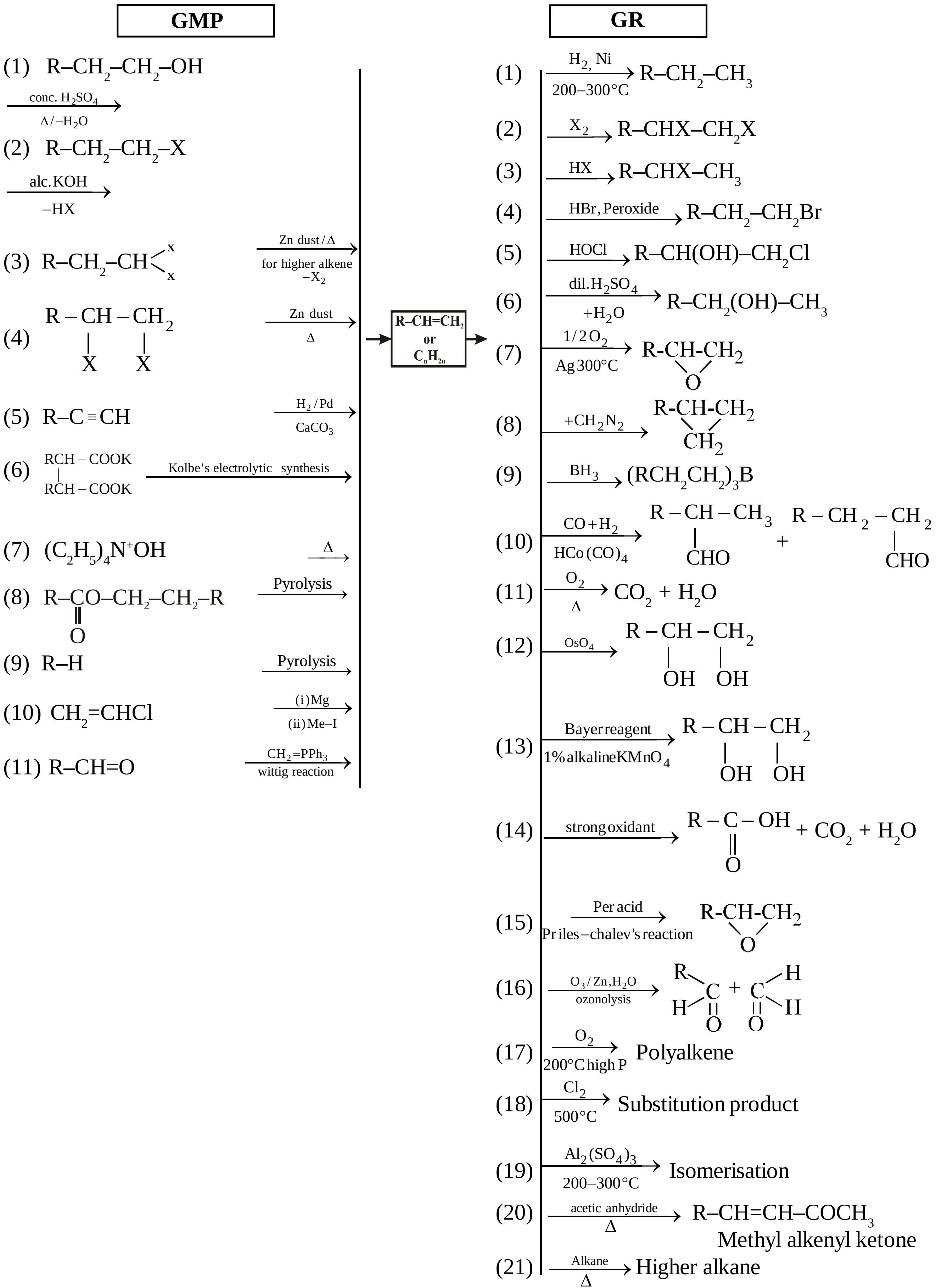
(7) $\xrightarrow[500°C]{(Cr) \text{ or } (Mo) \text{ or } Al_2O_3}$ Aromatic compound

(8) $\xrightarrow[\text{step up rx}^n]{CH_2N_2}$ Higher alkane

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

Combustion

REACTION CHART FOR ALKENES



GMP

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

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

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

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

(5) $R-C\equiv CH \xrightarrow[CaCO_3]{H_2/Pd}$

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

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

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

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

(10) $CH_2=CHCl \xrightarrow[(ii)Me-I]{(i)Mg}$

(11) $R-CH=O \xrightarrow[\text{wittig reaction}]{CH_2=PPh_3}$

$$\rightarrow \boxed{\begin{array}{c} R-CH=CH_2 \\ or \\ C_nH_{2n} \end{array}} \rightarrow$$

GR

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

(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$_2$ with O bridging (epoxide)

(8) $\xrightarrow{+CH_2N_2}$ R-CH-CH$_2$ with CH$_2$ bridging

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

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

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

(12) $\xrightarrow{OsO_4} \underset{\displaystyle OH}{\underset{|}{R-CH}}-\underset{\displaystyle OH}{\underset{|}{CH_2}}$

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

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

(15) $\xrightarrow[\text{Priles−chalev's reaction}]{Per\ acid}$ R-CH-CH$_2$ with O bridging

(16) $\xrightarrow[ozonolysis]{O_3/Zn,H_2O}$ $\underset{\displaystyle O}{\underset{\|}{C}}(R)(H) + \underset{\displaystyle O}{\underset{\|}{C}}(H)(H)$

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

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

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

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

(21) $\xrightarrow[\Delta]{Alkane}$ Higher alkane

REACTION CHART FOR ALKYNES

GMP

(1) $CH_2Br–CH_2Br \xrightarrow{alc.KOH,\ NaNH_2} C_2H_2$

(2) $CH_3–CHBr_2 \xrightarrow{alc.KOH,\ NaNH_2} C_2H_2$

(3) $CHCl_3 \xrightarrow[\Delta]{Ag\ powder} C_2H_2$

(4) $CHBr_2–CHBr_2 \xrightarrow[\Delta]{Zn\ dust} C_2H_2$

(5) $\begin{array}{l} CHBr \\ \| \\ CHBr \end{array} \xrightarrow{Zn} C_2H_2$

(6) $CH_2=CH–Cl \xrightarrow{alc.KOH,\ NaNH_2} C_2H_2$

(7) $\begin{array}{l} HC – COONa \\ \ \ \| \\ HC – COONa \end{array} \xrightarrow{Kolbe's\ electrolytic\ synthesis} C_2H_2$

(8) $CaC_2 \xrightarrow{H_2O} C_2H_2$

(9) $2C + H_2 \xrightarrow[Berthelot's\ process]{electric\ arc, 1200°C} C_2H_2$

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

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

GR

(1) $C_2H_2 \xrightarrow[Ni]{H_2} C_2H_4,\ C_2H_6$

(2) $\xrightarrow{X_2} C_2H_2X_4$

(3) $\xrightarrow[Peroxide]{HBr} CH_3BrCH_2Br$

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

(5) $\xrightarrow{HOCl} Cl_2CH–COOH$

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

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

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

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

(10) $\xrightarrow[Cal\ det\ Bunsen\ reaction]{AsCl_3} CHCl=CHAsCl_2$

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

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

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

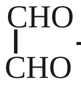
(14) $\xrightarrow{NaNH_2} NaC≡CNa$

(15) $\xrightarrow[(Tollen's\ Reagent)]{AgNO_3 + NH_4OH}$ AgC≡CAg white ppt.

(16) $\xrightarrow{Cu_2Cl_2 + NH_4OH}$ CuC≡CCu red ppt.

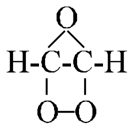
(17) $\xrightarrow{Combustion\ O_2} CO_2 + H_2O$

(18) $\xrightarrow{Bayer\ Reagent}$



$\begin{array}{l} CHO \\ | \\ CHO \end{array} \longrightarrow HCOOH$

(19) $\xrightarrow[Ozonolysis]{O_3}$



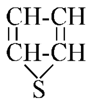
$\xrightarrow{+H_2O} HCOOH$

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

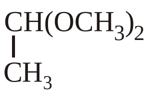
(21) $\xrightarrow[[Ni(CN)_2]]{Tetramerisation} C_8H_8$ or 1,3,5,7-cyclo octa tetraene

(22) $\xrightarrow[[Cu(NH_3)_2]^+\ or\ Cu_2Cl_2.NH_4Cl]{Dimerisation}$ butenyne

(23) $\xrightarrow[\Delta]{S}$



(24) $\xrightarrow[(BF_3–HgO)]{CH_3OH}$



$\begin{array}{l} CH(OCH_3)_2 \\ | \\ CH_3 \end{array}$ methylal

EXERCISE # I

1. 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

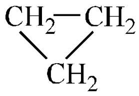
(B) Decreases progressively as the reaction proceeds

(C) Remains constant throughout the reaction

(D) May decrease of the the concentration of the electrolyte is not very high

2. $BrCH_2–CH_2–CH_2Br$ 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)

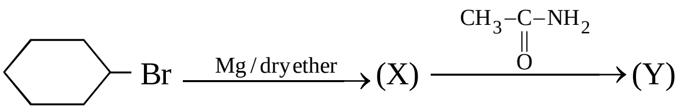


(D) All of these

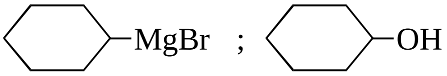
3. How many products will be formed excluding stereo when cis-1,3,5-trimethyl cyclohexene reacts with NBS?

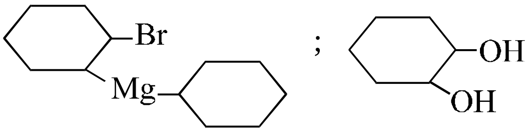
(A) 3 (B) 4 (C) 5 (D) 6

4.

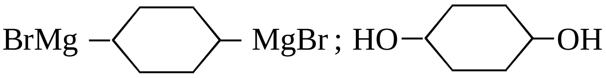


The structures of (X) and (Y) respectively are

(A)


(B)


(C)


(D)


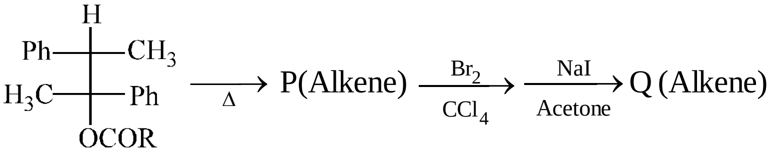
5. When n-butane is heated in the presence of $AlCl_3/HCl$ it will be converted into –

(A) Ethane (B) Propane (C) Butene (D) Isobutane

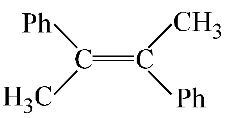
6. How many dibromo derivatives are formed when bromine is added to 3-Methyl Cyclohexene in 1,2-dichloroethane.

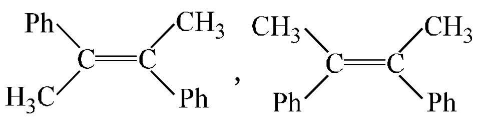
(A) 2 (B) 3 (C) 4 (D) 6

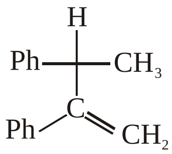
7.

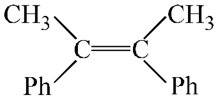


Alkene (P) & (Q) respectively are

(A) Both


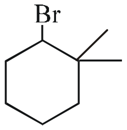
(B)


(C) Both


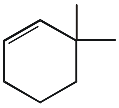
(D) Both


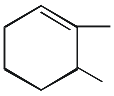
8. Anti–Markownikoff's addition of HBr is not observed in –

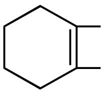
(A) Propene (B) But–2–ene (C) But–1–ene (D) Pent–2–ene

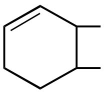
9. 

$\xrightarrow[\Delta]{\text{alcoholic KOH}}$ Product ; Product is:

(A) 

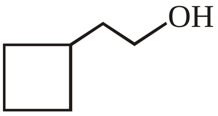
(B) 

(C) 

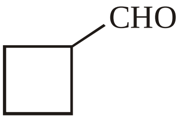
(D) 

10. Which is expected to react most readily with bromine –

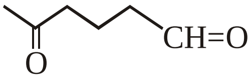
(A) $CH_3CH_2CH_3$ (B) $CH_2{=}CH_2$ (C) $CH{\equiv}CH$ (D) $CH_3{-}CH{=}CH_2$

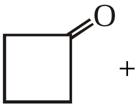
11. 

$\xrightarrow[\Delta]{H^{\oplus}}$ A $\xrightarrow[\text{(ii)Zn}/H_2O]{\text{(i)}O_3}$ Product(s). Product is/are?

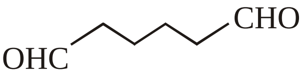
(A) 

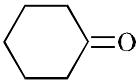
+ HCHO

(B) 

(C) 

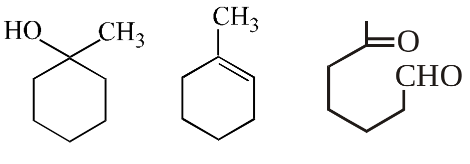
+ CH_3CHO

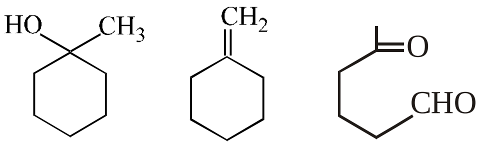
(D) 

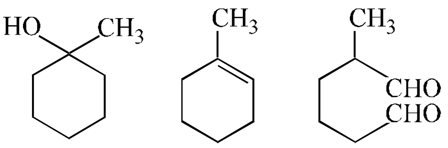
12. 

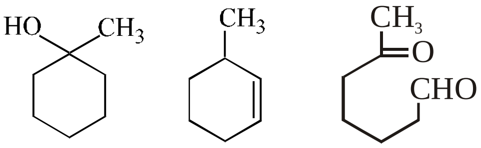
+ $CH_3MgBr \xrightarrow{H_3O^+} A \xrightarrow[\Delta]{\text{Con. } H_2SO_4} B \xrightarrow[\text{(ii) Zn}, H_2O]{\text{(i) } O_3} C$; A, B and C are –

A B C

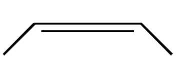
(A) 

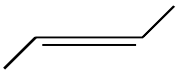
(B) 

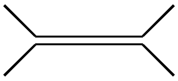
(C) 

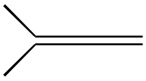
(D) 

13. Which has least heat of hydrogenation –

(A) 

(B) 

(C) 

(D) 

14. For the ionic reaction of hydrochloric acid with the following alkenes, predict the correct sequence of reactivity as measured by reaction rates:

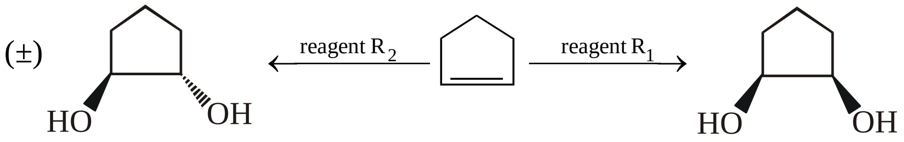
(I) $ClCH{=}CH_2$ (II) $(CH_3)_2.C{=}CH_2$ (III) $OHC.CH{=}CH_2$ (IV) $(NC)_2C{=}C(CN)_2$

(A) IV > I > III > II (B) I > IV > II > III (C) III > II > IV > I (D) II > I > III > IV

15. $\underset{\text{cis}}{CH_3{-}CH{=}CH{-}CH_3} \xrightarrow{x}$ Product is Y (non–resolvable) then X can be –

(A) Br_2 water (B) HCO_3H

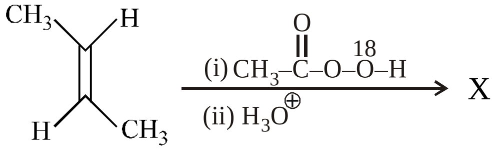
(C) Cold alkaline $KMnO_4$ (D) all of the above

16. 

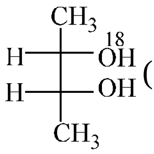
R_1 and R_2 respectively are –

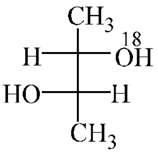
(A) Cold alkaline $KMnO_4$, OsO_4/H_2O_2 (B) Cold alkaline $KMnO_4$, HCO_3H

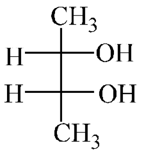
(C) Cold alkaline $KMnO_4$, $CH_3{-}O{-}O{-}CH_3$ (D) $C_6H_5CO_3H$, HCO_3H

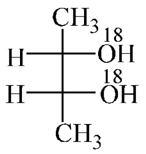
17. 

The probable structure of 'X' is

(A) 

(B) 

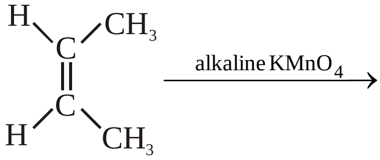
(C) 

(D) 

18. 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

19. 

A, which is true about this reaction?

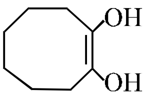
(A) A is meso 2, 3–butanediol formed by *syn* addition

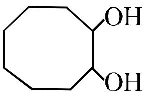
(B) A is meso 2, 3–butanediol formed by *anti* addition

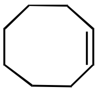
(C) A is a racemic mixture of d and *l*, 2, 3–butanediol formed by anti addition

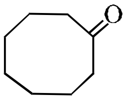
(D) A is a racemic mixture of d and *l* 2,3–butanediol formed by syn addition

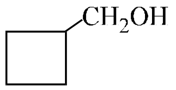
20. The reaction of cyclooctyne with $HgSO_4$ in the presence of a H_2SO_4 gives

(A) 

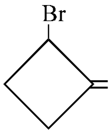
(B) 

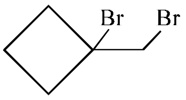
(C) 

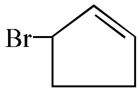
(D) 

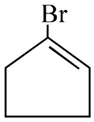
21.  $\xrightarrow[\Delta]{H_2SO_4}$ P (Major) $\xrightarrow{NBS}$ Q (Major)

The structure of Q is

(A) 

(B) 

(C) 

(D) 

22. 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

23. Acetylene may be prepared using Kolbe's electrolytic method employing –

(A) Pot. acetate (B) Pot. succinate (C) Pot. fumarate (D) None of these

24. $B \xleftarrow{\text{Lindlar}} R\text{–}C{\equiv}C\text{–}R \xrightarrow{Na/NH_3} A$

A and B are geometrical isomers –

(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

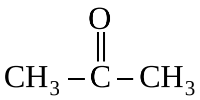
25. A mixture of CH_4, C_2H_4 and C_2H_2 gaseous are passed through a Wolf bottle containing ammonical cuprous chloride. The gas coming out is

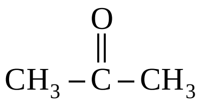
(A) Methane (B) Acetylene

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

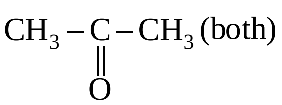
26. $B \xleftarrow[H_2O_2,\ OH^-]{BH_3\ THF} CH_3\text{–}C{\equiv}CH \xrightarrow{HgSO_4/H_2SO_4} A$

A and B are –

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

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

(C) CH_3CH_2CHO (both)

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

27. Which of the following reagents cannot be used to locate the position of triple bond in $CH_3\text{–}C{\equiv}C\text{–}CH_3$

(A) Br_2/CCl_4 (B) O_3/H_2O (C) Cu_2Cl_2/NH_4OH (D) $KMnO_4/H^{\oplus}$

28. 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.

29. $CH_3–CH_2–C≡CH \underset{B}{\overset{A}{\rightleftharpoons}} CH_3C≡C–CH_3$; A and B are –

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

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

30. If a mixture of iso-octane (70%) & n-heptane (30%) is present in sample. The octane number of this sample is :

(A) 40 (B) 70 (C) 30 (D) 85

31. $HC≡CH \xrightarrow[Cu_2Cl_2]{NH_4Cl}$ Product

Product is –

(A) Cu–C≡C–Cu (B) $H_2C=CH–C≡CH$ (C) HC≡C–Cu (D) $Cu–C≡C–NH_4$

32. Which of the following process is not good for the preparation of open chain alkane having odd number of carbons :

(A) Wurtz process (B) Kolbe electrolysis

(C) Corey house synthesis (D) Both (A) & (B)

EXERCISE # II

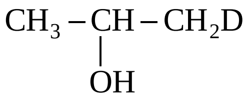
1. How many moles of O_2 required for complete combustion of one mole of propane –

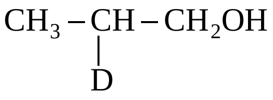
(A) 7 (B) 5 (C) 16 (D) 10

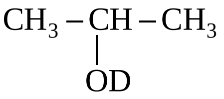
2. How much volume of air will be needed for complete combustion of 10 lit. of ethane – (Assuming that approx 20% O_2 is present in air)

(A) 135 lit. (B) 35 lit. (C) 175 lit. (D) 205 lit.

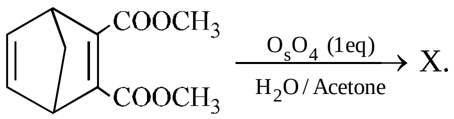
3. $CH_3CH{=}CH_2 \xrightarrow[H_2O_2/OH^-]{B_2D_6}$ product X ; X is –

(A) 
$CH_3-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_2D$

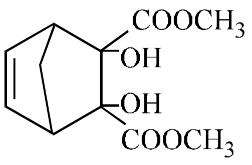
(B) 
$CH_3-\underset{\displaystyle D}{\underset{|}{CH}}-CH_2OH$

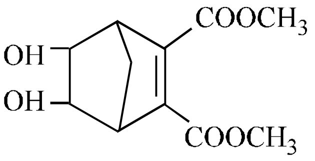
(C) 
$CH_3-\underset{\displaystyle OD}{\underset{|}{CH}}-CH_3$

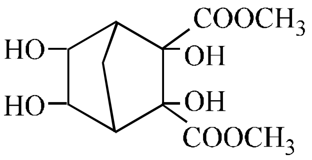
(D) none is correct

4. 

Identify ‘X’.

(A) 

(B) 

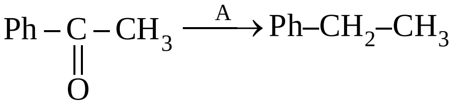
(C) 

(D) Reaction will not occur

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

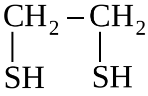
(A) n-Butane (B) $C_2H_5COOC_2H_5$

(C) $CH_3–CH_3$ (D) $CH_2{=}CH_2$

6. 
$Ph-\underset{\displaystyle O}{\underset{||}{C}}-CH_3 \xrightarrow{A} Ph–CH_2–CH_3$

A could be:

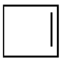
(A) NH_2NH_2, glycol/OH^-, Δ (B) Na(Hg)/conc. HCl

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

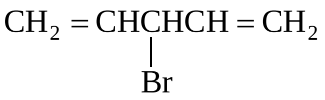
7. (A) $C_4H_6 \xrightarrow{H_2/Pt}$ (B) $C_4H_8 \xrightarrow{O_3/H_2O} CH_3COOH$

Hence A and B are

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

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

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

(A) 

$CH_2=CH\underset{|}{\overset{}{C}}HCH=CH_2$ with Br on the central carbon: $CH_2=\underset{\displaystyle Br}{\underset{|}{CHCH}}=CH_2$

(B) CH_2=CHCH=CH–CH_2Br

(C) $CH_2 = CHCH_2CH = CHBr$

(D) 

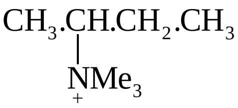
$CH_2=CHCH_2\underset{\displaystyle Br}{\underset{|}{C}}=CH_2$

9. An alkene on ozonolysis yields only ethanal. The ozonolysis of isomer of this alkene yields :

(A) Propanone (B) Ethanal (C) Methanal (D) Only propanal

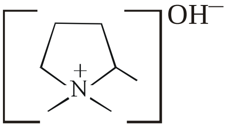
10. Which of the following elimination reactions will occur to give but-1-ene as the major product?

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

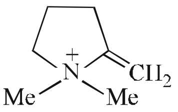
(B)  $CH_3.\underset{\displaystyle \overset{+}{N}Me_3}{\underset{|}{C}}H.CH_2.CH_3 + NaOEt \xrightarrow[\Delta]{EtOH}$

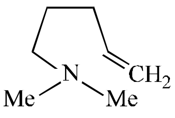
(C) $CH_3.CH_2.CHCl.CH_3+Me_3COK^+ \xrightarrow{\Delta}$

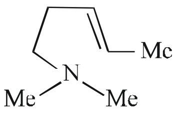
(D) $CH_3.CH_2.CH(OH).CH_3 + conc.\ H_2SO_4 \xrightarrow[\Delta]{}$

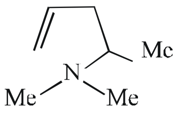
11. 

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

(A) 

(B) 

(C) 

(D) 

12. 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

13. 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) $CH_3.CH_2CH=CH.CH_3$

EXERCISE # III

1. 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) $Me_3C\text{–}H + KMnO_4 \xrightarrow[\Delta]{H^+} Me_3C\text{–}OH$

2. 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 $AgNO_3$

3. $C \xleftarrow[H_2O_2/OH^-]{BH_3/THF} A \xrightarrow[H_2SO_4]{HgSO_4} B$

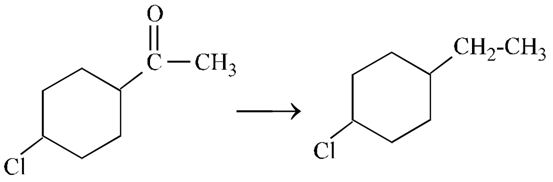
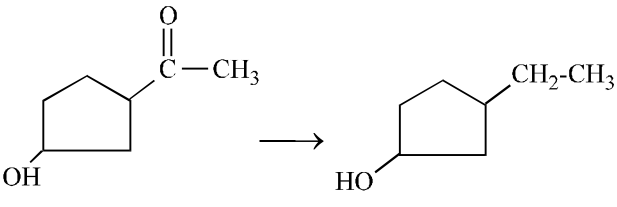
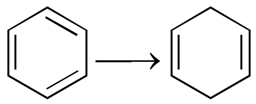
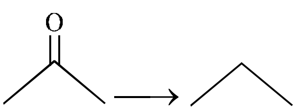
B & C are identical when A is –

(A) $HC{\equiv}CH$ (B) $CH_3\text{–}C{\equiv}CH$ (C) $CH_3\text{–}C{\equiv}C\text{–}CH_3$ (D) $CH_3\text{–}CH_2\text{–}C{\equiv}CH$

4. 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) $CH_3\text{–}CH{=}CH_2 \rightarrow CH_3\text{–}CHBr\text{–}CH_3$	(P) HBr
(B) $CH_3\text{–}CH{=}CH_2 \rightarrow CH_3\text{–}CH_2\text{–}CH_2Br$	(Q) Br_2 / CCl_4
(C) $CH_3\text{–}CH{=}CH_2 \rightarrow BrCH_2\text{–}CH{=}CH_2$	(R) HBr / Peroxide
(D) $CH_3\text{–}CH{=}CH_2 \rightarrow CH_3\text{–}CHBr\text{–}CH_2Br$	(S) NBS

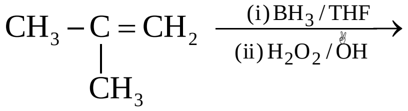
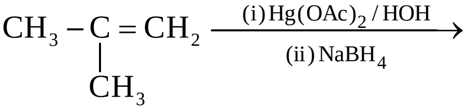
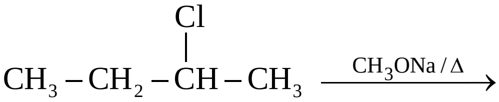
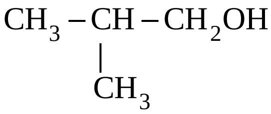
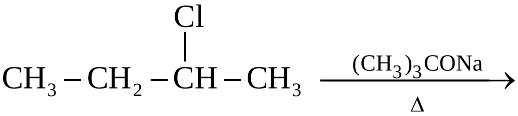
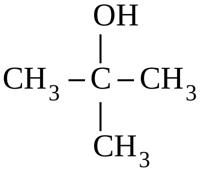
5. **Match the column**

Column I	**Column II**
(A) 	(P) Birch reduction
(B) 	(Q) Stephen's reduction
(C) 	(R) Wolf-Kishner reduction
(D) 	(S) Clemmensen reduction

6. **Match the column**

Column I	**Column II**
(A) $RCOONa \xrightarrow{\text{electrolysis}} R{-}R$	(P) Correy-House reaction
(B) $R{-}CH_2{-}COOH \xrightarrow[\Delta]{\text{NaOH,CaO}} R{-}CH_3$	(Q) Kolbe electrolysis
(C) $RCOOH \xrightarrow[\text{(ii)}\,Cl_2/\Delta]{\text{(i)}\,AgNO_3} R{-}Cl$	(R) Oakwood degradration / Soda lime process
(D) $R'{-}X + R_2CuLi \longrightarrow R{-}R'$	(S) Hunsdiecker reaction

7.

Column I	**Column II**
(A)  $CH_3-\underset{\underset{CH_3}{\vert}}{C}=CH_2 \xrightarrow[\text{(ii)}\,H_2O_2/\overset{\ominus}{O}H]{\text{(i)}\,BH_3/THF}$	(P) $CH_3{-}CH_2{-}CH{=}CH_2$
(B)  $CH_3-\underset{\underset{CH_3}{\vert}}{C}=CH_2 \xrightarrow[\text{(ii)}\,NaBH_4]{\text{(i)}\,Hg(OAc)_2/HOH}$	(Q) $CH_3{-}CH{=}CH{-}CH_3$
(C)  $CH_3-CH_2-\overset{\overset{Cl}{\vert}}{CH}-CH_3 \xrightarrow{CH_3ONa/\Delta}$	(R)  $CH_3-\underset{\underset{CH_3}{\vert}}{CH}-CH_2OH$
(D)  $CH_3-CH_2-\overset{\overset{Cl}{\vert}}{CH}-CH_3 \xrightarrow[\Delta]{(CH_3)_3CONa}$	(S)  $CH_3-\underset{\underset{CH_3}{\vert}}{\overset{\overset{OH}{\vert}}{C}}-CH_3$

8.

Column I	**Column II**
(A) $CH_3{-}C{\equiv}C{-}\,CH_3 \longrightarrow$ cis-2-butene	(P) $Na/NH_3(l)$
(B) $CH_3-C\equiv C-CH_3 \longrightarrow$ trans-2-butene	(Q) $H_2/Pd/BaSO_4$
(C) $CH_3C{\equiv}C{-}CH_3 \longrightarrow$ 1-Butyne	(R) alc. KOH, Δ
(D) $CH_3{-}CH_3{-}C{\equiv}CH \longrightarrow$ 2-Butyne	(S) $NaNH_2$, Δ

EXERCISE # (IV) (J-MAINS)

1. Which of these will not react with acetylene - **[AIEEE-2002]**

(1) NaOH (2) ammonical $AgNO_3$ (3) Na (4) HCl

2. What is the product formed when acetylene reacts with hypochlorous acid - **[AIEEE-2002]**

(1) CH_3COCl (2) $ClCH_2CHO$ (3) Cl_2CHCHO (4) $ClCH_2COOH$

3. 1–Butene may be converted to butane by reaction with - **[AIEEE-2003]**

(1) Pd/H_2 (2) Zn - HCl (3) Sn - HCl (4) Zn - Hg/HCl

4. On mixing a certain alkane with chlorine and irradiating it with ultraviolet light, it forms only one monochloroalkane. This alkane could be - **[AIEEE-2003]**

(1) neopentane (2) propane (3) pentane (4) isopentane

5. Which one of the following is reduced with Zn-Hg/HCl to give the corresponding hydrocarbon

(1) Butan-2-one (2) Acetic acid **[AIEEE-2004]**

(3) Acetamide (4) Ethyl acetate

6. Which one of the following has the minimum boiling point : **[AIEEE-2004]**

(1) isobutane (2) 1–butyne (3) 1–butene (4) n–butane

7. 2-Methylbutane on reacting with bromine in the presence of sunlight gives mainly **[AIEEE-2005]**

(1) 2–bromo-2–methylbutane (2) 1–bromo-2–methylbutane

(3) 1–bromo-3–methylbutane (4) 2–bromo-3–methylbutane

8. Alkyl halides react with dialkyl copper reagent to give **[AIEEE-2005]**

(1) alkyl copper halides (2) alkenes

(3) alkenyl halides (4) alkanes

Reaction of one molecule of HBr with one molecule of 1,3–butadiene at 40°C gives predominantly

(1) 1–bromo–2–butene under thermodynamically controlled conditions **[AIEEE-2005]**

(2) 3–bromobutene under kinetically controlled conditions

(3) 1–bromo–2–butene under kinetically controlled conditions

(4) 3–bromobutene under thermodynamically controlled conditions

10. Acid catalyzed hydration of alkenes except ethene leads to the formation of **[AIEEE-2005]**

(1) secondary or tertiary alcohol

(2) primary alcohol

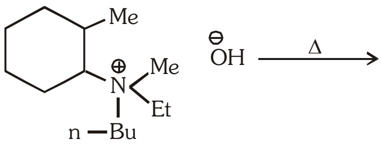
(3) mixture of secondary and tertiary alcohols

(4) mixture of primary and secondary alcohols

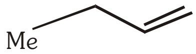
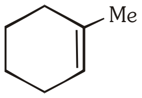
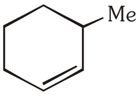
11. Elimination of bromine from 2–bromobutane results in the formation of **[AIEEE-2005]**

(1) predominantly 2–butene (2) equimolar mixture of 1 and 2–butene

(3) predominantly 2–butyne (4) predominantly 1–butene

12. 

The alkene formed as a major product in the above elimination reaction is- **[AIEEE-2006]**

(1)  (2) $CH_2=CH_2$ (3)  (4) 

13. Reaction of trans-2-phenyl-1-bromocyclo pentane on reaction with alcoholic KOH produces-

(1) 4-phenyl cyclopentene (2) 2-phenyl cyclopentene **[AIEEE-2006]**

(3) 1-phenyl cyclopentene (4) 3-phenyl cyclopentene

14. Phenyl magnesium bromide reacts with methanol to give- **[AIEEE-2006]**

(1) A mixture of anisole and Mg(OH)Br (2) A mixture of benzene and Mg(OMe)Br

(3) A mixture of toluene and Mg(OH)Br (4) A mixture of phenol and Mg(Me)Br

15. Which of the following reactions will yield, 2, 2-dibromopropane **[AIEEE-2007]**

(1) $CH_3—C\equiv CH + 2HBr \longrightarrow$ (2) $CH_3CH=CHBr + HBr \longrightarrow$

(3) $CH\equiv CH + 2HBr \longrightarrow$ (4) $CH_3 — CH = CH_2 + HBr \longrightarrow$

16. In the following sequence of reactions, the alkene affords the compound ‘B’ :- **[AIEEE-2008]**

$CH_3CH=CHCH_3 \xrightarrow{O_3} A \xrightarrow[Zn]{H_2O} B.$

The compound B is

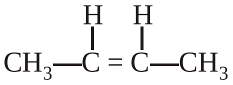
(1) CH_3CH_2CHO (2) CH_3COCH_3 (3) $CH_3CH_2COCH_3$ (4) CH_3CHO

17. The hydrocarbon which can react with sodium in liquid ammonia is **[AIEEE-2008]**

(1) $CH_3CH_2CH_2C\equiv CCH_2CH_2CH_3$ (2) $CH_3CH_2C\equiv CH$

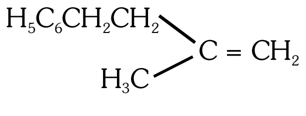
(3) $CH_3CH=CHCH_3$ (4) $CH_3CH_2C\equiv CCH_2CH_3$

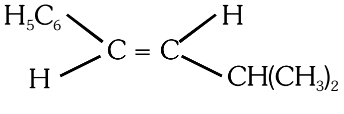
18. The treatment of CH_3MgX with $CH_3C\equiv C–H$ produces **[AIEEE-2008]**

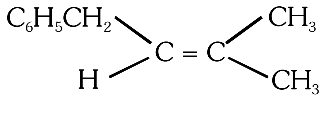
(1) $CH_3–CH=CH_2$ (2) $CH_3C\equiv C–CH_3$ (3)  $CH_3—\overset{H}{C}=\overset{H}{C}—CH_3$ (4) CH_4

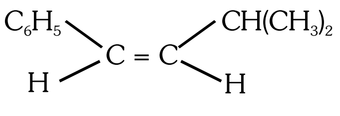
19. The main product of the following reaction is **[AIEEE-2010]**

$C_6H_5CH_2CH(OH)CH(CH_3)_2 \xrightarrow{\text{Conc. } H_2SO_4}$?

(1) 

(2) 

(3) 

(4) 

20. One mole of a symmetrical alkene on ozonolysis gives two moles of an aldehyde having a molecular mass of 44 u. The alkene is :- **[AIEEE-2010]**

(1) Ethene (2) Propene (3) 1-Butene (4) 2-Butene

21. Ozonolysis of an organic compound gives formaldehyde as one of the products. This confirms the presence of :- **[AIEEE-2011]**

(1) an isopropyl group (2) an acetylenic triple bond

(3) two ethylenic double bonds (4) a vinyl group

22. Ozonolysis of an organic compound 'A' produces acetone and propionaldehyde in equimolar mixture. Identify 'A' from the following compounds :- **[AIEEE-2011]**

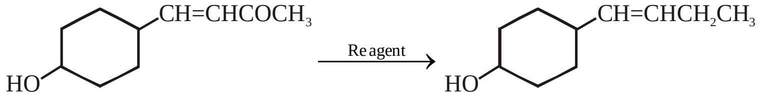
(1) 2-Methyl-1-pentene (2) 1-Pentene

(3) 2-Pentene (4) 2-Methyl-2-pentene

23. 2–Hexyne gives trans–2–Hexene on treatment with :- **[AIEEE-2012]**

(1) $LiAlH_4$ (2) Pt/H_2 (3) Li/NH_3 (4) $Pd/BaSO_4$

24. In the given transformation, which of the following is the most appropriate reagent ? **[AIEEE-2012]**



(1) $NaBH_4$ (2) $NH_2\ NH_2, \overset{\ominus}{O}H$ (3) Zn – Hg / HCl (4) Na, Liq.NH_3

25. The major organic compound formed by the reaction of 1, 1, 1–trichloroethane with silver powder is :- **(JEE MAIN OFFLINE 2013)**

(1) 2-Butyne (2) 2-Butene (3) Acetylen (4) Ethene

26. The number and type of bonds in C_2^{2-}ion in CaC_2 are: **(JEE MAIN ONLINE 2014)**

(1) Two σ bonds and one π – bond (2) Two σ bonds and two π – bonds

(3) One σ bond and two π – bonds (4) One σ bond and one π – bond

27. In the hydroboration - oxidation reaction of propene with diborane, H_2O_2 and NaOH, the organic compound formed is : **(JEE MAIN ONLINE 2014)**

(1) $CH_3CH_2CH_2OH$ (2) $(CH_3)_3COH$ (3) $CH_3CHOHCH_3$ (4) CH_3CH_2OH

28. Which one of the following class of compounds is obtained by polymerization of acetylene ?

(JEE MAIN ONLINE 2014)

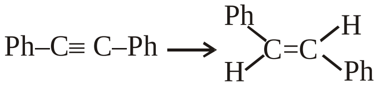
(1) Poly-ene (2) Poly-yne (3) Poly-amide (4) Poly-ester

29. The gas liberated by the electrolysis of Dipotassium succinate solution is :

(JEE MAIN ONLINE 2014)

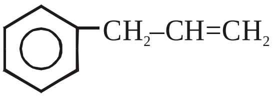
(1) Ethyne (2) Ethene (3) Propene (4) Ethane

30. The reagent needed for converting **(JEE MAIN ONLINE 2014)**



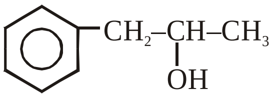
is :

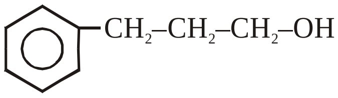
(1) H_2/Lindlar Cat.
(2) Cat. Hydrogenation
(3) $LiAlH_4$
(4) Li/NH_3

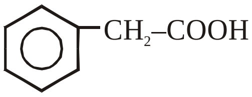
31. 

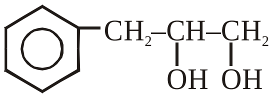
on mercuration- demercuration produces the major product :-

(Jee Main online 2014)

(1) 

(2) 

(3) 

(4) 

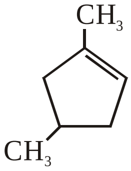
32. The major product obtained in the photo catalysed bromination of 2-methylbutane is :-
(Jee Main online 2014)

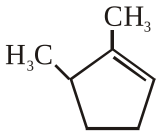
(1) 2-bromo-2-methylbutane
(2) 2-bromo-3-methylbutane
(3) l-bromo-2-methylbutane
(4) l-bromo-3-methylbutane

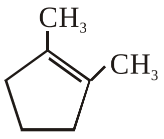
33. In the presence of peroxide, $HC\ell$ and HI do not give anti-Markownikoff s addition to alkenes because
(Jee Main online 2014)

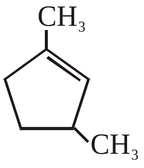
(1) All the steps are exothermic in HCl and HI
(2) One of the steps is endothermic in HCl and HI
(3) HCl is oxidizing and the HI is reducing
(4) Both HCl and HI are strong acids

34. Which compound would give 5-keto-2-methyl hexanal upon ozonlysis? **(Jee Main offline 2015)**

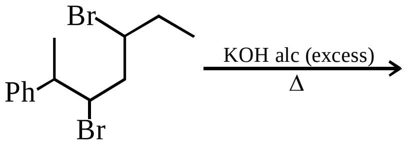
(1) 

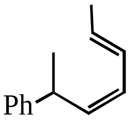
(2) 

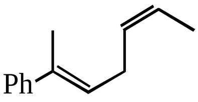
(3) 

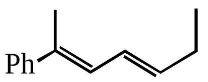
(4) 

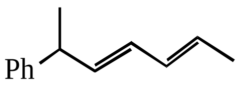
35. The major product of the following reaction is **(Jee Main (Jan) 2019)**



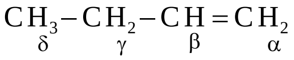
(1) 

(2) 

(3) 

(4) 

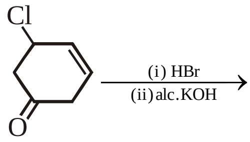
36. Which hydrogen in compound (E) is easily replaceable during bromination reaction in presence of light : **(Jee Main (Jan) 2019)**

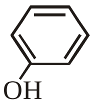


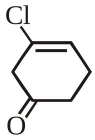
$\underset{\delta}{CH_3}-\underset{\gamma}{CH_2}-\underset{\beta}{CH}=\underset{\alpha}{CH_2}$

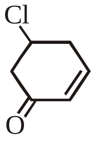
(1) β – hydrogen (2) γ – hydrogen (3) δ – hydrogen (4) α – hydrogen

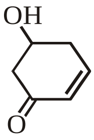
37. The major poduct of the following reaction is: **(Jee Main (Jan) 2019)**



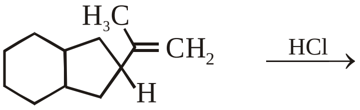
(1) 

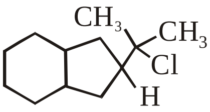
(2) 

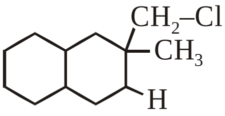
(3) 

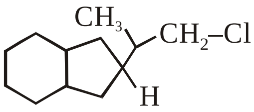
(4) 

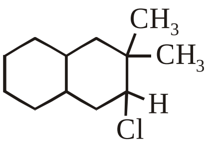
38. The major product of the following reaction is: **(Jee Main (Jan) 2019)**



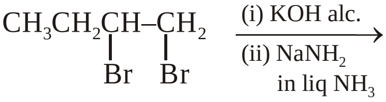
(1) 

(2) 

(3) 

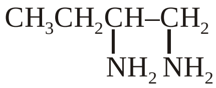
(4) 

39. The major product of the following reaction is: **(Jee Main (Jan) 2019)**



$$CH_3CH_2\underset{\displaystyle Br}{\underset{|}{C}}H-\underset{\displaystyle Br}{\underset{|}{C}}H_2 \xrightarrow[\text{(ii) NaNH}_2\text{ in liq NH}_3]{\text{(i) KOH alc.}}$$

(1) $CH_3CH_2C\equiv CH$

(2) 

$CH_3CH_2\underset{\displaystyle NH_2}{\underset{|}{C}}H-\underset{\displaystyle NH_2}{\underset{|}{C}}H_2$

(3) $CH_3CH=C=CH_2$

(4) $CH_3CH=CHCH_2NH_2$

40. Which one of the following alkenes when treated with HCl yields majorly an anti Markovnikov product? **(Jee Main (April) 2019)**

(1) $F_3C-CH=CH_2$

(2) $Cl-CH=CH_2$

(3) $CH_3O-CH=CH_2$

(4) $H_2N-CH=CH_2$

41. The mojor product of the following reaction is : **(Jee Main (April) 2019)**

$$CH_3C\equiv CH\xrightarrow[\text{(ii) DI}]{\text{(i) DCl (1 equiv.)}}$$

(1) $CH_3CD(Cl)CHD(I)$

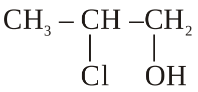
(2) $CH_3CD_2CH(Cl)(I)$

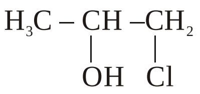
(3) $CH_3CD(I)CHD(Cl)$

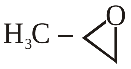
(4) $CH_3C(I)(Cl)CHD_2$

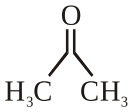
42. The major product of the following addition reaction is : **(Jee Main (April) 2019)**

$$H_3C - CH = CH_2 \xrightarrow{Cl_2/H_2O}$$

(1) 
$CH_3-\underset{Cl}{CH}-\underset{OH}{CH_2}$

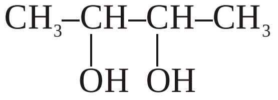
(2) 
$H_3C-\underset{OH}{CH}-\underset{Cl}{CH_2}$

(3) 

(4) 

43. But-2-ene on reaction with alkaline $KMnO_4$ at elevated temperature followed by acidification will give : **(Jee Main (April) 2019)**

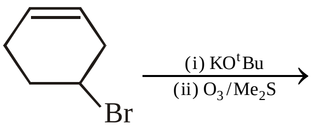
(1) one molecule of CH_3CHO and one molecule of CH_3COOH

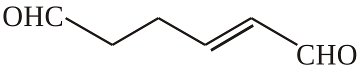
(2) 
$CH_3-\underset{OH}{CH}-\underset{OH}{CH}-CH_3$

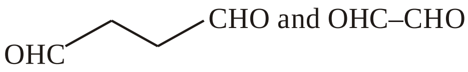
(3) 2 molecules of CH_3COOH

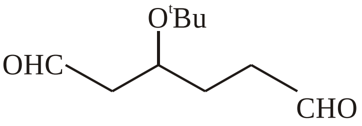
(4) 2 molecules of CH_3CHO

44. The major product(s) obtained in the following reaction is/are : **(Jee Main (April) 2019)**



(1) 

(2) 

(3) 

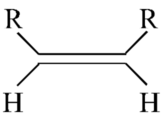
(4) 

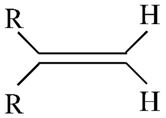
EXERCISE # IV (A) (JEE ADVANCE)

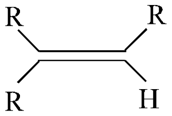
1. Propyne and propene can be distinguished by – **[IIT '2000]**

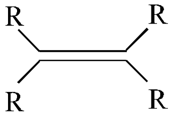
(A) conc. H_2SO_4 (B) Br_2 in CCl_4 (C) dil. $KMnO_4$ (D) $AgNO_3$ in ammonia

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

(A) 

(B) 

(C) 

(D) 

3. In the presence of peroxide, hydrogen chloride and hydrogen iodide do not give anti–Markovnikov addition to alkene because – **[IIT S'2001]**

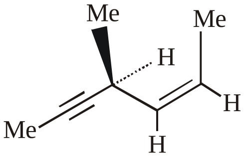
(A) both are highly ionic (B) one is oxidising and the other is reducing

(C) one of the step is endothermic in both the cases (D) All the steps are exothermic in both cases

4. 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

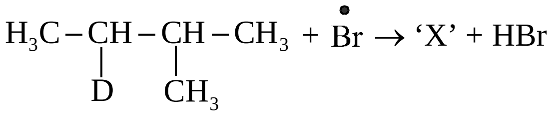
5. 

Hydrogenation of the above compound in the presence of poisoned paladium catalyst gives – **[IIT '2001]**

(A) An optically active compound (B) An optically inactive compound

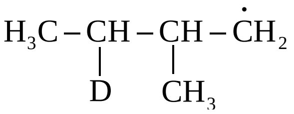
(C) A racemic mixture (D) A diastereomeric mixture

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

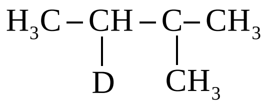


$$H_3C-\underset{D}{\underset{|}{CH}}-\underset{CH_3}{\underset{|}{CH}}-CH_3 + \dot{Br} \rightarrow \text{'X'} + HBr$$

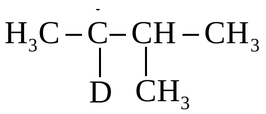
Identify the structure of the major product 'X'

(A) 

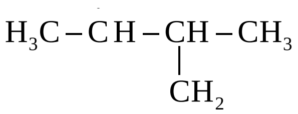
$$H_3C-\underset{D}{\underset{|}{CH}}-\underset{CH_3}{\underset{|}{CH}}-\dot{C}H_2$$

(B) 

$$H_3C-\underset{D}{\underset{|}{CH}}-\underset{CH_3}{\underset{|}{C}}-CH_3$$

(C) 

$$H_3C-\underset{D}{\underset{|}{\dot{C}}}-\underset{CH_3}{\underset{|}{CH}}-CH_3$$

(D) 

$$H_3C-\dot{C}H-\underset{CH_2}{\underset{|}{CH}}-CH_3$$

7. 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

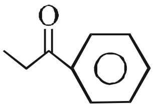
(D) A plane perpendicular to the molecular plane which contains the carbon–carbon σ–bond

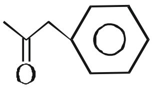
8. Identify a reagent from the following list which can easily distinguish between 1–butyne and 2-butyne- **[IIT '2002]**

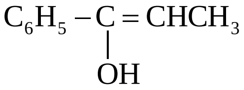
(A) Bromine, CCl_4 (B) H_2, Lindlar catalyst

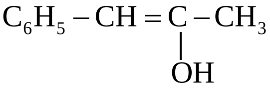
(C) Dilute H_2SO_4, $HgSO_4$ (D) Ammonical Cu_2Cl_2 solution

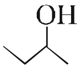
9. $C_6H_5–C \equiv C–CH_3 \xrightarrow[H_2SO_4]{HgSO_4} A$ **[IIT '2003]**

(A) 

(B) 

(C) 
$C_6H_5-\underset{\displaystyle OH}{\underset{|}{C}}=CHCH_3$

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

10.  $\xrightarrow[-H_2O]{H^+} \overset{X}{\text{(mixture)}} \xrightarrow{Br_2}$ 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

11. 2–hexyne can be converted into trans–2–hexene by the action of : **[IIT '2004]**

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

12. Cyclohexene is best prepared from cyclohexanol by which of the following: **[IIT '2004]**

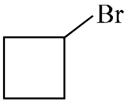
(A) conc. H_3PO_4 (B) conc. $HCl/ZnCl_2$ (C) conc. HCl (D) conc. HBr

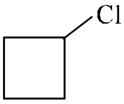
13. When Phenyl Magnesium Bromide reacts with tert. butanol, which of the following is formed?

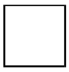
(A) Tert. butyl methyl ether (B) Benzene **[IIT '2005]**

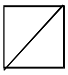
(C) Tert. butyl benzene (D) Phenol

14. 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) 

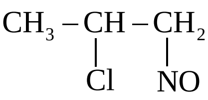
(B) 

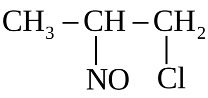
(C) 

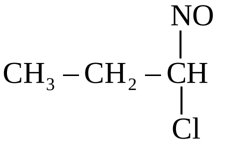
(D) 

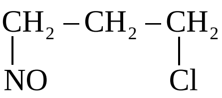
15. $CH_3–CH=CH_2$ + NOCl $\rightarrow$ P **[IIT 2006]**

Identify the adduct.

(A) 
$CH_3-\underset{\displaystyle Cl}{\underset{|}{CH}}-\underset{\displaystyle NO}{\underset{|}{CH_2}}$

(B) 
$CH_3-\underset{\displaystyle NO}{\underset{|}{CH}}-\underset{\displaystyle Cl}{\underset{|}{CH_2}}$

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

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

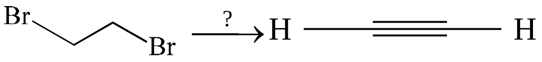
16. The number of stereoisomers obtained by bromination of trans-2-butene is **[IIT 2007]**

(A) 1 (B) 2 (C) 3 (D) 4

17. The number of structural isomers for C_6H_{14} is **[IIT 2007]**

(A) 3 (B) 4 (C) 5 (D) 6

18. The reagent(s) for the following conversion, **[IIT 2007]**



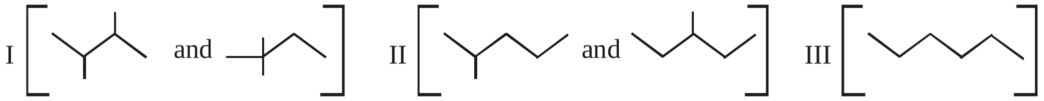
is / are

(A) alcoholic KOH
(B) alcoholic KOH followed by $NaNH_2$
(C) aqueous KOH followed by $NaNH_2$
(D) Zn / CH_3OH

19. The synthesis of 3-octyne is achieved by adding a bromoalkane into a mixture of sodium amide and an alkyne. The bromoalkane and alkyne respectively are **[IIT-2010]**

(A) $BrCH_2CH_2CH_2CH_2CH_3$ and $CH_3CH_2C \equiv CH$
(B) $BrCH_2CH_2CH_3$ and $CH_3CH_2CH_2C \equiv CH$
(C) $BrCH_2CH_2CH_2CH_2CH_3$ and $CH_3C \equiv CH$
(D) $BrCH_2CH_2CH_2CH_3$ and $CH_3CH_2C \equiv CH$

20. Isomers of hexane, based on their branching, can be divided into three distinct classes as shown in the figure. **[IIT-2014]**

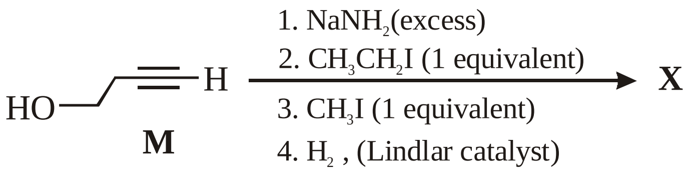


The correct order of their boiling point is

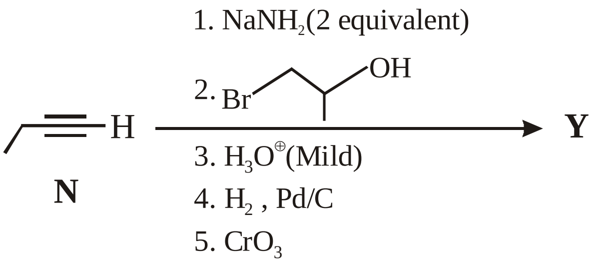
(A) I > II > III (B) III > II > I (C) II > III > I (D) III > I > II

Paragraph For Question 21 and 22

Schemes 1 and 2 describe sequential transformation of alkynes M and N. Consider only the major products formed in each step for both the schemes. **[IIT-2014]**

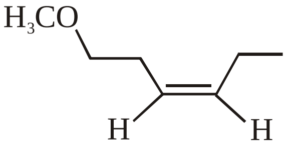


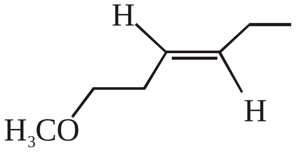
Scheme-1

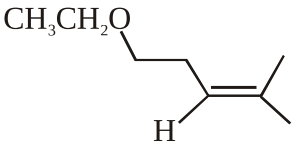


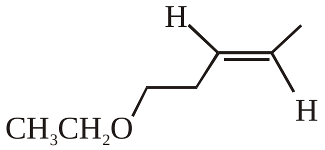
Scheme-2

21. The product X is -

(A) 

(B) 

(C) 

(D) 

22. The correct statement with respect to prodcut Y is -

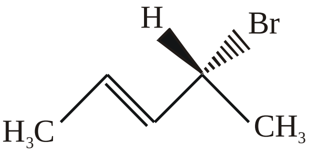
(A) It gives a positive Tollens test and is a functional isomer of X

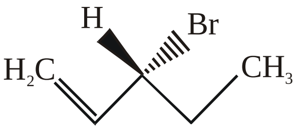
(B) It gives a positive Tollens test and is a geometrical isomer of X

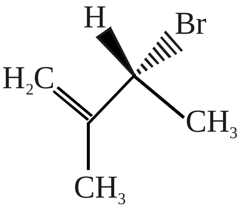
(C) It gives a positive Iodoform test and is a functional isomer of X

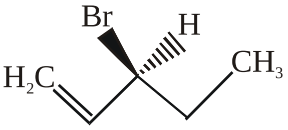
(D) It gives a positive Iodoform test and is a geometrical isomer of X

23. Compound(s) that on hydrogenation produce(s) optically inactive compound(s) is (are) **[IIT-2015]**

(A) 

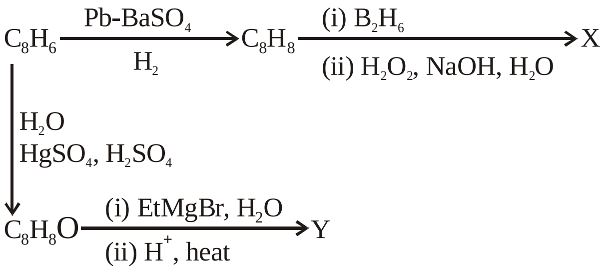
(B) 

(C) 

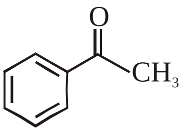
(D) 

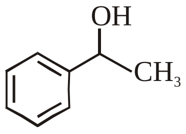
Paragraph For Questions 24 and 25

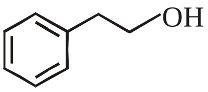
In the following reaction **[IIT-2015]**

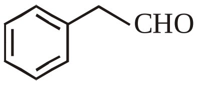


24. Compound X is :

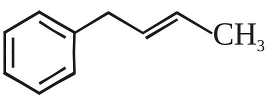
(A) 

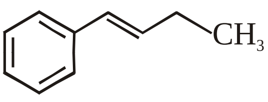
(B) 

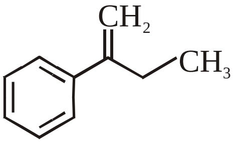
(C) 

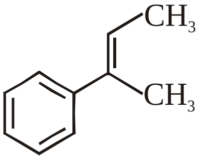
(D) 

25. The major compound Y is :

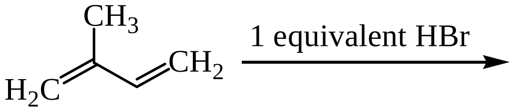
(A) 

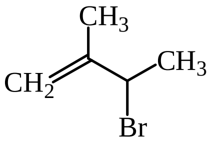
(B) 

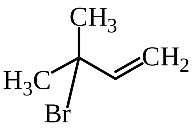
(C) 

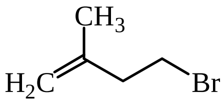
(D) 

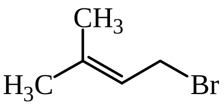
26. In the following reaction, the major product is - **[IIT-2015]**



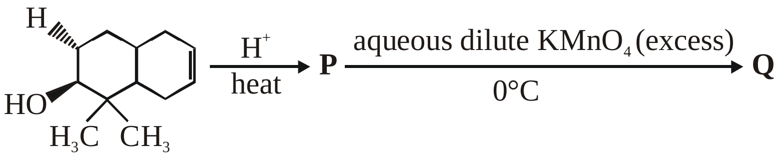
(A) 

(B) 

(C) 

(D) 

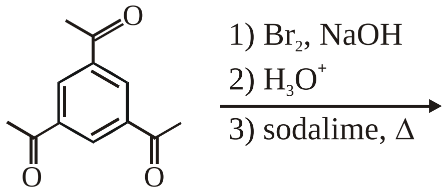
27. The number of hydroxyl group(s) in **Q** is **[IIT-2015]**

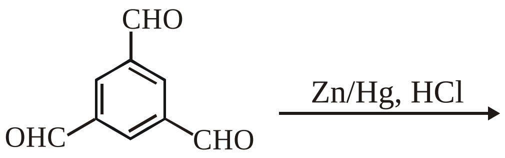


28. The reaction(s) leading to the formation of 1,3,5-trimethylbenzene is (are) **[IIT-2018]**

(A) 

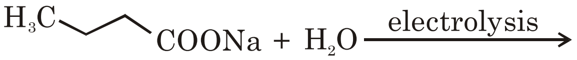
(B) $\mathrm{Me{-}{\equiv}{-}H} \xrightarrow[\text{873 K}]{\text{heated iron tube}}$

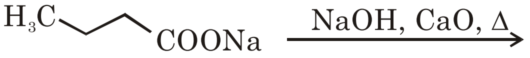
(C) 

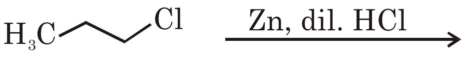
(D) 

29. Which of the following reactions produce(s) propane as a major product?

[IIT-2019]

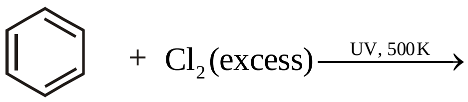
(1) 

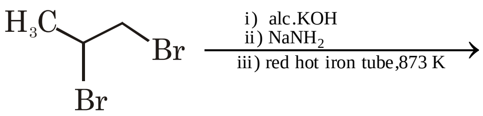
(2) 

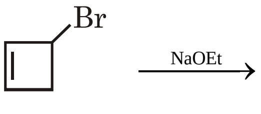
(3) 

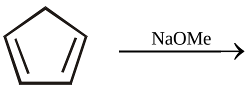
(4) 

30. Choose the correct option(s) that give(s) an aromatic compound as the major product.

(1) 

(2) 

(3) 

(4) 

[IIT-2019]

ANSWER KEY

EXERCISE # I

1.	**(A)**	**2.**	**(C)**	**3.**	**(B)**	**4.**	**(C)**	**5.**	**(D)**
6.	**(C)**	**7.**	**(C)**	**8.**	**(B)**	**9.**	**(A)**	**10.**	**(D)**
11.	**(B)**	**12.**	**(A)**	**13.**	**(C)**	**14.**	**(D)**	**15.**	**(C)**
16.	**(B)**	**17.**	**(A)**	**18.**	**(B)**	**19**	**(A)**	**20**	**(D)**
21	**(C)**	**22**	**(B)**	**23**	**(C)**	**24**	**(A)**	**25**	**(C)**
26	**(B)**	**27**	**(A)**	**28**	**(C)**	**29**	**(A)**	**30**	**(B)**
31	**(B)**	**32.**	**(D)**						

EXERCISE # II

1.	**(B)**	**2.**	**(C)**	**3.**	**(B)**	**4.**	**(B)**	**5.**	**(A,B,C,D)**
6.	**(A,B,C,D)**	**7.**	**(A,B)**	**8.**	**(A,B)**	**9.**	**(A,B,C)**	**10.**	**(B,C)**
11.	**(B,C,D)**	**12.**	**(A,C)**	**13.**	**(A,B,D)**				

EXERCISE # III

1. **(A,B,C,D)** **2.** **(D)** **3.** **(A,C)**

4. **(A)→P ; (B)→R ; (C)→S ; (D)→Q** **5.** **(A)→S ; (B)→R ; (C)→P ; (D)→R,S**

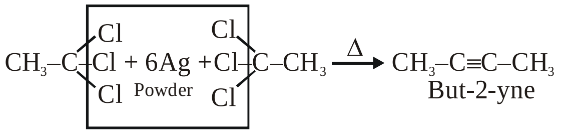
6. **(A)→Q ; (B)→R ; (C)→S ; (D)→P** **7.** **(A)→R ; (B)→S ; (C)→Q ; (D)→P**

8. **(A)→Q ; (B)→P ; (C)→S ; (D)→R**

EXERCISE # (IV) (J-MAINS)

1.	**(1)**	**2.**	**(3)**	**3.**	**(1)**	**4.**	**(1)**	**5.**	**(1)**
6.	**(1)**	**7.**	**(1)**	**8.**	**(4)**	**9.**	**(1)**	**10.**	**(1)**
11.	**(1)**	**12.**	**(2)**	**13.**	**(4)**	**14.**	**(2)**	**15.**	**(1)**
16.	**(4)**	**17.**	**(2)**	**18.**	**(4)**	**19.**	**(2)**	**20.**	**(4)**
21.	**(4)**	**22.**	**(4)**	**23.**	**(3)**	**24.**	**(2)**		

25. **(1)**

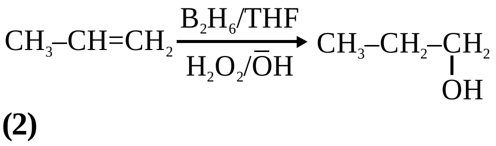


$$CH_3-C\begin{matrix}Cl\\Cl\\Cl\end{matrix} + 6Ag\ \underset{}{\text{Powder}} + \begin{matrix}Cl\\Cl\\Cl\end{matrix}C-CH_3 \xrightarrow{\Delta} \underset{\text{But-2-yne}}{CH_3-C\equiv C-CH_3}$$

26. **(3)**

$Ca^{+2}[C\equiv C]^{-2}$

27. **(1)**



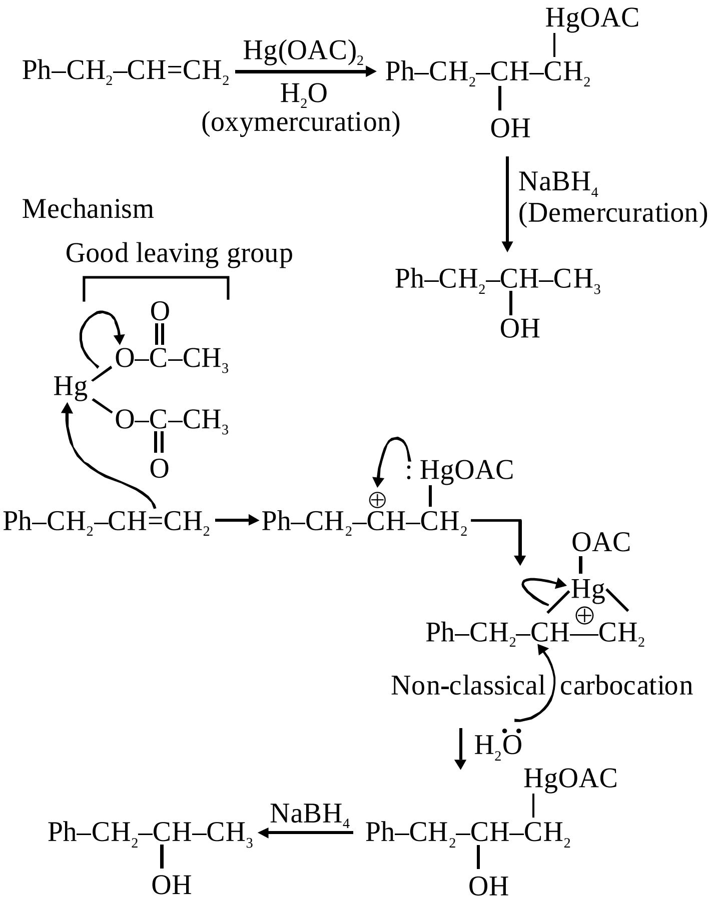
$$CH_3-CH=CH_2 \xrightarrow[H_2O_2/\bar{O}H]{B_2H_6/THF} CH_3-CH_2-\underset{OH}{\underset{|}{CH_2}}$$

28. **(2)**

$$\underset{\text{yne}}{nHC\equiv CH} \xrightarrow{\text{Polymerisation}} \underset{\text{poly-yne}}{-\!\!(CH=CH)_n\!\!-}$$

29. (2) 30. (4)

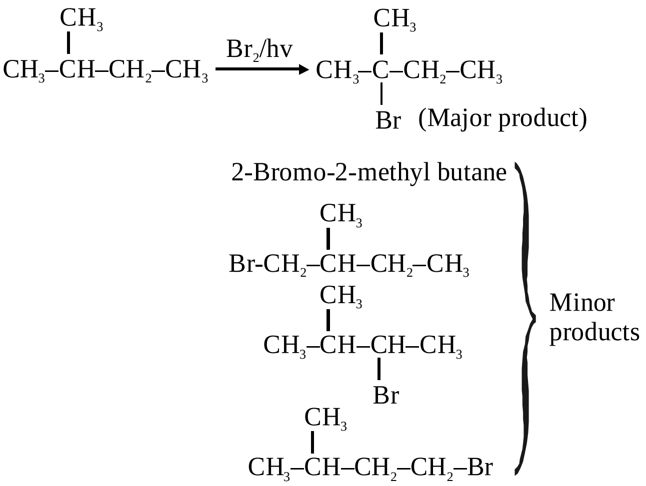
31. (1)



$$Ph{-}CH_2{-}CH{=}CH_2 \xrightarrow[H_2O\ (oxymercuration)]{Hg(OAC)_2} Ph{-}CH_2{-}\underset{OH}{CH}{-}\overset{HgOAC}{CH_2} \xrightarrow[(Demercuration)]{NaBH_4} Ph{-}CH_2{-}\underset{OH}{CH}{-}CH_3$$

Rearrangement of carbocation formed is not possible due to formatiion of cyclic non-classical carbocation.

32. (1)



$$CH_3{-}\overset{CH_3}{CH}{-}CH_2{-}CH_3 \xrightarrow{Br_2/hv} CH_3{-}\underset{Br}{\overset{CH_3}{C}}{-}CH_2{-}CH_3\ \text{(Major product)}$$

$$Br{-}CH_2{-}\overset{CH_3}{CH}{-}CH_2{-}CH_3,\quad CH_3{-}\overset{CH_3}{CH}{-}\underset{Br}{CH}{-}CH_3,\quad CH_3{-}\overset{CH_3}{CH}{-}CH_2{-}CH_2{-}Br\ \text{(Minor products)}$$

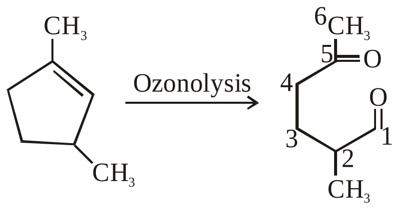
relectivity ratio for bromination is

1° : 2° : 3° : : 1 : 82 : 1600

Hence 3° product will be major product.

33. (2)

34. **(4)**



5-Keto-2-Methylhexanal

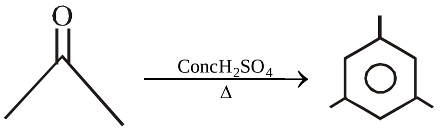
35.	**Ans. (3)**	**36.**	**Ans. (2)**	**37.**	**Ans. (1)**	**38.**	**Ans. (1)**
39.	**Ans. (1)**	**40.**	**Ans. (1)**	**41.**	**Ans. (4)**	**42.**	**Ans.(2)**
43.	**Ans. (3)**	**44.**	**Ans. (2)**				

EXERCISE # IV (A) (JEE ADVANCE)

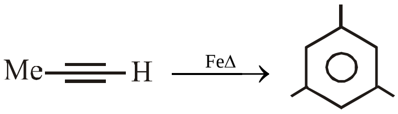
1.	**(D)**	**2.**	**(A)**	**3.**	**(C)**	**4.**	**(B)**	**5.**	**(B)**
6.	**(B)**	**7.**	**(A)**	**8.**	**(D)**	**9.**	**(A)**	**10.**	**(B)**
11.	**(B)**	**12.**	**(A)**	**13.**	**(B)**	**14.**	**(D)**	**15.**	**(A)**
16.	**(A)**	**17.**	**(C)**	**18.**	**(B)**	**19.**	**(D)**	**20**	**(B)**
21.	**(A)**	**22.**	**(C)**	**23.**	**(B,D)**	**24.**	**(C)**	**25.**	**(D)**
26.	**(D)**	**27.**	**(4)**						

28. **(A,B,D)**

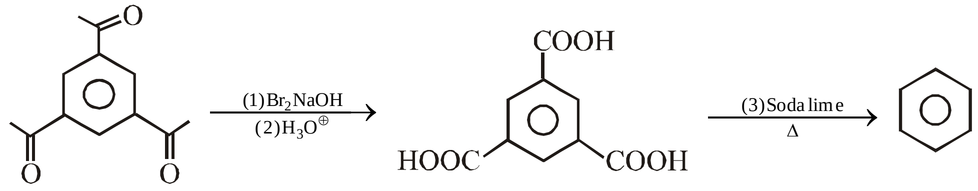
Sol. **(A)**



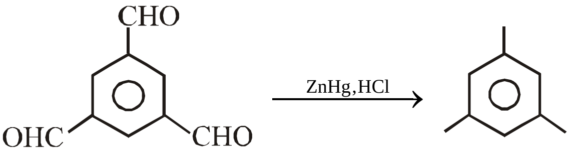
(B)



(C)



(D)



29. **Ans. (2,3)** **30.** **Ans. (2,4)**

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Important Notes