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Q1. How will you convert 1-Bromopropane to 2-Bromopropane?

Q2. How will you convert propene to propane-1-O*l*?

Q3. How will you convert Isopropylchloride to *n*-propylalcohol?

Q4. How will you convert Propylchloride to Butanoic acid?

Q5. How will you convert Propanol to Isopropylcynide?

Q6. How will you convert Benzylalcohol to 2-phenylethanoic acid?

Q7. How will you convert nitrobenzene to *p*-florochlorobenzene?

Q8. How will you convert Nitrobenzene to chlorobenzene?

Q9. How will you convert Toluene to *m*-chlorobenzyoic acid?

Q10. How will you convert Toluene to *p*-chlorobenzoic acid?

Q11. How will you convert Benzene to *m*-Nitrotoluene?

Q12. How will you convert Benzene to *p*-nitrobromobenzene?

Q13. How will you convert Ethyne to Butyne?

Q14. How will you convert tert-Butylbromide to Isobutylbromide?

Q15. How will you convert Ethanol to but-2-yne?

Q16. How will you convert Benzene to diphenyl?

Q17. How will you convert Aniline to phenyl isocynide?

Q18. How will you convert Benzene to phenyl ethanoic acid?

Q19. How will you convert benzene to styrene?

Q20. Starting from methyl iodide, how will you prepare (a) nitromethane and (b) methyl nitrite? Write the complete reaction involved.

Q21. How will you convert

(a) Bromomethane to propanone (b) Propene to 1-nitropropane

Q22. How will you convert

(a) But-1-ene to But-2-ene (b) Bromoethane to Bromoethene

Q23. How will you convert Benzene to phenylethenyl?

Q24. How will you convert

(a) Ethylchloride to Ethylmagnesium Iodide (b) Benzylalcohol to phenylethanenitrate

Q25. How will you prepare *p*-chlorobenzoic acid from *p*-chloronitrobenzene?

Q26. How will you prepare *p*-chlorotoluene from *p*-nitrotoluene?

Q27. How will you convert

(a) Ethylchloride to propanamide **(b) Isopropylalcohol to 3-Methylbut-1-ene**

(c) Toluene to 1,2-diphenylethane

Q28. How will you convert

(a) 1-Bromopropane to 2-Bromopropane **(b) Toluene to benzylalcohol**

(c) Benzene to 4-Bromonitro benzene

Q29. How will you convert

(a) Ethene to bromoethene **(b) Propene to propyne**

(c) Aniline to phenyl isocynide

Q30. How will you convert

(a) *p*-Nitroethyl benzene to 1-(*p*-nitrophenyl) ethanol.

(b) Cyclohexene to cyclohexylcyclohexane or dicyclohexyl

(c) Cyclohexyl.bromide to dutrariumcyclohexane

Q31. Give reagents inorganic or organic, needed to convert benzyl bromide into (a) benzyl acetate (b) (nitromethyl) benzene (c) *tri-n*-butylbenzylammonium bromide.

Q32. How will you to convert

(a) Ethylchloride to But-2-yne. **(b) Allyl bromide to Hex-1-en-4-yne**

Q33. How will you convert

(a) Isopropylalcohol to iodoform **(b) Propene to But-2-yne**

Q34. How will you carry out the following conversions in not more than two steps:

(a) Toluene to benzyl alcohol **(b) Ethanol to ethyl fluoride**

(c) Benzene to biphenyl

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S1. $CH_3-CH_2-CH_2-Br \xrightarrow[KCN]{\text{alc. KOH.}} CH_3-CH=CH_2 \xrightarrow{HBr} CH_2(Br)-CH(Br)-CH_3$

S2. $CH_2=CH-CH_3 \xrightarrow[KCN]{\text{HCl, ROOR (A.M.R.)}} CH_3-CH_2-CH_2-Cl \xrightarrow{\text{aq. KOH}} CH_3-CH_2-CH_2-OH$

S3. $CH_3-CH(CH_3)-Cl \xrightarrow{\text{alc. KOH}} CH_3-CH=CH_2 \xrightarrow{BH_3THF(I)\ H_2O_2(II)\ ^{\ominus}OH} CH_3-CH_2-CH_2-OH$

(OR)

$CH_3-CH(CH_3)-Cl \xrightarrow{\text{alc. KOH}} CH_3-CH=CH_2 \xrightarrow{HBr/ROOR} CH_3CH_2-CH_2-Br \xrightarrow{\text{aq. KOH}} CH_3-CH_2-CH_2-OH$

S4. $CH_3-CH_2-CH_2-Cl \xrightarrow{KCN} CH_3CH_2CH_2-CN \xrightarrow{HOH/H^{\oplus}} CH_3CH_2-CH_2-COOH$

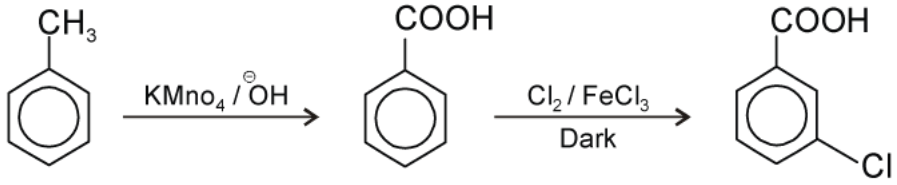
S5. $CH_3-CH_2-CH_2-OH \xrightarrow{H_2SO_4\Delta} CH_3-CH=CH_2 \xrightarrow{HCl} CH_3-CH(Cl)-CH_3 \xrightarrow{KCN} CH_3-CH(CH_3)-CN$

S6. $C_6H_5-CH_2-OH \xrightarrow{PCl_5} C_6H_5-CH_2-Cl \xrightarrow{KCN} C_6H_5-CH_2-CN \xrightarrow{HOH/H^{\oplus}} C_6H_5-CH_2-COOH$

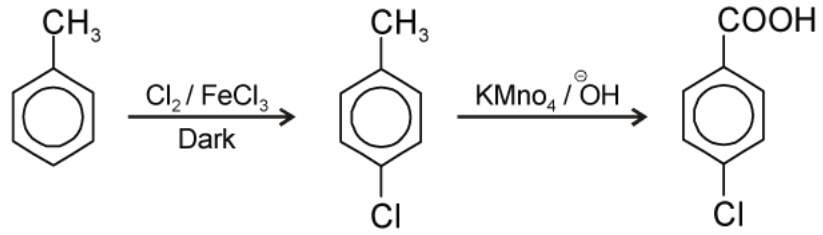
S7. $C_6H_5-NO_2 \xrightarrow{Sn/HCl} C_6H_5-NH_2 \xrightarrow[O°C]{NaNO_2/HCl} C_6H_5-N_2Cl \xrightarrow{HBF_4} C_6H_5-F \xrightarrow[Dark]{Cl_2/FeCl_3}$ 1-chloro-2-fluorobenzene

S8. $C_6H_5-NO_2 \xrightarrow{Sn/HCl} C_6H_5-NH_2 \xrightarrow[(O-5)°C]{NaNO_2/HCl} C_6H_5-N_2^+Cl^- \xrightarrow{CuCl/HCl} C_6H_5-Cl$

S9.



S10.



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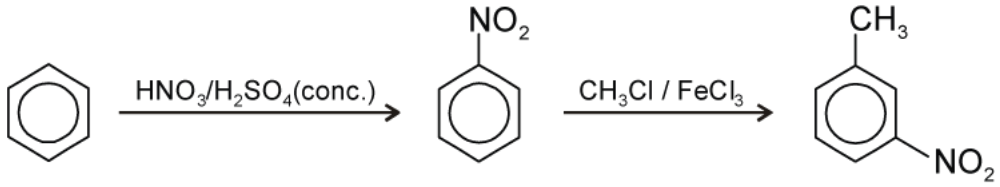

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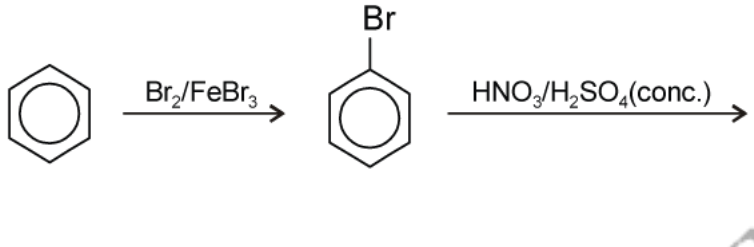

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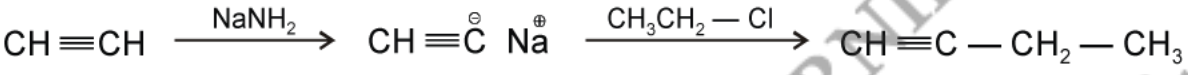

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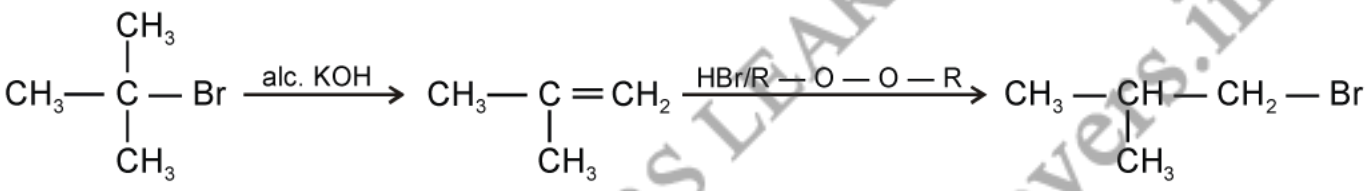

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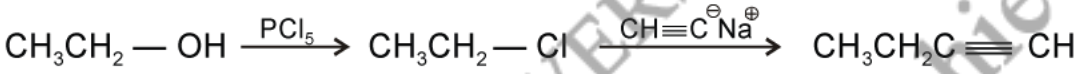

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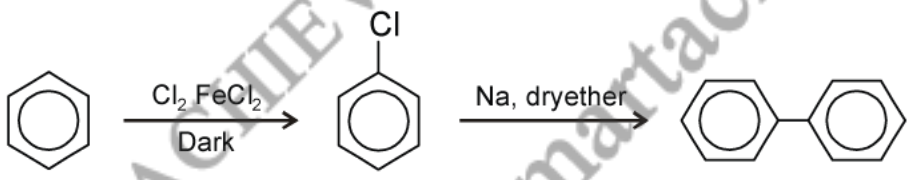
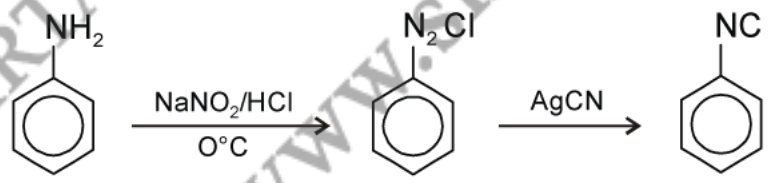


S17.



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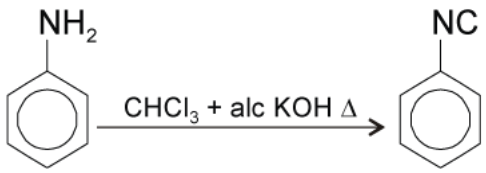
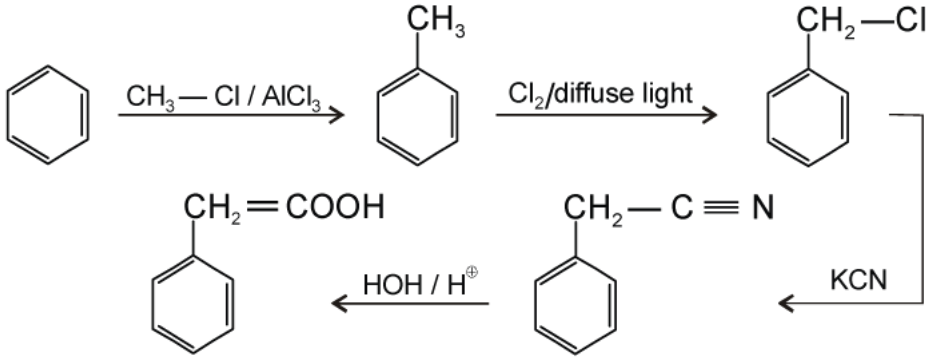


S18.



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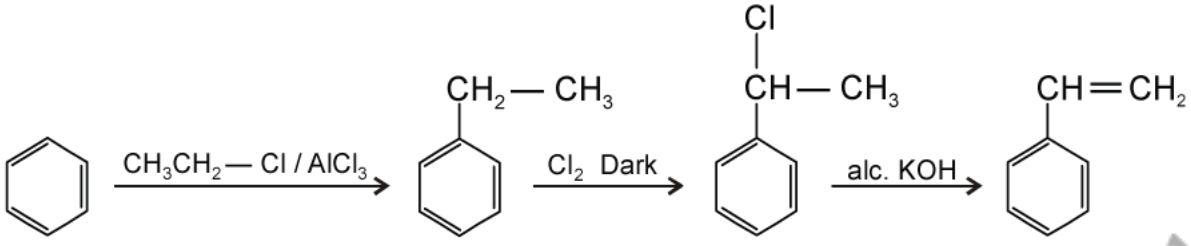


S20.

(a) $CH_3I + AgNO_2 \longrightarrow CH_3-N(=O)-O + AgI$

Silver nitrate — Nitromethane

(b) $CH_3I + K-O-N=O \longrightarrow CH_3-O-N=O + KI$

Potassium nitrite — Methyl nitrite

S21.

(a) $CH_3-Br \xrightarrow{Mg} CH_3MgBr \xrightarrow[\text{Dry ether}]{CH_3CHO} CH_3-CH(OH)-CH_3 \xrightarrow{KMnO_4/\overset{\ominus}{O}H/\Delta} CH_3-C(=O)-CH_3$

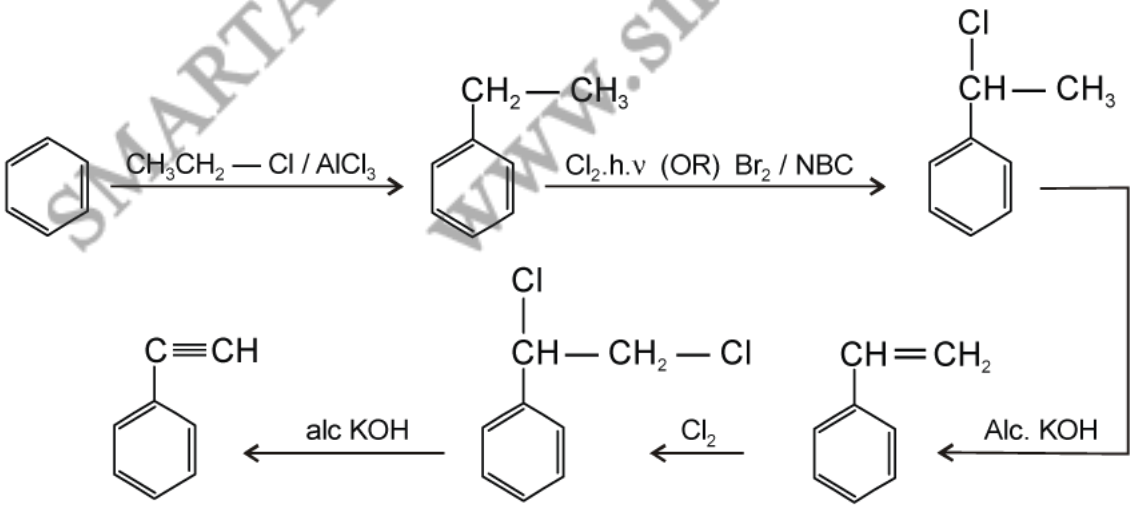
(b) $CH_3-CH=CH_2 \xrightarrow[\Delta]{HBr/R-O-O-R} CH_3CH_2CH_2-Br \xrightarrow[\Delta]{AgNO_2(aq.)} CH_3-CH_2-CH_2-NO_2$

S22.

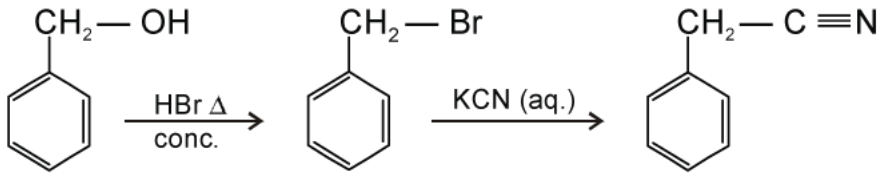
(a) $CH_3-CH_2-CH=CH_2 \xrightarrow{HBr} CH_3-CH_2-CH(Br)-CH_3 \xrightarrow{CH_3-Cl} CH_3-CH=CH-CH_3$

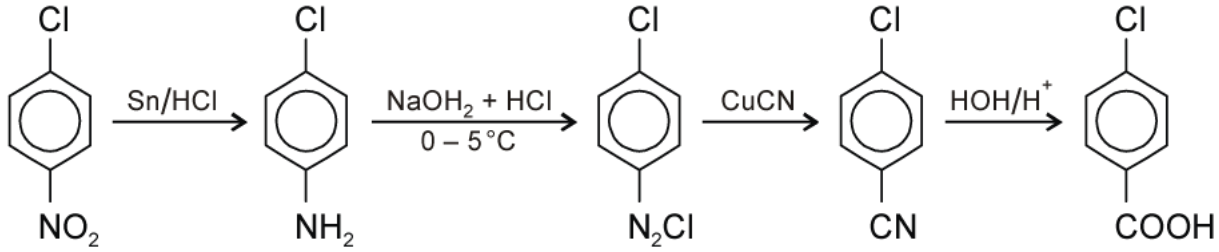
(b) $CH_3CH_2-Br \xrightarrow{\text{alc. KOH}} CH_2=CH_2 \xrightarrow{Br_2} CH_2(Br)-CH_2(Br) \xrightarrow[1\text{ eq.}]{\text{alc. KOH }\Delta} CH_2=CH-Br$

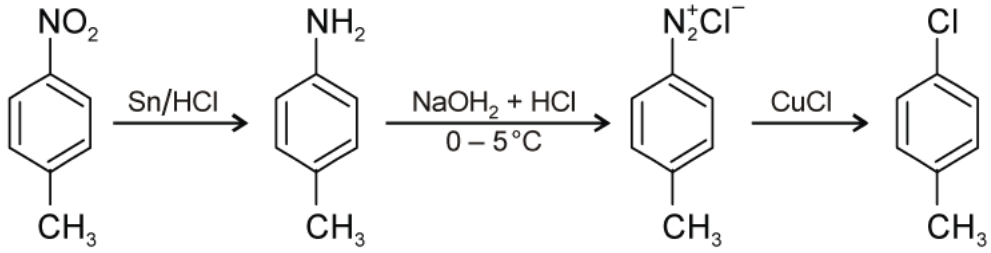
S23.



S24. (a) $CH_3 - CH_2 - Cl \xrightarrow{NaI\ /\ acetone} CH_3 - CH_2 - I \xrightarrow{Mg/Dryether} CH_3 - CH_2 - MgI$

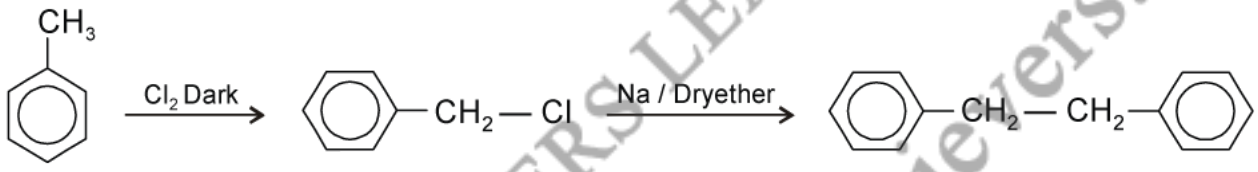
(b) 

S25. 

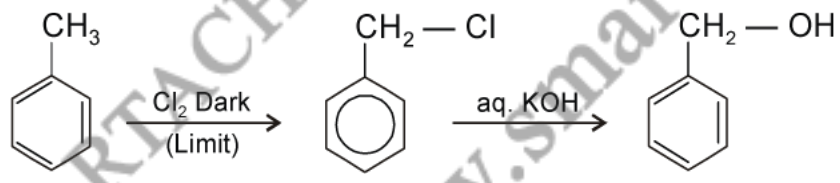
S26. 

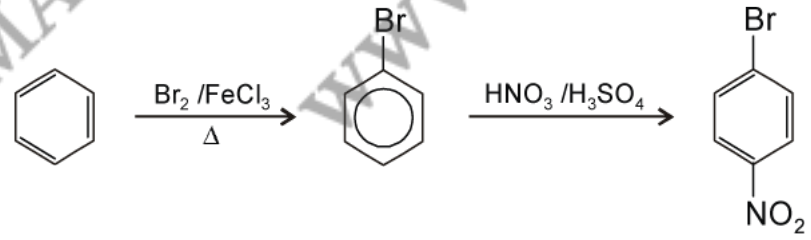
S27. (a) $CH_3CH_2 - Cl \xrightarrow{KCN} CH_3CH_2 - C \equiv N \xrightarrow[\text{(incomplete hydrolysis)}]{H^{\oplus}} CH_3 - CH_2CONH_2$

(b) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}} - OH \xrightarrow{PCl_5} CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}} - Cl \xrightarrow{CH \equiv C^{\ominus}Na^{\oplus}} CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}} - C \equiv CH$

(c) 

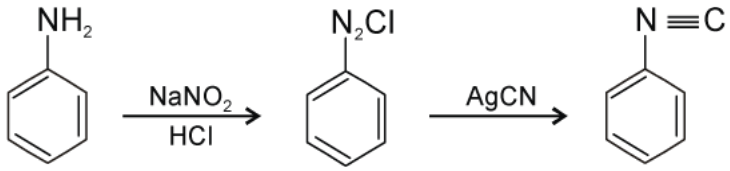
S28. (a) $CH_3 - CH_2 - CH_2 - Br \xrightarrow{alc.\ KOH} CH_3 - CH = CH_2 \xrightarrow{HBr.\ /\ R-O-O-R} CH_3 - \underset{\displaystyle Br}{\overset{\displaystyle |}{CH}} - CH_3$

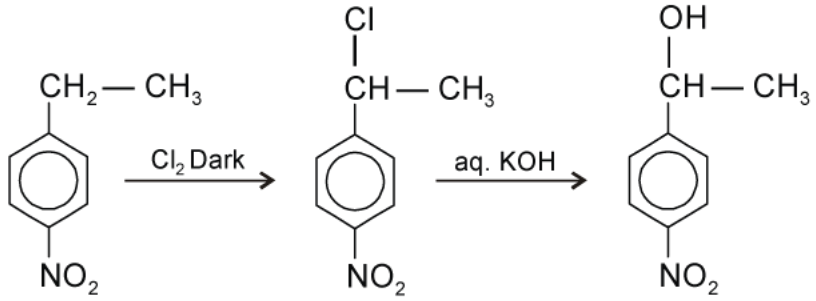
(b) 

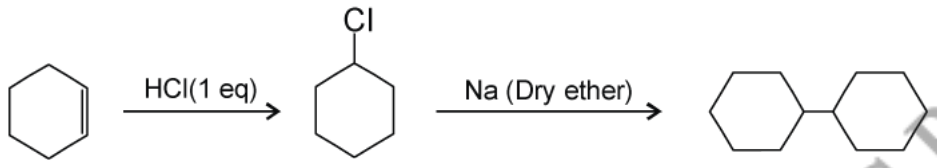
(c) 

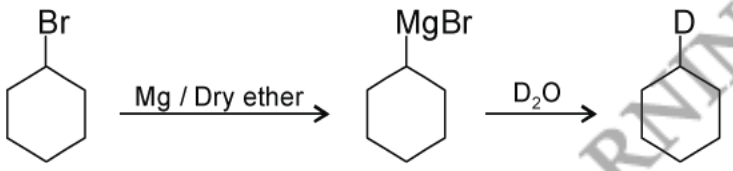
S29. (a) $CH_2 = CH_2 \xrightarrow{Br_2} \underset{\displaystyle Br}{\overset{\displaystyle |}{CH_2}} - \underset{\displaystyle Br}{\overset{\displaystyle |}{CH_2}} \xrightarrow{alc.\ KOH} CH \equiv CH \xrightarrow{HBr(1eq.)} CH_2 = CH - Br$

(b) $CH_3-CH=CH_2 \xrightarrow{Br_2} CH_3-\underset{Br}{CH}-\underset{Br}{CH_2} \xrightarrow{\text{alc. KOH}} CH-C\equiv CH$

(c) 

S30. (a) 

(b) 

(c) 

S31.

$C_6H_5CH_2-Br$ (Benzyl bromide)

(a) $CH_2COOAg \rightarrow CH_3COOCH_2C_6H_5$ (benzyl acetate)

(b) $AgNO_2 \rightarrow C_6H_5CH_2NO_2$ (phenylnitromethane)

(c) $(CH_2CH_2CH_2CH_2)_3N \rightarrow [(CH_3CH_2CH_2CH_2)_3NCH_2C_6H_5]Br^-$
(*tri-n*-butylbezylammonium bromide)

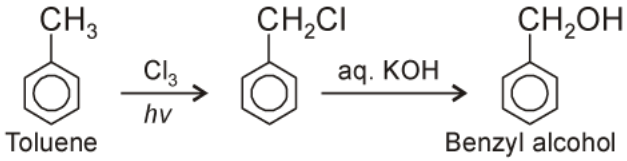
S32. (a) $CH_3CH_2-Cl \xrightarrow{\text{alc. KOH}} CH_2=CH_2 \xrightarrow{Br_4/CCl_4} \underset{Br}{CH_2}-\underset{Br}{CH_2} \xrightarrow[\Delta]{\text{alc. KOH}} CH\equiv CH \xrightarrow{NaNH_2} Na^{\oplus}\,{}^{\ominus}C\equiv C^{\ominus}\,Na^{\oplus} \xrightarrow{CH_3Cl} CH_3-C\equiv C-CH_3$

(b) $CH_2=CH-CH_2-Br \xrightarrow{Na^{\oplus}\,{}^{\ominus}C\equiv C-CH_3} CH_2=CH-CH_2-C\equiv C-CH_3$

S33. (a) $CH_3-\underset{OH}{CH}-CH_3 \xrightarrow{I_2 + NaOH/\Delta} CHI_3$

(b) $CH_3-CH=CH_2 \xrightarrow{Cl_2} CH_3-\underset{Cl}{CH}=\underset{Cl}{CH_2} \xrightarrow{\text{alc. KOH}} CH_3-C\equiv CH \xrightarrow{NaNH_2} CH_3-C\equiv CNa \xrightarrow{CH_3-Cl} CH_3-C\equiv C-CH_3$

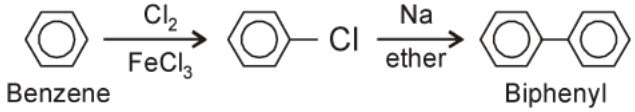
S34. (a)



(b) $CH_3CH_2OH \xrightarrow{SOCl_2} CH_3CH_2Cl \xrightarrow{Hg_2F_2} CH_3CH_2F$

Ethanol — Fluroroethane

(c)



Date: 23/10/2021

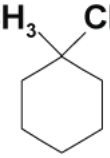
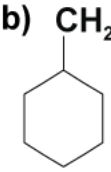
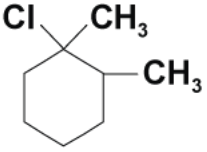
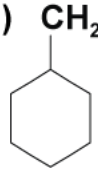
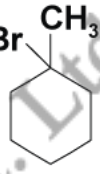
Q1. Arrange the following according to decreasing S_N1 mechanism.

(a) *Neo*-butylbromide (b) *Iso*-butylbromide (c) *Sec*-butylbromide
(d) Vinylchloride (e) Allylchloride

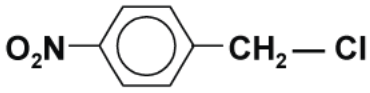
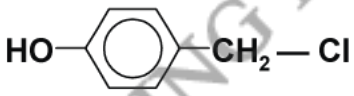
Q2. Arrange the following according to decreasing order of S_N2 mechanism.

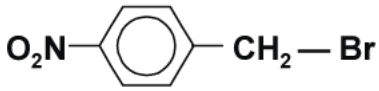
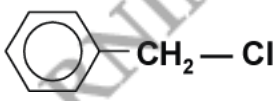
(a) $CH_3 — CH_2 — F$ (b) $CH_3 — CH_2 — Br$ (c) $CH_3 — CH_2 — Cl$
(d) $CH_3 — CH_2 — I$

Q3. Arrange the following according to decreasing order of reactivity S_N2 mechanism.

(a)  (b)  (c)  (d)  (e) 

Q4. Arrange the following according to decreasing stability of S_N1 reactivity.

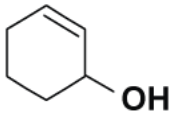
(a)  (b) 

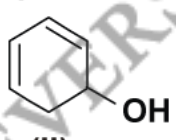
(c)  (d) 

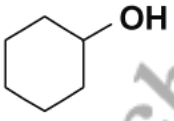
Q5. Arrange the following halides in order of increasing reactivity through S_N2 mechanism.

CH_3Br, CH_3CH_2Br, $(CH_3)_2CHBr$, $(CH_3)_3CBr$.

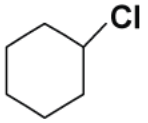
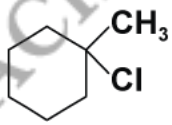
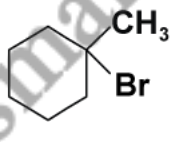
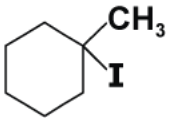
Q6. Arrange the following in increasing order of dehydration.


(i)


(ii)


(iii)

Q7. Predict the order of reactivity of the following compounds in S_N1 reactions.

(a)  (b)  (c)  (d) 

Q8. Arrange the following halides in order of increasing S_N2 reactions.

(a) CH_3Cl (b) CH_3Br (c) CH_3CH_2Cl (d) $(CH_3)_2CHCl$

Q9. Which compound in each of the following pairs will react faster in S_N2 reaction with $HO^{\ominus}$?

(a) CH_3Br or CH_3I (b) $CH_2 = CHBr$ or $CH_2 = CH — CH_2Br$

Q10. Give the order of reactivity towards S_N1 solvolysis of the following:

(i) Benzyl chloride (ii) *p*-Chlorobenzylchloride
(iii) *p*-Methoxybenzyl chloride (iv) *p*-Methyl benzyl chloride
(v) *p*-Nitrobenzyl chloride

Q11. Give the order of reactivity towards S_N1 reaction of the following:

(a) 1-Bromopentane (b) 2-Bromopentane (c) 2-Bromo-2-methyl butane

Q12. Give the order of reactivity towards E_2 dehydrohalogenation of the following.

(a) (i) C_2H_5Br (ii) C_3H_7Br
(iii) *iso*-butyl bromide (iv) Neopentyl bromide

(b) (i) 2-Bromo-2-methylbutane (ii) 1-Bromo pentane
(iii) 2-Bromo pentane (iv) 3-Bromo pentane

Q13. Predict the order of reactivity of the following compounds in dehydrohalogenation.

(a) (i) $CH_3CH_2CH_2CH_2Cl$ (ii) $(CH_3)_2CHCH_2Cl$
(iii) $(CH_3)_2CH — CH_2Br$ (iv) $CH_3CH(Br)CH_2CH_3$
(v) $(CH_3)_3C — Br$

(b) (i) $CH_3CH(Br)CH_3$ (ii) $CH_3CH_2CH_2Br$
(iii) $(CH_3)_2CH — CH_2Br$ (iv) $(CH_3)_3C — CH_2Br$

Q14. Predict the order of reactivity of the following compounds in S_N1 and S_N2 reactions.

(a) The four isomeric bromobutanes

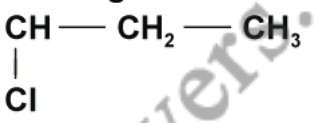
(b) (i) $C_6H_5CH_2Br$ (ii) $C_6H_5CH(C_6H_5)Br$
(iii) $C_6H_5CH(CH_3)Br$ (iv) $C_6H_5C(CH_3)(C_6H_5)Br$

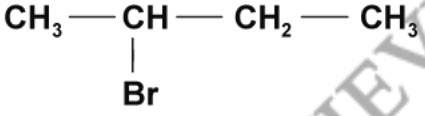
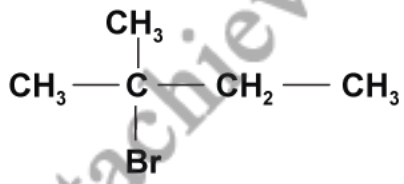
Q15. Arrange the following according to decreasing boiling point.

(a) (i) *iso*-propyl bromide (ii) *n*-propyl bromide
(iii) *tert*-propyl bromide (iv) ethyliodide

(b) Arrange the C_4H_9Cl isomers in decreasing boiling point.

Q16. Arrange the following decreasing reactivity towards dehydrohalogenation

(a) (i) $CH_3 — CH_2 — CH_2 — CH_2 — Cl$ (ii) 

(iii)  (iv) 

(b) (i) $CH_3 — CH_2 — CH_2 — CH_2 — Br$ (ii) $(CH_3)_2 — CH — CH_2 — Br$
(iii) $(CH_3)_3 — C — CH_2 — Br$ (iv) $(CH_3)_3C — CH_2 — Cl$

Q17. Give the order of reactivity towards S_N2 reaction of the following:

(a) (i) 1-Bromopentane (ii) 2-Bromopentane
(iii) 2-Bromo-2-methylbutane

(b) (i) *n*-Butylbromide (C_4H_9Br) (ii) *iso*-butyl bromide Me_2CHCH_2Br
(iii) *sec*-Butyl bromide $CH_3 — CH(Me)CH_2Br$ (iv) *tert*-Butyl bromide $Me_3C — Br$

Q18. Arrange the following compounds in increasing order of S_N1 reactivity.

(a) (i) $ClCH_2CH = CHCH_2CH_3$ (ii) $CH_3C(Cl) = CHCH_2CH_3$

(iii) $CH_3CH = CHCH_2CH_2Cl$ (iv) $CH_3CH = CHCH_2(Cl)CH_3$

(b) (i) CH_3CH_2Br (ii) $CH_2 = CHCH(Br)CH_3$

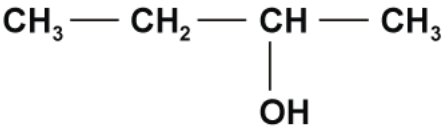
(iii) $CH_2 = CHBr$ (iv) $CH_3CH(Br)CH_3$

(c) (i) $(CH_3)_3CCl$ (ii) $C_6H_5C(CH_3)_2Cl$

(iii) $(CH_3)_2CHCl$ (iv) $CH_3CH_2CH_2Cl$

Q19. Arrange the following according to given trend.

(a) (i) $(CH_3)_3 - C - OH$ (ii) $(CH_3)_2CH - CH_2 - OH$

(iii) 

Reactivity towards HCl.

(b) (i) 2-Chloro-2-methylbutane (ii) 2,2,3-trimethyl-3-bromopentane

(iii) Cyclohexyl methyl bromide (iv) 1-Bromo-1-methyl cyclohexane

Reactivity with sodium ethoxide towards elimination reaction.

(c) (i) H — F, (ii) HCl (iii) HBr (iv) HI

Reactivity towards C_2H_5OH.

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S1. (a) > (e) > (c) > (b) > (d)

Backup: – $CH_3-\overset{\oplus}{C}(CH_3)_2$ is more stable than $CH_2=CH-\overset{\oplus}{C}H_2$

– $CH_2=\overset{\oplus}{C}H$ highly unstable *i.e.*, sp^2 hybridized.

S2. (d) > (b) > (c) > (a)

Backup: Not depend on degree, depend on the leaving group tendency.

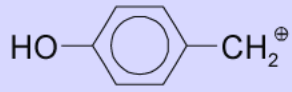
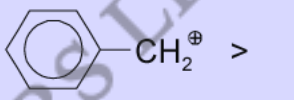
S3. (d) > (b) > (e) > (a) > (c)

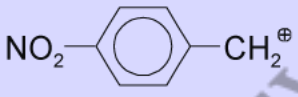
Backup: – d and b compare on leaving group tendency

– e and a same as d and b

– c is more alkylated

S4. (b) > (d) > (c) > (a)

Backup: –  >  >



– Br is good leaving group — Cl

S5. Reactivity through S_N2 mechanism decreases with increase in size of the alkyl group. Therefore, the order of reactivity through S_N2 mechanism is

$$(CH_3)_3CBr < (CH_3)_2CHBr < CH_3CH_2Br < CH_3Br$$

S6. (iii) < (i) < (ii)

S7. First compound is a secondary halide and the other three are tertiary halides. Also, the reactivity follows the order chloride < bromide < iodide. Thus, the compounds as given are arranged in the decreasing order of reactivity in S_N1 and S_N2 reactions.

$S_N1 \Rightarrow$ (d) > (c) > (b) > (a)

$S_N2 \Rightarrow$ (a) > (d) > (c) > (b)

S8. (d) < (c) < (a) < (b)

Backup: $S_N2 = (CH_3)_2CHCl < CH_3CH_2Cl < CH_3Cl < CH_3Br$.

As the size of the alkyl group increases, the S_N2 reactivity decreases. Further, the (C — Cl) bond is stronger and more difficult to leave than the the (C — Br) bond.

$S_N1 = (CH_3)_2CHCl > CH_3CH_2Cl > CH_3Br > CH_3Cl$

(d) > (c) > (b) > (a)

S9. S_N2 reactivity

(a) CH_3I ($I^{\ominus}$ is a better leaving group than $Br^{\ominus}$).

(b) $CH_2 = CH - CH_2Br$ (Allylic bromide)

Vinyl bromide ($CH_2 = CH - Br$) neither undergoes S_N1 nor S_N2.

S10. (iii) > (iv) > (i) > (ii) > (v).

Solvolysis means the replacement of Cl by solvent anion. In S_N1 mechanism, a carbocation is formed as the intermediate. The stability of carbocation decides the reactivity.

An electron-donating group increases the stability and hence reactivity, while electron-withdrawing group decreases the stability (and hence reactivity) but in (iv), the stability of benzyl CÅ is due to hyperconjugation. +R and –I effects of the (–OMe) group are stronger than +I and H.C. effects of the (Me) group.

S11. (c) > (b) > (a) (3° > 2° > 1°)

S12. (a) (iii) > (ii) > (i) > (iv).

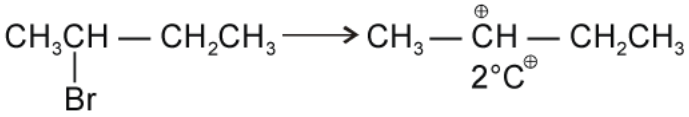
Backup: Neopentyl bromide does not undergo dehydrohalogenation as C-bearing bromide does not contain hydrogen. Reactivity in E_2 dehydrohalogenation depends mainly on the stability of the alkenes being formed which is governed by Saytzeff's rule.

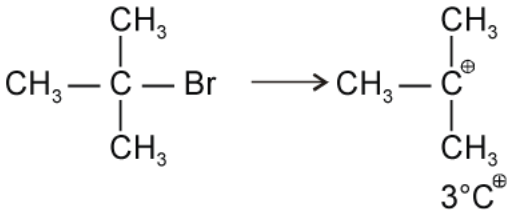
(b) (i) > (iii) > (iv) > (ii).

S13. (a) (i) $CH_3CH_2CH_2CH_2Cl \longrightarrow \underset{1°C^{\oplus}}{CH_3CH_2CH_2\overset{\oplus}{C}H_2} \longrightarrow \underset{2°C^{\oplus}}{CH_3CH_2\overset{\oplus}{C}HCH_3}$

(ii) $CH_3-\underset{CH_3}{\underset{|}{CH}}-CH_2-Cl \longrightarrow CH_3-\underset{CH_3}{\underset{|}{CH}}-\underset{1°C^{\oplus}}{\overset{\oplus}{C}H_2} \longleftrightarrow CH_3-\underset{CH_3}{\underset{|}{\overset{\oplus}{C}H}}-CH_3$ ($3°C^{\oplus}$)

(iii) $CH_3-\underset{CH_3}{\underset{|}{CH}}-CH_2-Br \longrightarrow CH_3-\underset{CH_3}{\underset{|}{CH}}-\underset{1°C^{\oplus}}{\overset{\oplus}{C}H_2} \longleftrightarrow CH_3-\underset{CH_3}{\underset{|}{\overset{\oplus}{C}H}}-CH_3$ ($3°C^{\oplus}$)

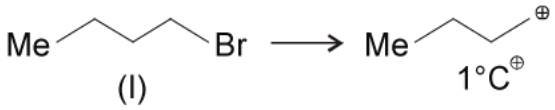
(iv) 

(v) 

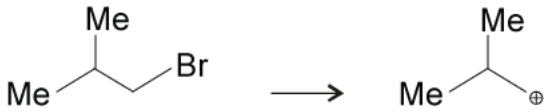
Ease of dehydrohalogenation is due to the formation of carbocation, and the stability of carbocation is 3° > 2° > 1°, and ease of formation of carbocation is (R — I) > (R — Br) > (R — Cl).

So the order of dehyrogenation is (v) > (iii) > (ii) > (iv) > (i).

(b) (iii) > (i) > (ii) > (iv) (1° $C^{\oplus}$ stabilises to 3° $C^{\oplus}$) (iii) > 2°$C^{\oplus}$ (ii) > 1°$C^{\oplus}$ (i) > Neopentyl $C^{\oplus}$ ion (iv) is least reactive due to steric hindrance.

S14. (a) 
(I) (A)


(II) (B)


(III) (C)


(IV) (D)

$S_N1 \Rightarrow$ (I) < (III) < (II) < (IV)

$S_N2 \Rightarrow$ (IV) < (II) < (III) < (I)

(b) $S_N1 \Rightarrow$ (IV) < (II) < (III) < (I)

$S_N2 \Rightarrow$ (I) < (III) < (II) < (IV)

S15. (a) (iv) > (ii) > (i) > (iii)

(b) *n*-butyl chloride > *sec*-butyl chloride > *iso*-butyl chloride > *tert*-butyl chloride.

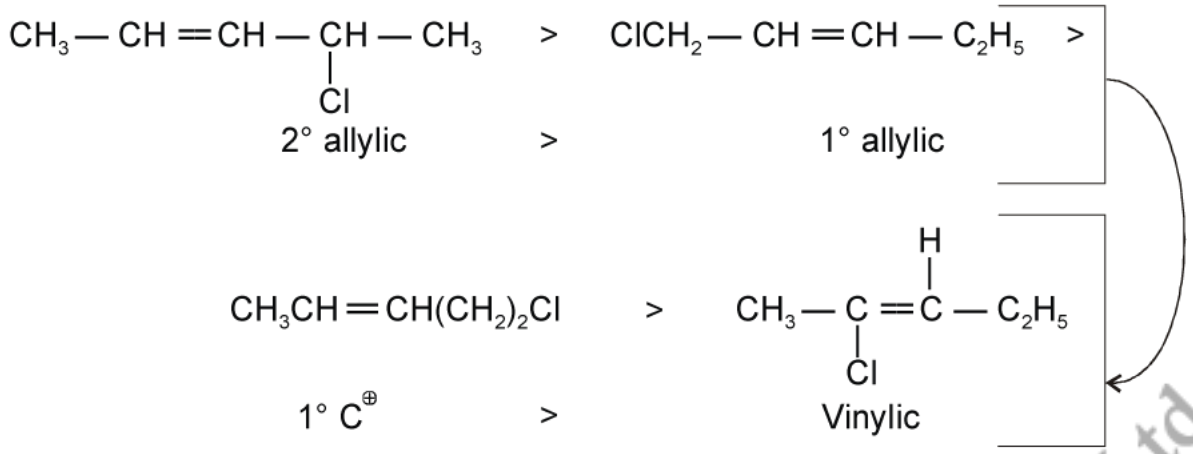
S16. (a) (iv) > (iii) > (ii) > (i) (b) (iii) > (iv) > (ii) > (i)

S17. (a) (i) > (ii) > (iii) (1° > 2° > 3°)

(b) (i) > (ii) > (iii) > (iv). S_N2 is slow for large G in G — CH_2X

S18. S_N1 reactivity

(a) (iv) > (i) > (iii) > (ii)



(b) $CH_2=CH-\underset{\underset{Br}{|}}{CH}-CH_3$ > $CH_3-\underset{\underset{Br}{|}}{CH}-CH_3$ > CH_3CH_2Br > $CH_2=CBr$

2° allylic > 2° $C^{\oplus}$ > 1° $C^{\oplus}$ > Vinylic

(c) $C_6H_5-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-Cl$ > $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-Cl$ > $CH_3-\underset{\underset{H}{|}}{\overset{\overset{CH_3}{|}}{C}}-Cl$ > $CH_3CH_2CH_2Cl$

Benzylic $C^{\oplus}$ > 3°$C^{\oplus}$ > 2°$C^{\oplus}$ > 1°$C^{\oplus}$

S19. (a) (i) > (iii) > (ii). (b) (i) > (iv) > (ii) > (iii) (c) (iv) > (iii) > (ii) > (i)

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Q1. Give the IUPAC name of $[Co(NH_3)_6]ClSO_4$.

Q2. Give the IUPAC name of $Fe_4[Fe(CN)_6]_3$.

Q3. Give the IUPAC name of $[Fe(C_5H_5)_2]$.

Q4. Give the IUPAC name of $K_2[OsCl_5N]$.

Q5. Give the IUPAC name of $[PtBrCl(C_5H_5N)NH_3]$.

Q6. Give the IUPAC name of $[Ni(dmg)_2]$.

Q7. Give the IUPAC name of $[CoF_2(en)_2]ClO_4$.

Q8. Give the IUPAC name of $[CoBr_2(en)_2]Cl$.

Q9. Give the IUPAC name of $[\{(C_6H_5)_3P\}_3Rh]Cl$.

Q10. Give the IUPAC name of $K_3[Fe(C_2O_4)_3]$.

Q11. Give the IUPAC name of $[Cr(PPh_3)\ (CO)_5]$.

Q12. Give the IUPAC name of $K_3[Fe(CN)_5NO]$.

Q13. Give the IUPAC name of $Na[Au(CN)_2]$.

Q14. Give the IUPAC name of $[Ni(H_2O)_2(NH_3)_4]SO_4$.

Q15. Give the IUPAC name of $[CoCl_2\ (NO_2)\ (NH_3)_3]$.

Q16. Give the IUPAC name of $[Pt.\ Cl(NO_2)\ (NH_3)_4]\ SO_4$.

Q17. Give the IUPAC name of $[CoCl_2(en)_2]Cl$.

Q18. Give the IUPAC name of $[Pt\ Cl\ (NH_2CH_3)\ (NH_3)_2]\ Cl$

Q19. Give the IUPAC name of $[Pt(py)_4]\ [PtCl_4]$.

Q20. Give the IUPAC name of $[Pt(py)_4]\ [PtCl_4]$.

Q21. Give the IUPAC name of $[CoCl_2(NH_3)_4]_3\ [Cr(CN)_6]$

Q22. Give the IUPAC name of $[Cr(NCS)\ (NH_3)_5]\ [ZnCl_4]$.

Q23. Give the IUPAC name of $[PtCl_2(NH_3)_4]\ [PtCl_4]$.

Q24. Give the IUPAC name of $Mn_3(CO_{12})$.

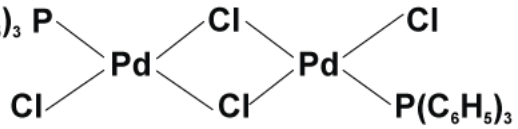
Q25. Give the IUPAC name of $K[CrF_4O]$.

Q26. Give the IUPAC name of $Hg[Co(CNS)_4]$.

Q27. Give the IUPAC name of $[VO(acac)_2]$.

Q28. Give the IUPAC name of $Na[Pt\ Br\ Cl\ (NO_2)\ (NH_3)]$.

Q29. Give the IUPAC name of



Q30. Give the IUPAC name of $[CoCl(ONO)(en)_2]^{\oplus}$.

Q31. Give the IUPAC name of $[Mn(H_2O)_6]^{2\oplus}$.

Q32. Give the IUPAC name of $[Fe(CN)_6]^{4\ominus}$.

Q33. Give the IUPAC name of $[Co(en)_3]^{3\oplus}$.

Q34. Give the IUPAC name of $[NiCl_4]^{2\ominus}$.

Q35. Give the IUPAC name of $[Hg[Co(SCN)_4]$.

Q36. Give the IUPAC name of $[Co(NH_3)_5(CO_3)]Cl$.

Q37. Give the IUPAC name of $K_3[Cr(C_2O_4)_3]$.

Q38. Give the IUPAC name of $[Pt\ (NH_3)_2\ Cl(NO_2)]$.

Q39. Give the IUPAC name of $[Co(en)_3]Cl_3$.

Q40. Give the IUPAC name of $Hg[Co(SCN)_4]$.

Q41. Give the IUPAC name of $[PtCl(NH_2CH_3)(NH_3)_2]Cl$.

Q42. Give the IUPAC name of $[Co(NH_3)_4(H_2O)(Cl)]Cl_2$.

Q43. Give the IUPAC name of $Na[Au(CN)_2]$.

Q44. Give the IUPAC name of $[CrCl_2(en)_2]Cl$.

Q45. Give the IUPAC name of $K_3[Fe(CN)_5NO]$.

Q46. Give the IUPAC name of $[Co(en)_2(ONO)Cl]^{\oplus}$.

Q47. Give the IUPAC name of $Na_3[Cr(OH)_2F_4]$.

Q48. Write the formula of potassium tetracyanocuperate (II).

Q49. Write the formula of ammineaquadibromocopper (II).

Q50. Write the formula of tetra carbonylnickel (0).

Q51. Write the formula of dichloridobis (ethane-1, 2-diamine) cobalt (III) ion.

Q52. Write the formula of potassium trioxalatoaluminate (III).

Q53. Write the formula of tetraammineaquachloridocobalt (III) chloride.

Q54. Write the formula of potassium tetrahydroxozincate (II).

Q55. Give the IUPAC name of $[Pt(NH_3)_2Cl\ (NO_2)]$.

Q56. Give the IUPAC name of $K_4[Ni(CN_4)]$.

Q57. Give the IUPAC name of $Na_3[Fe(C_2O_4)_3]$.

Q58. Give the IUPAC name of $[CoCl_2(en)_2]Cl$.

Q59. Give the IUPAC name of $K_3[Fe(C_2O_4)_3]$.

Q60. Give the IUPAC name of $[Ag(NH_3)_2]$ $[Ag(CN)_2]$.

Q61. Give the IUPAC name of $K_2[Zn(OH)_4]$.

Q62. Write the formula of tetraaminedichloridocobalt (III) ion.

Q63. Write the formula of amminechloridobis (ethane-1, 2-diamine) cobalt (III) ion.

Q64. Write the formula of potassiumpentacyanonitrosylferrate (II).

Q65. Write the formula of diamminedichloroplatinum (II).

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S1. Hexaamminecobalt (III) chloride sulphate

S2. Iron (III) hexacyanoferrate (II)

S3. *Bis*-(cyclopentadienyl) iron (II)

S4. Potassiumpentachloridonitridoosmate (VI)

S5. Amminebromidochloridophyridineplatinum (II)

S6. *Bis*-(dimethylglyoximato) nickel(II)

S7. *Bis*-(ethane-1, 2-diamine) difluoridocobalt (III) perchlorate

S8. Dibromidobis(ethane-1, 2-diamine)cobalt (III) chloride

S9. Tris(triphenylphosphine)rhodium (I) chloride

S10. Potassium trioxalatoferrate (III)

S11. Pentacarbonyltriphenylphosphinechromium (0)

S12. Potassium pentacyanonitrosylferrate (II)

S13. Sodium dicyanoaurate (I)

S14. Tetramminediaquanickel (II) sulphate

S15. Triamminedichloridonitrioto-N-cobalt (III)

S16. Tetraamminechloridonitrito-N-Plantinum (IV) sulphate

S17. Dichloridobis (ethane-1, 2-diamine) cobalt (III) chloride

S18. Diamminechlorido (methylamine) platinum (II) chloride

S19. Tetrapyridineplatinum (II) tetrachloridoplatinate (II)

S20. Tetrapyridineplatinum (II) tetrachloridoplatinate (II)

S21. Tetraamminedichloridocobalt (III) hexacyanochromate (III)

S22. Pentaamminethiocyanate-N-chromium (III) tetrachloridozincate (II)

S23. Tetraamminedichloridoplatinum (IV) tetrachloridoplatinate (II)

S24. Dodecacarbonyltrimanganese (0)

S25. Potassium tetrafluoridooxochromate (V)

S26. Mercury tetrathiocyanatocobaltate (II)

S27. *Bis*-(acetylacetonato)oxovanadium (IV)

S28. Sodium amminebromidochloridonitrito-N-platinate(II)

S29. Chloridotriphenylphosphinepalladium (II)-μ-dichlorido-chloridotriphenylphosphinepalladium (II)

S30. Chlorobis(ethylenediamine) nitrito-O-cobalt (III) ion

S31. Hexaaquamanganese (II) ion

S32. Hexacyanoferrate (II) ion

S33. Tris (ethane-1, 2-diamine) cobalt (III) ion

S34. Tetrachloridonickelate (II) ion

S35. Mercury tetrathiocyanatocobaltate (III)

S36. Pentaamminecarbonatocobalt (III) chloride

S37. Potassium trioxalatochromate (III)

S38. Diamminechloridonitrito-N-platinum (II)

S39. Tris (ethane-1, 2-diamine) cobalt (III) chloride

S40. Murcury tetrathiocyanatocobaltate (III)

S41. Diamminechlorido (methylamine) platinum (II) chloride

S42. Tetraammineaquachloridocobalt (III) chloride

S43. Sodium dicyanoaurate (I)

S44. Dichloridobis(ethane-1, 2-diamine)chromium (III) chloride

S45. Potassium pentacyanonitrosylferrate (III)

S46. Chloridobis (ethane-1, 2-diamine) nitrito-O-cobalt (III) ion

S47. Sodium tetrafluoridodihydroxochromate (III)

S48. $K_2[Cu(CN)_4]$

S49. $[CuBr_2(H_2O)(NH_3)]$

S50. $[Ni(CO)_4]$

S51. $[CoCl_2(en)_2]^{\oplus}$

S52. $K_3[Al(C_2O_4)_3]$

S53. $[Co(NH_3)_4(H_2O)Cl]Cl_2$

S54. $K_2[Zn(OH)_4]$

S55. Diamminechloridonitrito-*N*-platinum(II)

S56. Potassium tetracyanonickelate (0)

S57. Sodium trioxalatoferrate (III)

S58. Dichloridobis (ethane-1, 2-diamine) cobalt (III) chloride

S59. Potassium trioxalatoferrate (III)

S60. Diaamminesilver(I)dicyanoargentate(I)

S61. Potassium tetrahydroxozincate (II)

S62. $[CoCl_2(NH_3)_4]^{\oplus}$ ion

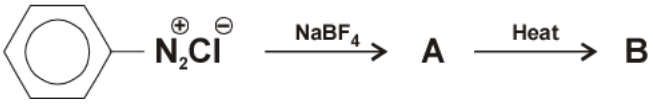
S63. $[CoCl(en)_2(NH_3)]^{2\oplus}$ ion

S64. $K_3[Fe(CN)_5(NO)]$

S65. $[PtCl_2(NH_3)_2]$

Date: 23/10/2021

Q1. Complete the following reaction:



Q2. Complete the following reaction:

$$CH_3CH_2 - Cl + CH_3COOAg \longrightarrow \text{'A'} + \text{'B'}$$

Q3. Complete the following reaction:

$$CH_3CH_2 - OH \xrightarrow{SOCl_2} A \xrightarrow{KCN} B$$

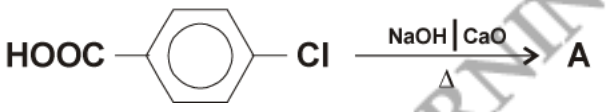
Q4. Complete the following reaction:

$$CH_3CH_2Br + Hg_2F_2 \longrightarrow A + B$$

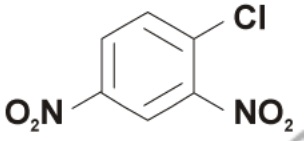
Q5. Complete the following reaction:

$$CH_3CH_2 - Cl + SbF_3 \xrightarrow{1073\,K} A + B$$

Q6. Complete the following reaction:



Q7. Complete the following reaction:



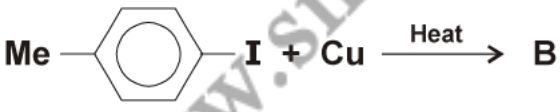
$$+ \; CH_3ONa \xrightarrow[\text{Heat}]{\text{Ethanol}} A$$

Q8. Complete the following reaction:

$$CH_2 = CH - CH_2 - Br + CH \equiv CNa \xrightarrow{\text{Liq. } NH_3} A$$

$$A \xrightarrow[\text{Liq. HOH}]{} B$$

Q9. Complete the following reaction:



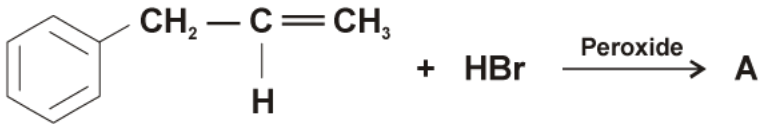
Q10. Identify the structure of *A* and *B*.

$$CH_3 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - OH \xrightarrow{PCl_5} A \xrightarrow[\text{dry Actone}]{NaI} B$$

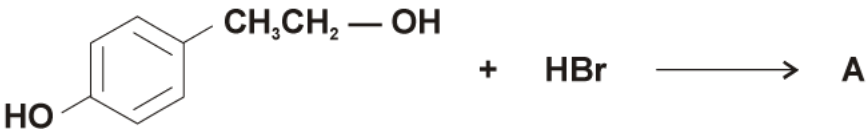
Q11. Write structure and IUPAC name of compounds *A* and *B* in the following reactions.

$$CH_3 - CH = CH_2 \xrightarrow{HBr} A \xrightarrow[\text{Dryether}]{Na} B$$

Q12. Complete the following reaction:

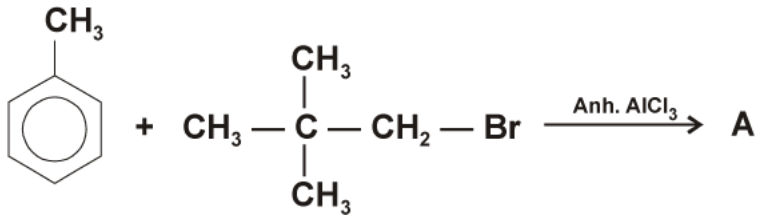


Q13. Complete the following reaction:

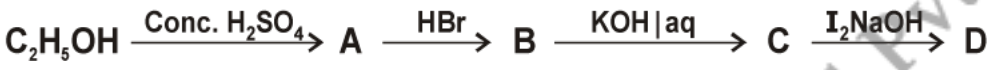


Q14. Write equation for carbylamine reaction.

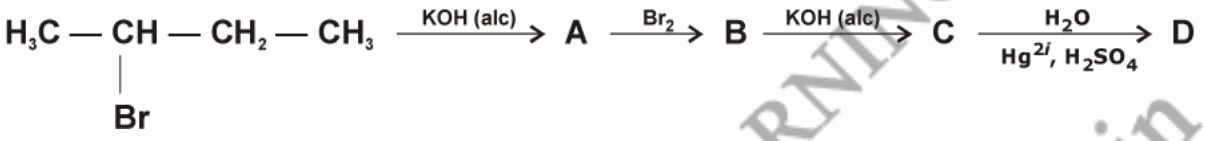
Q15. Complete the following reaction:



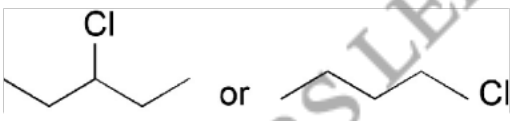
Q16. Identify the compounds *A*, *B*, *C* and *D* in the following sequence of reaction.



Q17. Write the structural formula of *A*, *B*, *C* and *D*.

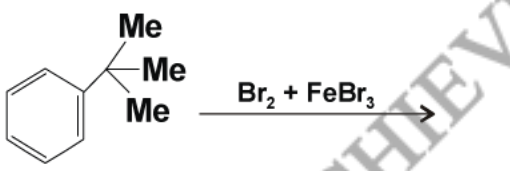


Q18. Which of the following two substances undergo S_N1 reaction faster and why?

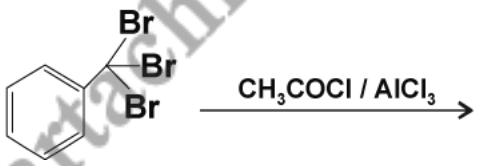


Q19. Give the major product of the following

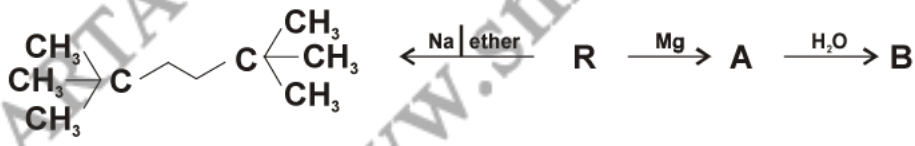
(1)



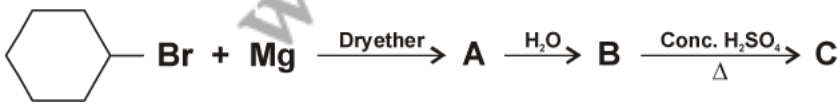
(2)



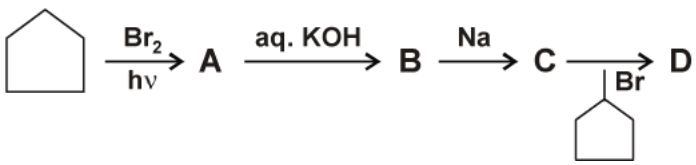
Q20. Identify R, A and B in the following:



Q21. Identify *A*, *B* and *C* in the following:



Q22. Identify *A*, *B*, *C* and *D* in the following series of reaction.

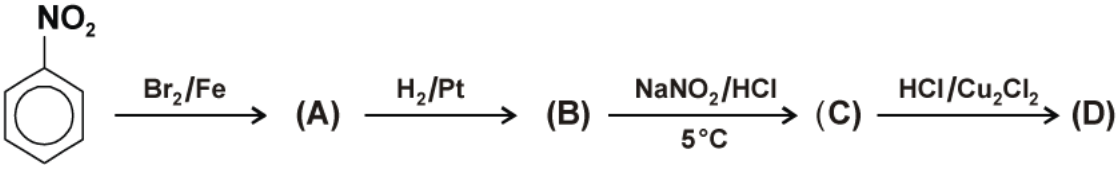


Q23. Write reaction for Chlorination of toluene in the presence of light and heat followed by treatment with aqueous NaOH.

Q24. Identify all the possible alkenes that would be formed on dehydrohalogenation of the following organic halides with alcoholic KOH. Also, identify the major alkene.

(a) 1-Chloropentane (b) 2-Chloro-3-methylbutane

Q25. Complete the following supplying (*A*), (*B*), (*C*) and (*D*):

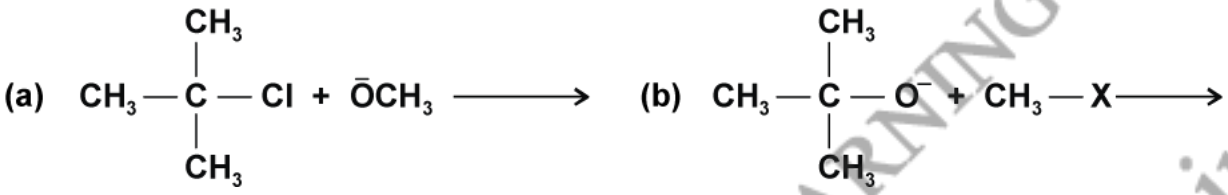


Q26. An alkyl, "X" of formula $C_6H_{13}Cl$ on treatment with potassium *tert*-butoxide gives two isomeric alkene Y and Z (C_6H_{12}). Both alkenes on hydrogenation give 2, 3-dimethylbutane, predict the structures of X, Y and Z.

Q27. Propose mechanism of the reaction taking place when (–)-2-Bromooctane reacts with sodium hydroxide to form (+)-octane-2-ol.

Q28. An optically active compound having molecular formula $C_7H_{15}Br$ reacts with KOH to give a racemic mixture of products. Write the mechanism involved for this reaction.

Q29. What are the products of the following reactions?

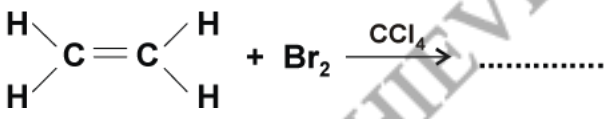


Q30. Complete the following reaction equations.

(a) $C_6H_5\overset{+}{N}_2\overset{-}{Cl} + KI \longrightarrow$ (b) $CH_2 = CH_2 + Br \xrightarrow{CCl_4}$

Q31. Complete the following reaction equations:

(a) $C_6H_5N_2^+Cl^- + KI \longrightarrow$ .....

(b)  + $Br_2 \xrightarrow{CCl_4}$ .....

Q32. Write the reactions involved in (a) the isocyanide test (b) iodoform test.

Q33. Describe laboratory preparation of chloroform. Why is it stored in dark coloured bottles? Give four main uses of chloroform.

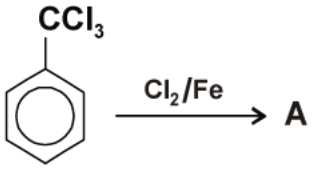
Q34. Give principle product on bromination with Br_2 / $FeBr_3$ of the following

(a) Ph — O COR (b) Ph — O — Ph

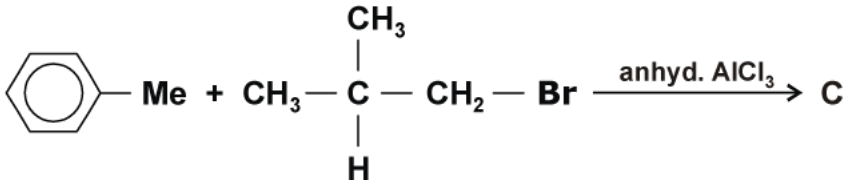
(c) $PhCOCH_3$ (d) Ph — CH = CH — COOH

(e) Ph — CH_2 — OH (f) Ph — $NHCOCH_3$

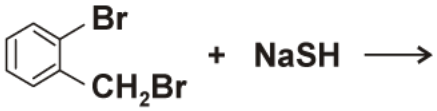
Q35. Complete the following giving structures of the principal organic products:

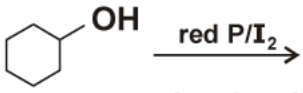
(a) 

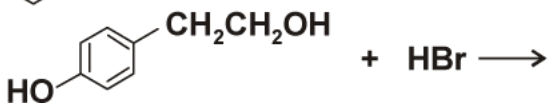
(b) 

(c) 

Q36. Write the structure of the major organic product in each of the following reactions:

(a) 

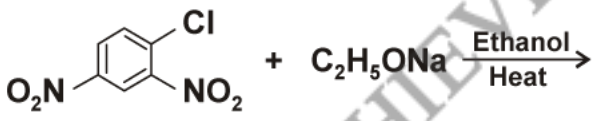
(b) 

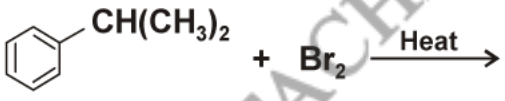
(c) 

Q37. A sweet smelling organic compound A is slowly oxidised by air in presence of light to a highly poisonous gas. On warming with silver power, it forms a gaseous substance B, which is also produced by the action of calcium carbide on water. Identify A and B and write the chemical equations of the reactions involved.

Q38. Primary alkyl halide (A) C_4H_9Br reacted with alcoholic KOH to give compound (B). Compound (B) is reacted with HBr to give (C) which is an isomer of (A). When (A) was reacted with sodium metal it gave a compound (D) C_8H_{18} which is different from the compound formed when *n*-butyl bromide was reacted with sodium. Give the structural formula of (A) and write the equations for all the reactions.

Q39. Write the structure of the major organic product in each of the following reactions:

(a) 

(b) 

(c) 

Q40. Predict all the alkenes that would be formed by dehydrogalogenation of the following halides with sodium ethoxide in ethanol and identify major alkene.

(a) 2-Chloro-2-methylbutane (b) 3-Bromopent-1-ene

(c) 2,2,3-Trimethyl-3-bromopentane

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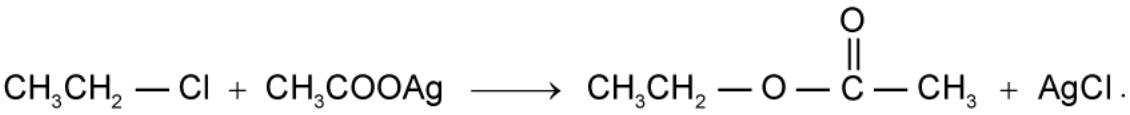
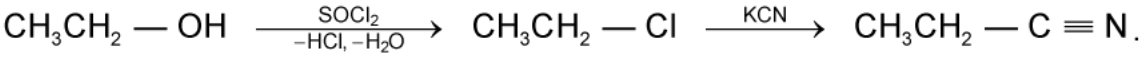
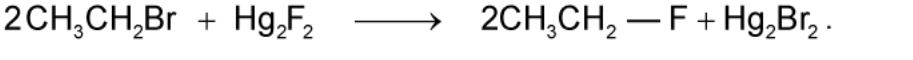
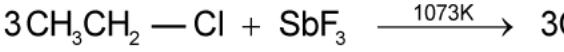
S1. 

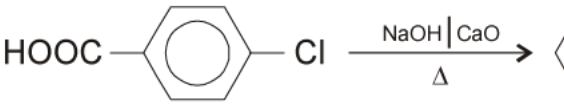
S2. 

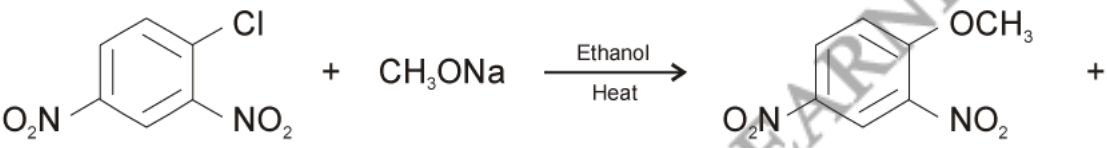
S3. 

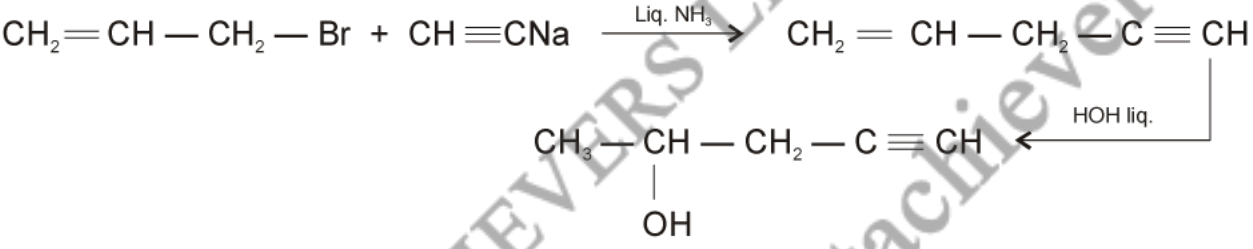
S4. 

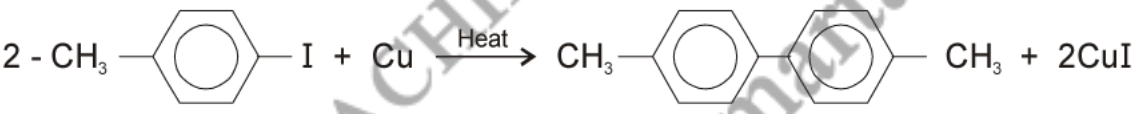
(Swarts *R*eaction)

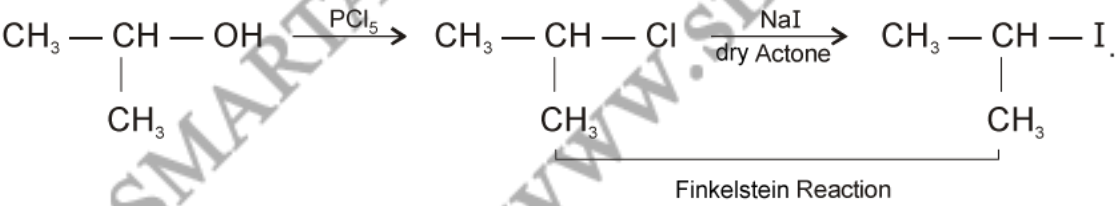
S5. 

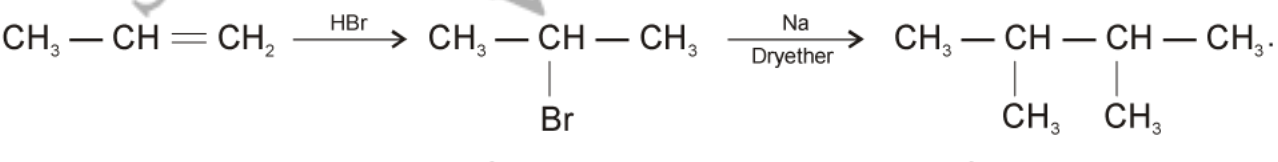
S6. 

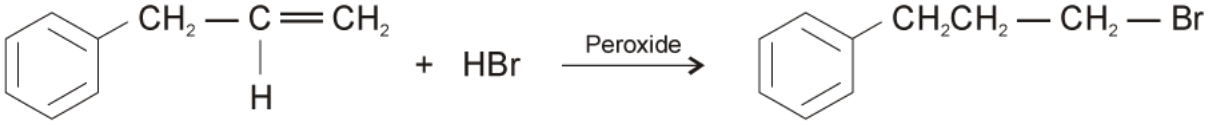
S7. 

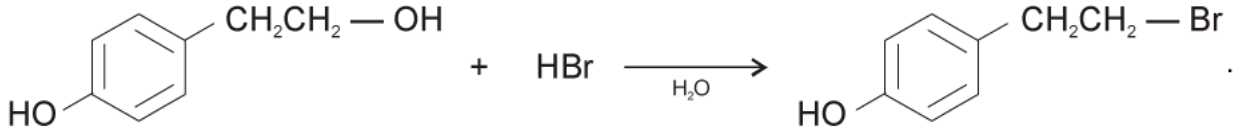
S8. 

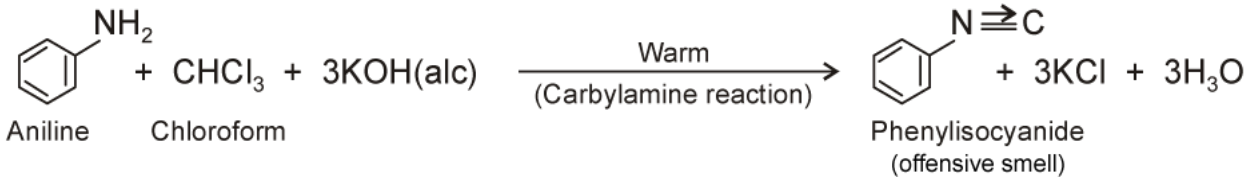
S9. 

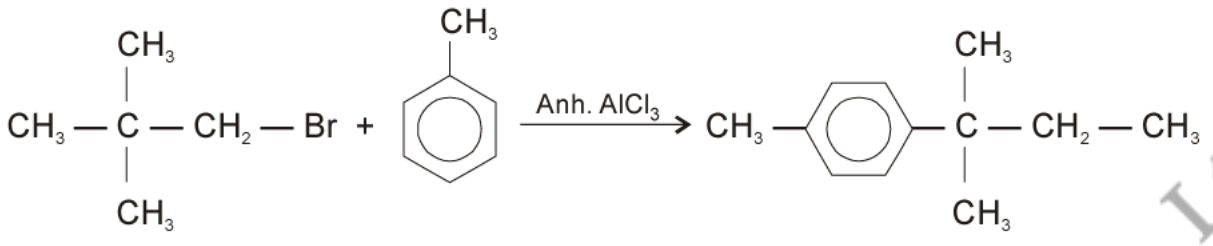
S10. 

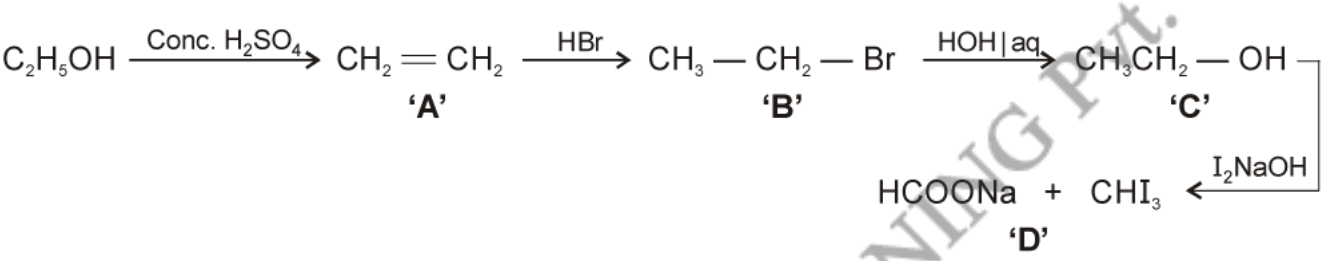
S11. 

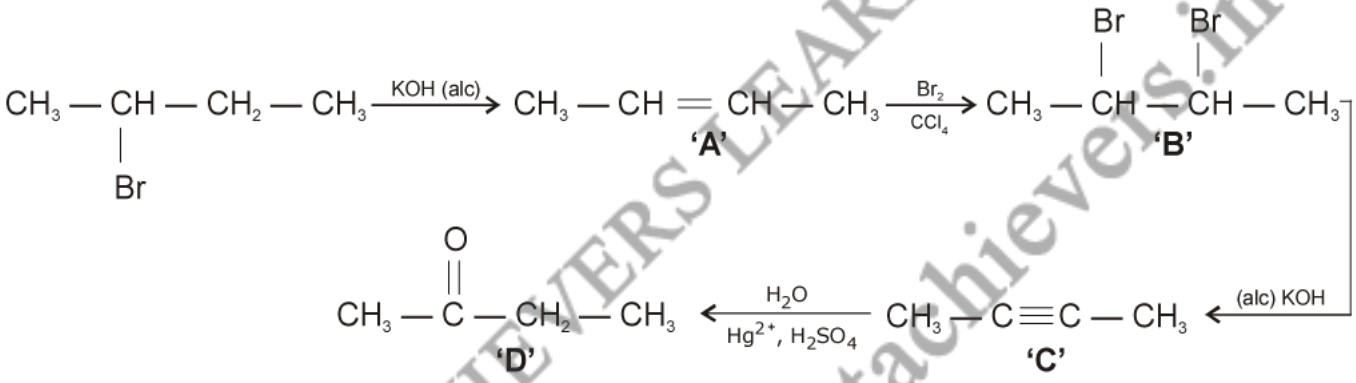
S12. 

S13. 

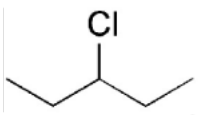
S14. 

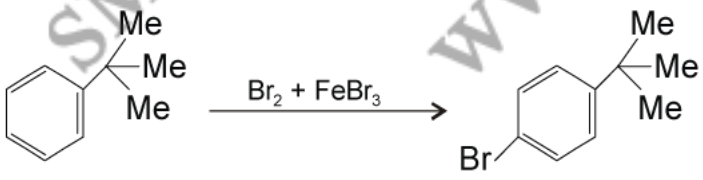
S15. 

S16. 

S17. 

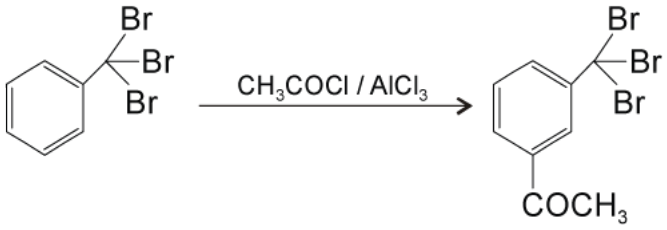
S18. In S_N1 reaction reactivity depends upon the reactivity of intermediate carbocation. A secondary carbocation is more stable than primary carbocation.

Carbocation obtained from  is 

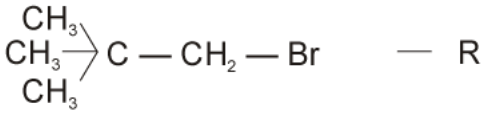
S19. (1) 

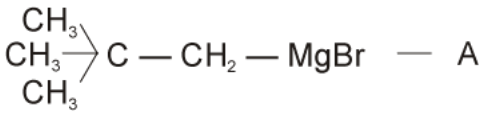
Backup: Due to steric effect of $-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_3$ ortho product is very minute.

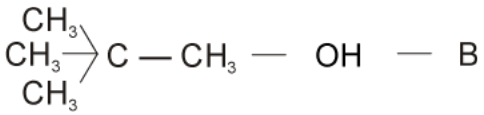
(2)



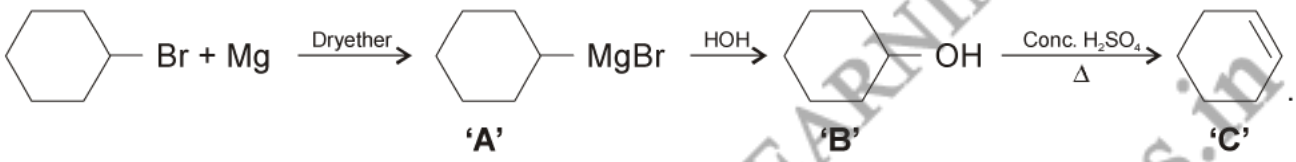
S20.



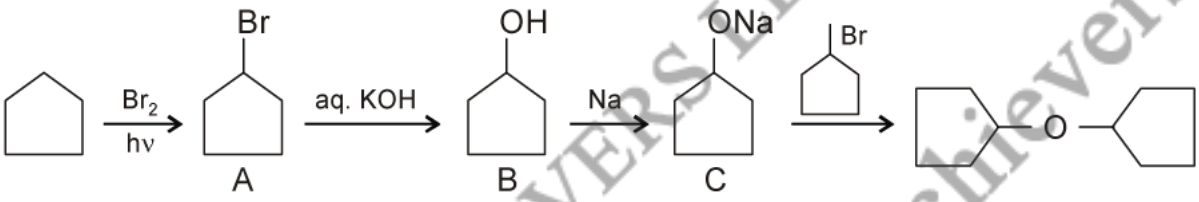




S21.



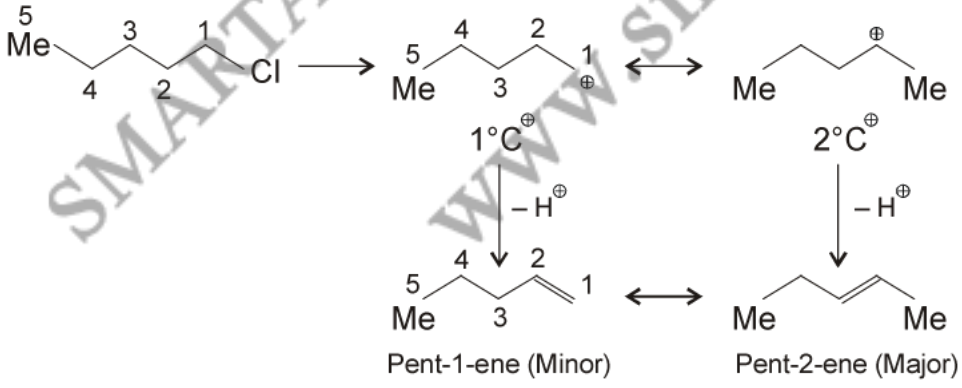
S22.



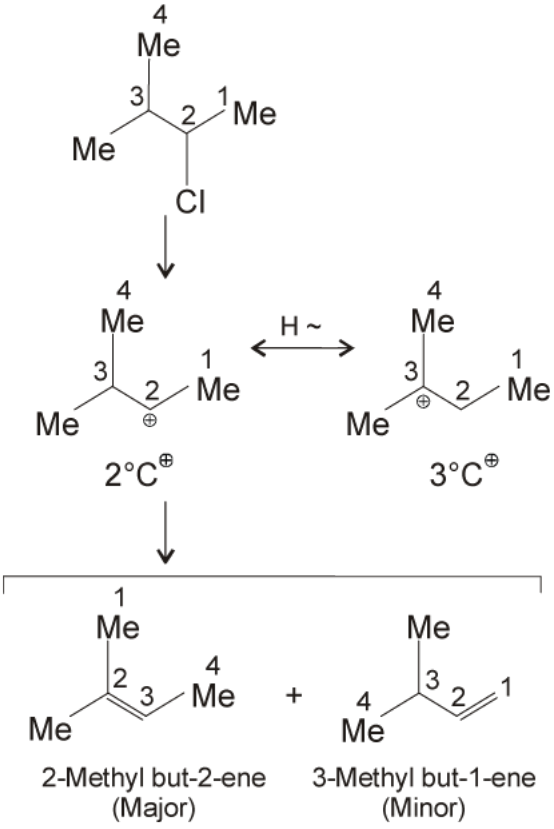
S23. $C_6H_5CH_3 \xrightarrow[-3HCl]{3Cl_2,\ h\nu,\ \Delta} C_6H_5CCl_3 \xrightarrow[-3NaCl]{aq.\ NaOH} C_6H_5C(OH)_3 \xrightarrow[-H_2O]{\Delta} C_6H_5COOH$

S24. More-substituted alkene is more stable.

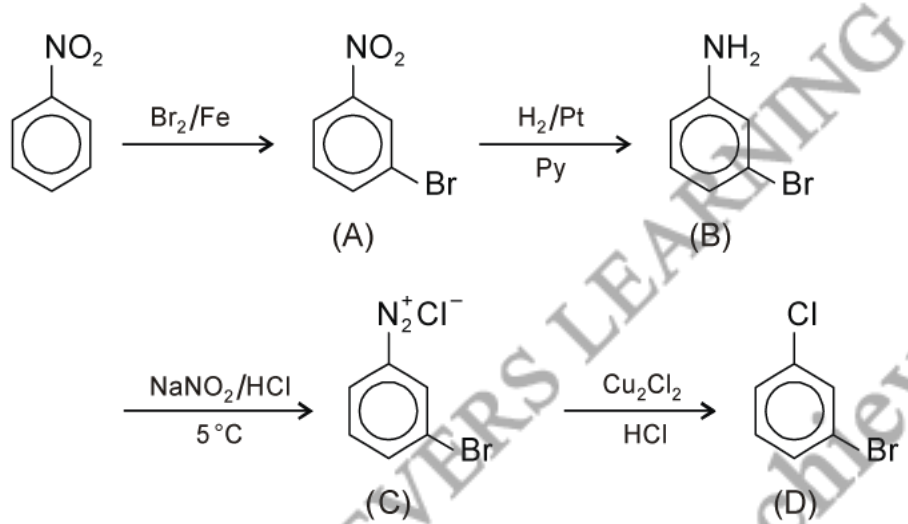
(a)



(b)

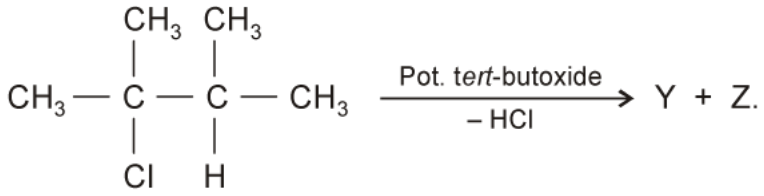


S25.



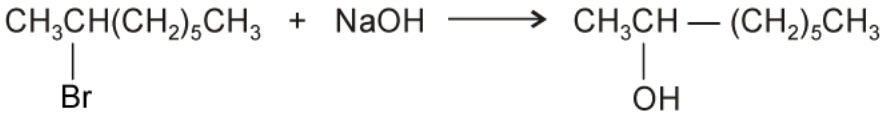
S26. The alkenes Y and Z (C_6H_{12}) on catalytic hydrogenation give the same alkane, 2, 3-dimethylbutane, therefore, Y and Z must be position isomers.

The compounds Y and Z are formed by dehydro-halogenation of X. Therefore, the alkyl halide X ($C_6H_{13}Cl$) must have a H-atom on either side of Cl atom. Thus, X is 2-chloro-2, 3-dimethylbutane

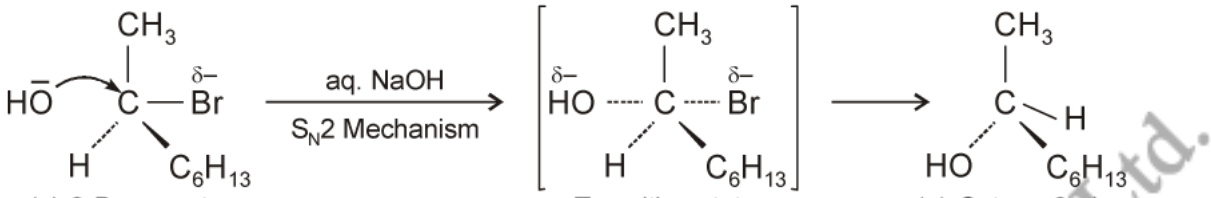


2-Chloro-2, 3-dimethylbutane

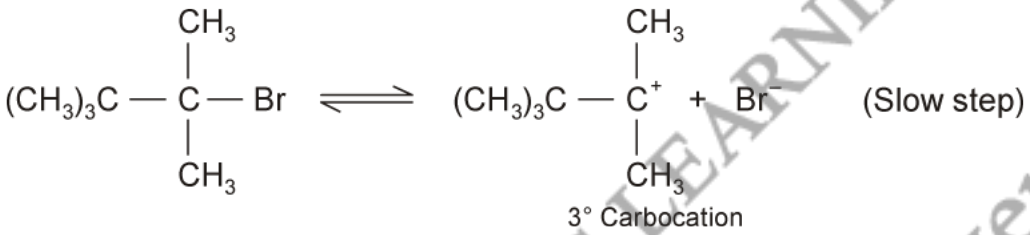
(X)

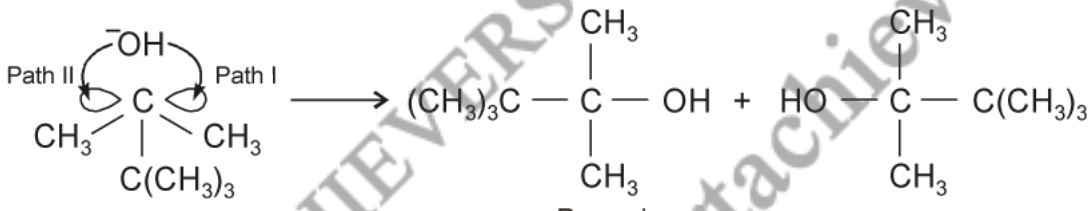
S27. 

(–) 2 -Bromooctane (+)-Octane-2-ol

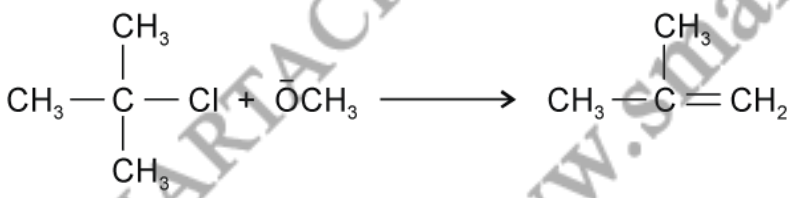


S28. Since $C_7H_{15}Br$ reacts with aqueous KOH to give a racemic mixture of products, therefore, it undergoes S_N1 reactions. It may preferably be 3° alkyl halide, 3-bromo-3-methylhexane. The reaction occurs in two steps. The first step involves the formation of carbocation which is attacked by nucleophile OH^- to form the product as:

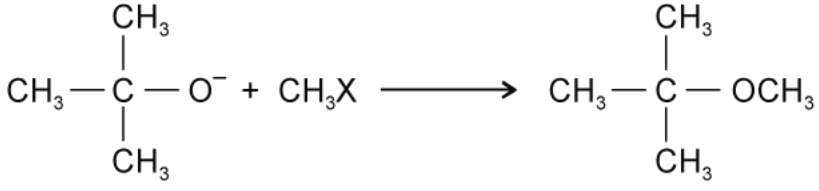




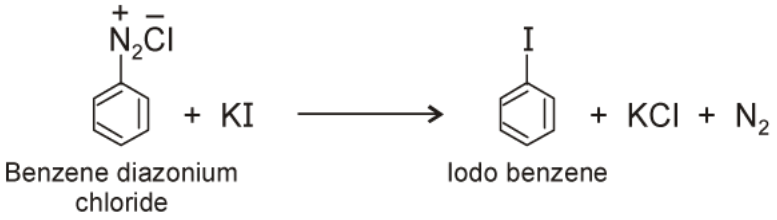
S29.

(a) 

$\bar{O}CH_3$ (nucleophile) can't attack 3° carbon having high electron-density hence elimination takes place.

(b) 

Nucleophilic attack on methyl carbon is possible giving ether (Williamson synthesis).

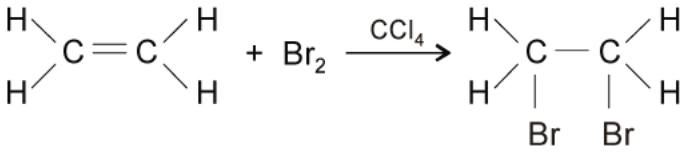
S30. (a) 

Benzene diazonium chloride — Iodo benzene

(b) $CH_2 = CH_2 + Br_2 \xrightarrow{CCl_4} CH_2(Br)-CH_2(Br)$

Ethene — 1, 2 dibromoethane

S31. (a) $C_6H_5N_2Cl + KI \longrightarrow C_6H_5I + N_2 + KCl$

(b) 

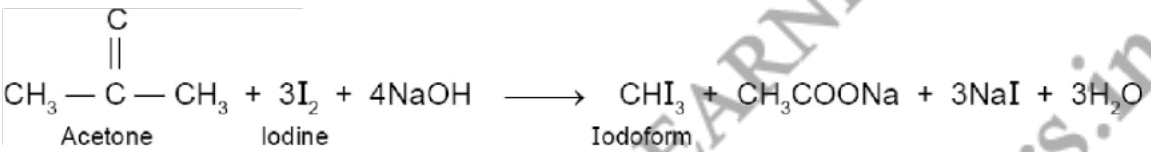
1,2, Dibromoethane

S32. (a) Isocyanide test:

$RNH_2 + CHCl_3 + 3KOH(alc.) \longrightarrow RN{\overset{\rightarrow}{=}}C + 3KCl + 3H_2O$

1° Amine Chloroform — Alkyl isocyanide

(b) Iodoform test:



Acetone — Iodine — Iodoform

S33. Chloroform is prepared in the laboratory by hydrolysis of chloralhydrate with alkali (sodium hydroxide).

$Cl_3CCH(OH)_2 + NaOH \longrightarrow CHCl_3 + HCOONa + H_2O$

Chloralhydrate

It is stored in dark coloured bottles because it reacts with O_2 in presence of sunlight to form phosgene gas which is poisonous.

$CHCl_3 + O_2 \xrightarrow{light} 2COCl_2 + 2HCl$

phosgene

Uses:

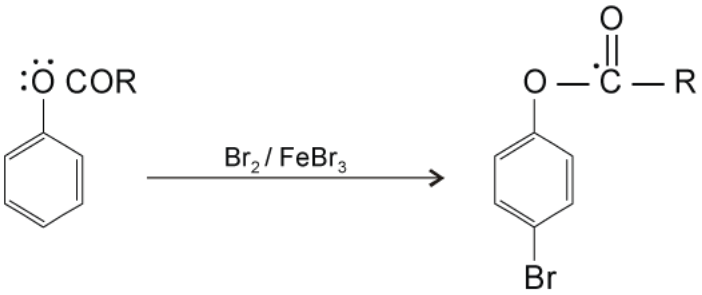
(a) It is used as solvent.

(b) It is used for preparation of chloretone which is hypnotic drug (sleep inducing drug).

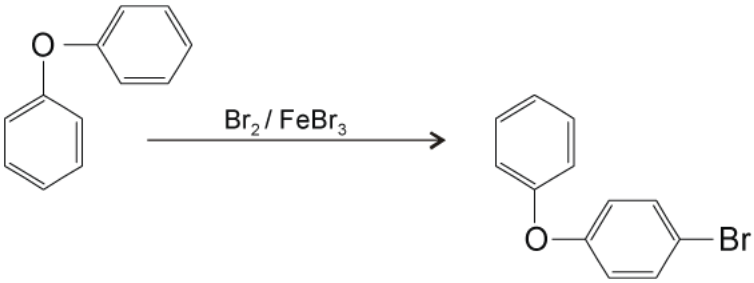
(c) It is used in preparation of chloropicrin which is used as tear gas as well as insecticide.

(d) It is used for testing primary amine by carbylamine reaction.

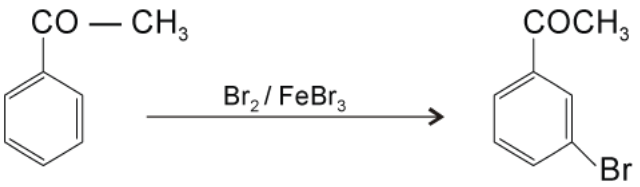
S34. (a)



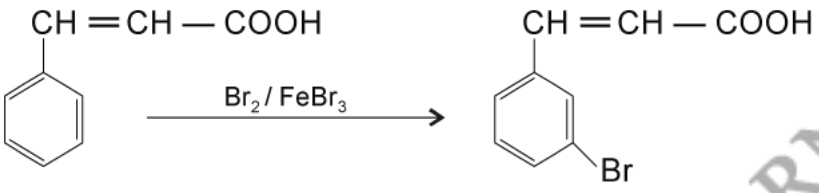
(b)



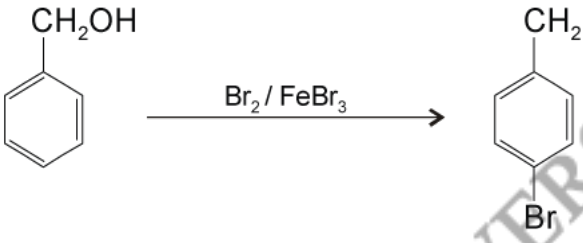
(c)



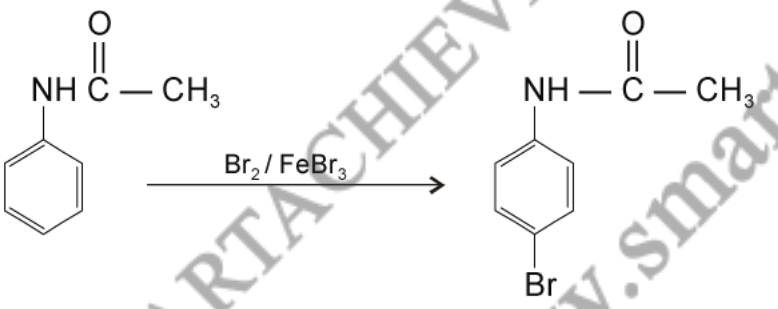
(d)



(e)



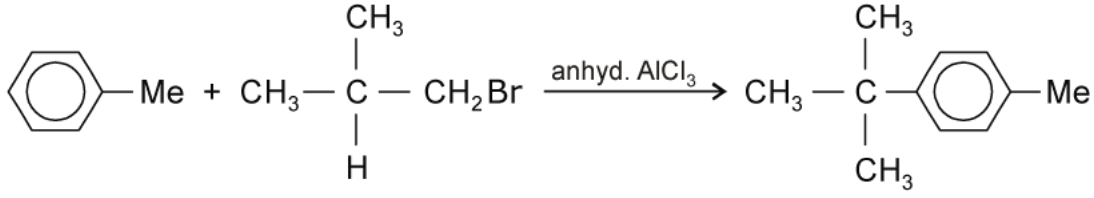
(f)



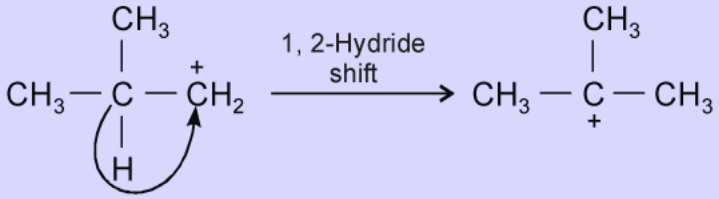
S35. (a)

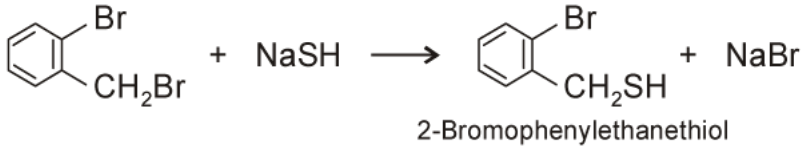
— CCl_3 is *meta*-directing group

(b) Me — C6H4 — I + Cu $\xrightarrow{\text{Heat}}$ Me — C6H4 — C6H4 — Me + Cu_2I_2

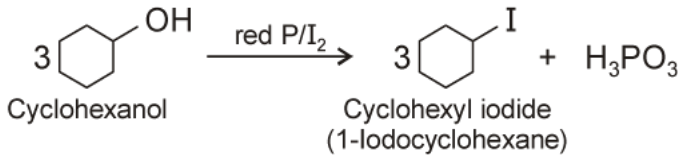
(c) 

Backup: The reaction is Friedal Craft alkylation. The product is formed through rearrangement of intermediate *iso*-butyl carbocation to *tert*-butyl carbocation through 1, 2-hydride shift.

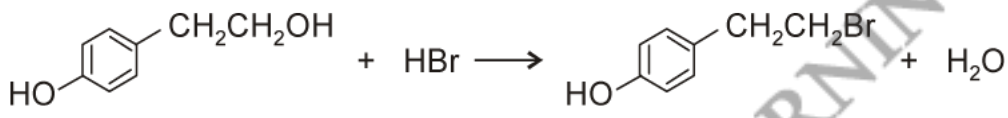


S36. (a) 

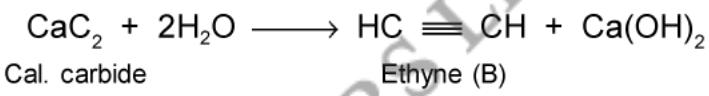
2-Bromophenylethanethiol

(b) 

Cyclohexanol — Cyclohexyl iodide (1-Iodocyclohexane)

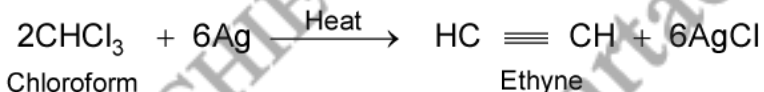
(c) 

S37. Since the compound **B** is produced by the action of water on calcium carbide, the compound **B** must be ethyne.



Cal. carbide — Ethyne (B)

Since compound (B), i.e., ethyne is produced by warming compound (A) with silver powder, therefore, *compound (A) must be chloroform*



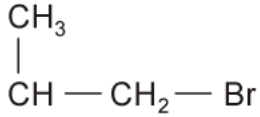
Chloroform (A) — Ethyne (B)

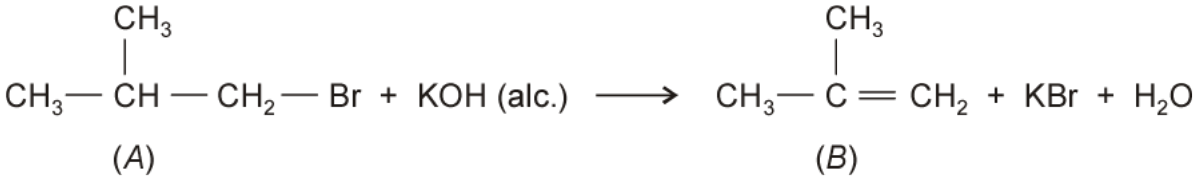
Chloroform is slowly oxidised by air in presence of light to a highly poisonous gas, *i.e.*, *phosgene*.

Chloroform (A) — Phosgene (Poisonousgas)

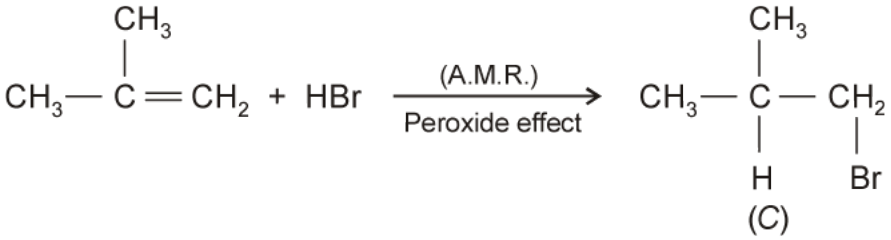
Thus, ***compound A is chloroform*** and the ***compound B is ethyne***.

S38. For C_4H_9Br, two primary halides are possible $CH_3CH_2CH_2CH_2Br$ (*n*-butyl bromide) and $(CH_3)_2CHCH_2Br$ (*iso*-butyl bromide). Since (A) is not *n*-butylbromide, it must be *iso*-butyl bromide.

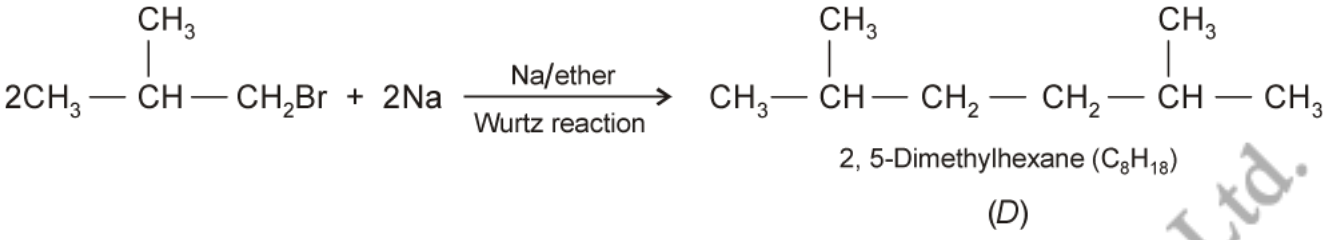
Thus, (A) is 



(*A*) (*B*)



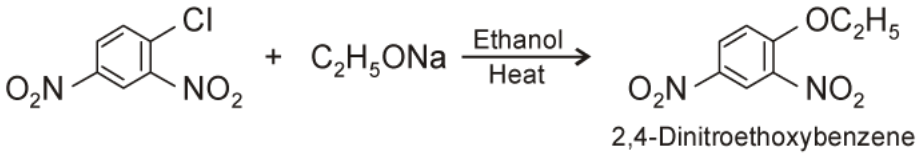
(*C*)



2, 5-Dimethylhexane (C_8H_{18})

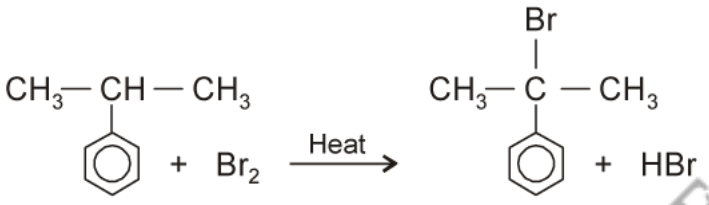
(*D*)

S39. (a)

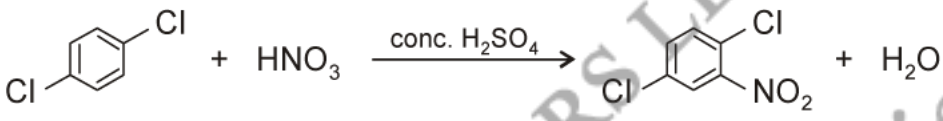


2,4-Dinitroethoxybenzene

(b)

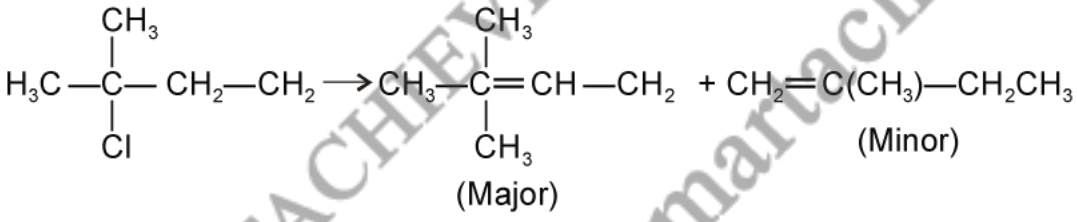


(c)



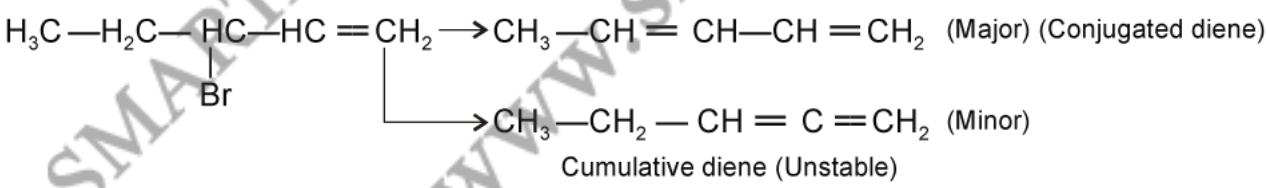
2,5-Dichloronitrobenzene

S40. (a)



(Major) (Minor)

(d)



Cumulative diene (Unstable)

(e)