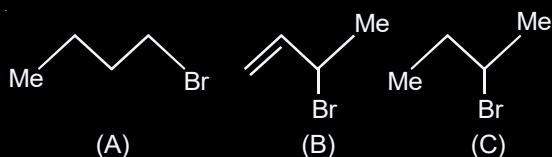


Haloalkanes and Haloarenes

1. The number of stereoisomers possible for a compound of the molecular formula $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}(\text{OH}) - \text{Me}$ is [AIEEE-2009]

(1) 2 (2) 4
(3) 6 (4) 3

2. Consider the following bromides



The correct order of $\text{S}_{\text{N}}1$ reactivity is [AIEEE-2010]

(1) $\text{A} > \text{B} > \text{C}$ (2) $\text{B} > \text{C} > \text{A}$
(3) $\text{B} > \text{A} > \text{C}$ (4) $\text{C} > \text{B} > \text{A}$

3. Out of the following, the alkene that exhibits optical isomerism is [AIEEE-2010]

(1) 2-methyl-2-pentene (2) 3-methyl-2-pentene
(3) 4-methyl-1-pentene (4) 3-methyl-1-pentene

4. The change in the optical rotation of freshly prepared solution of glucose is known as [AIEEE-2011]

(1) Mutarotation (2) Tautomerism
(3) Racemisation (4) Specific rotation

5. Consider thiol anion (RS^\ominus) and alkoxy anion (RO^\ominus). Which of the following statement is correct? [AIEEE-2011]

(1) RS^\ominus is more basic but less nucleophilic than RO^\ominus
(2) RS^\ominus is less basic and less nucleophilic than RO^\ominus
(3) RS^\ominus is less basic but more nucleophilic than RO^\ominus
(4) RS^\ominus is more basic and more nucleophilic than RO^\ominus

6. How many chiral compounds are possible on monochlorination of 2-methyl butane? [AIEEE-2012]

(1) 2 (2) 4
(3) 6 (4) 8

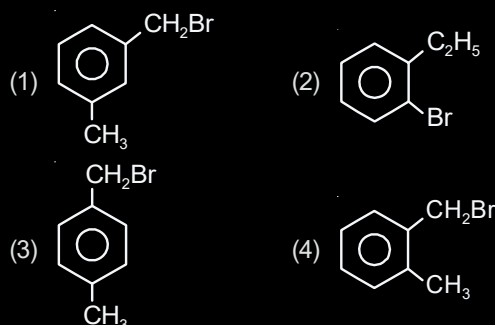
7. What is DDT among the following? [AIEEE-2012]

(1) A fertilizer
(2) Biodegradable pollutant
(3) Non-Biodegradable pollutant
(4) Greenhouse gas

8. A solution of (–) – 1 – chloro – 1 – phenylethane in toluene racemises slowly in the presence of a small amount of SbCl_5 , due to the formation of [JEE (Main)-2013]

(1) Carbanion (2) Carbene
(3) Carbocation (4) Free radical

9. Compound (A), $\text{C}_8\text{H}_9\text{Br}$, gives a white precipitate when warmed with alcoholic AgNO_3 . Oxidation of (A) gives an acid (B), $\text{C}_8\text{H}_6\text{O}_4$. (B) easily forms anhydride on heating. Identify the compound (A). [JEE (Main)-2013]



10. In $\text{S}_{\text{N}}2$ reactions, the correct order of reactivity for the following compounds

CH_3Cl , $\text{CH}_3\text{CH}_2\text{Cl}$, $(\text{CH}_3)_2\text{CHCl}$ and $(\text{CH}_3)_3\text{CCl}$ is

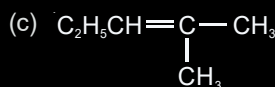
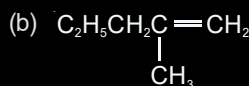
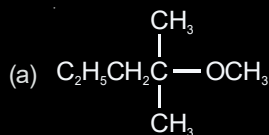
[JEE (Main)-2014]

(1) $\text{CH}_3\text{Cl} > (\text{CH}_3)_2\text{CHCl} > \text{CH}_3\text{CH}_2\text{Cl} > (\text{CH}_3)_3\text{CCl}$
(2) $\text{CH}_3\text{Cl} > \text{CH}_3\text{CH}_2\text{Cl} > (\text{CH}_3)_2\text{CHCl} > (\text{CH}_3)_3\text{CCl}$
(3) $\text{CH}_3\text{CH}_2\text{Cl} > \text{CH}_3\text{Cl} > (\text{CH}_3)_2\text{CHCl} > (\text{CH}_3)_3\text{CCl}$
(4) $(\text{CH}_3)_2\text{CHCl} > \text{CH}_3\text{CH}_2\text{Cl} > \text{CH}_3\text{Cl} > (\text{CH}_3)_3\text{CCl}$

11. The synthesis of alkyl fluorides is best accomplished by **[JEE (Main)-2015]**

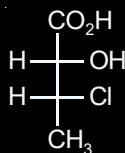
- (1) Free radical fluorination
- (2) Sandmeyer's reaction
- (3) Finkelstein reaction
- (4) Swarts reaction

12. 2-chloro-2-methylpentane on reaction with sodium methoxide in methanol yields: **[JEE (Main)-2016]**



- (1) (a) and (c)
- (2) (c) only
- (3) (a) and (b)
- (4) All of these

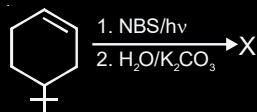
13. The absolute configuration of



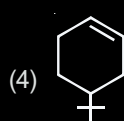
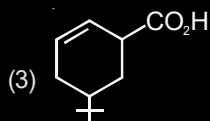
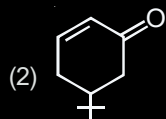
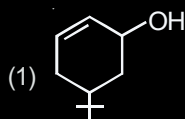
is **[JEE (Main)-2016]**

- (1) (2S, 3R)
- (2) (2S, 3S)
- (3) (2R, 3R)
- (4) (2R, 3S)

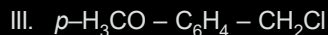
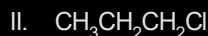
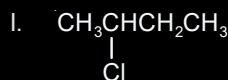
14. The product of the reaction given below is



[JEE (Main)-2016]

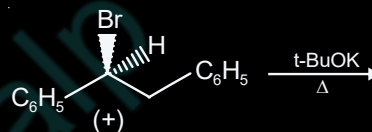


15. The increasing order of the reactivity of the following halides for the $\text{S}_{\text{N}}1$ reaction is **[JEE (Main)-2017]**



- (1) (I) < (III) < (II)
- (2) (II) < (III) < (I)
- (3) (III) < (II) < (I)
- (4) (II) < (I) < (III)

16. The major product obtained in the following reaction is **[JEE (Main)-2017]**



- (1) $(+)\text{C}_6\text{H}_5\text{CH}(\text{O}^t\text{Bu})\text{CH}_2\text{C}_6\text{H}_5$
- (2) $(-)\text{C}_6\text{H}_5\text{CH}(\text{O}^t\text{Bu})\text{CH}_2\text{C}_6\text{H}_5$
- (3) $(\pm)\text{C}_6\text{H}_5\text{CH}(\text{O}^t\text{Bu})\text{CH}_2\text{C}_6\text{H}_5$
- (4) $\text{C}_6\text{H}_5\text{CH}=\text{CHC}_6\text{H}_5$

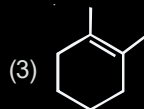
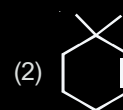
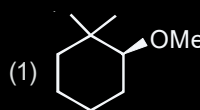
17. 3-Methyl-pent-2-ene on reaction with HBr in presence of peroxide forms an addition product. The number of possible stereoisomers for the product is **[JEE (Main)-2017]**

- (1) Two
- (2) Four
- (3) Six
- (4) Zero

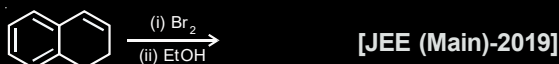
18. The major product of the following reaction is

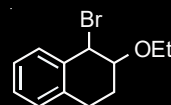
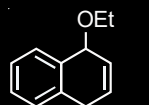
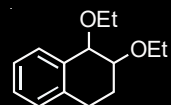
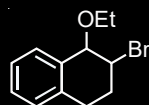


[JEE (Main)-2018]

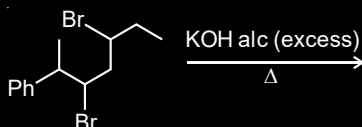


19. The major product of the following reaction is

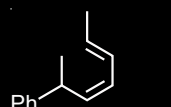
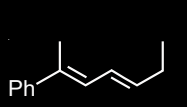
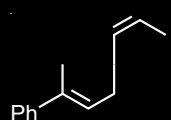
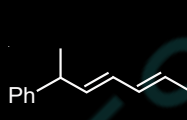


- (1)  (2) 
 (3)  (4) 

20. The major product of the following reaction is

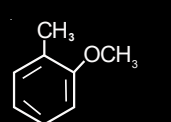
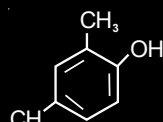
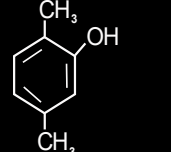
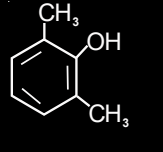


[JEE (Main)-2019]

- (1)  (2) 
 (3)  (4) 

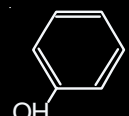
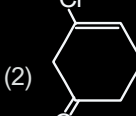
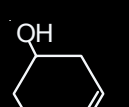
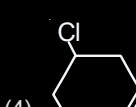
21. The major product of the following reaction is



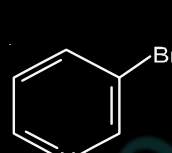
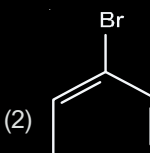
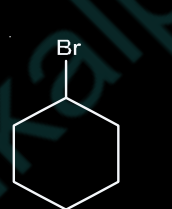
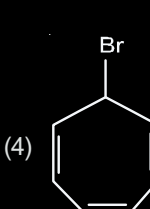
- (1)  (2) 
 (3)  (4) 

22. The major product of the following reaction is

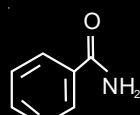
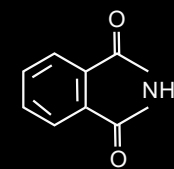
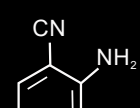
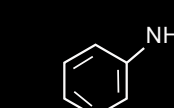


- (1)  (2) 
 (3)  (4) 

23. Which of the following compounds will produce a precipitate with AgNO_3 ? **[JEE (Main)-2019]**

- (1)  (2) 
 (3)  (4) 

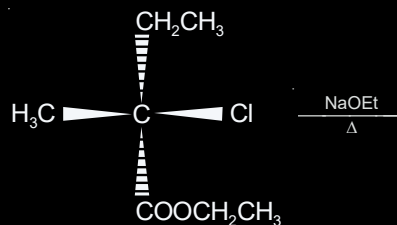
24. The increasing order of reactivity of the following compounds towards reaction with alkyl halides directly is

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

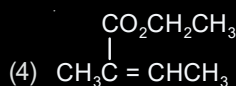
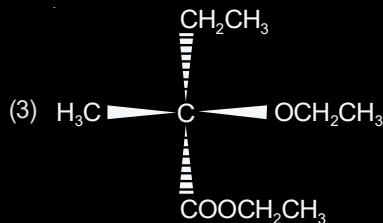
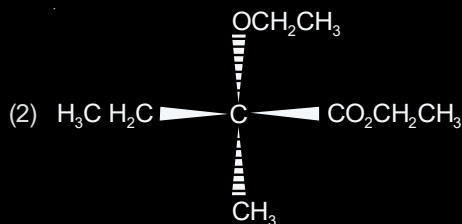
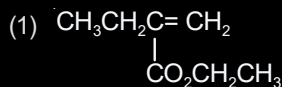
[JEE (Main)-2019]

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

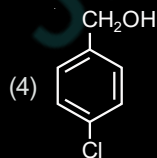
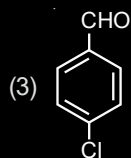
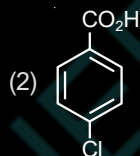
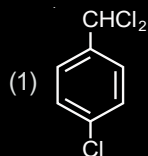
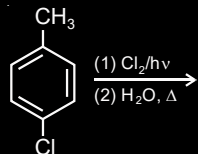
25. The major product of the following reaction is



[JEE (Main)-2019]

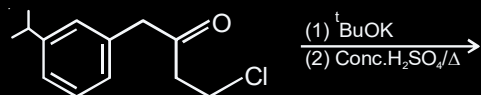


26. The major product of the following reaction is:

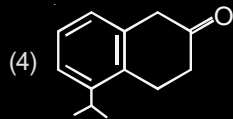
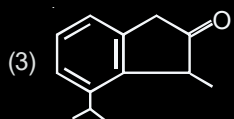
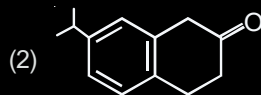
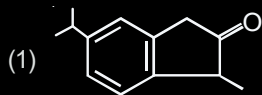


[JEE (Main)-2019]

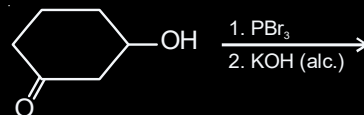
27. The major product of the following reaction is



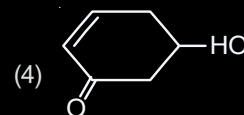
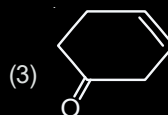
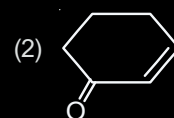
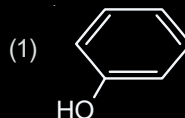
[JEE (Main)-2019]



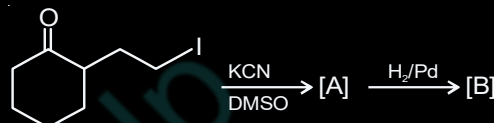
28. The major product of the following reaction is



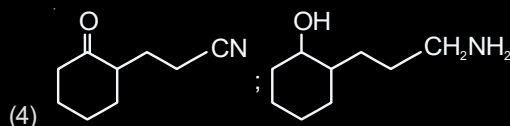
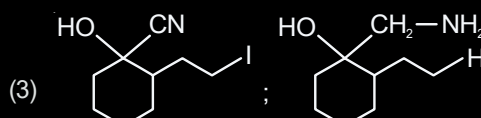
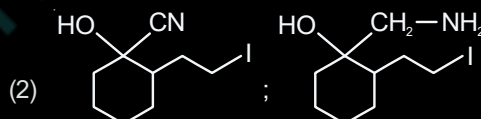
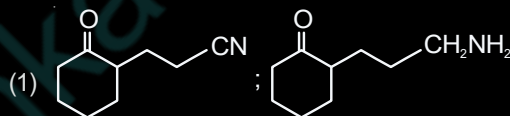
[JEE (Main)-2019]



29. The major products A and B for the following reactions are, respectively

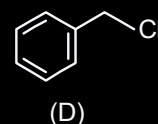
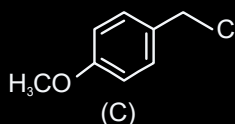
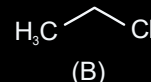
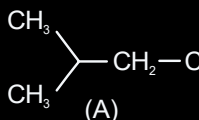


[JEE (Main)-2019]



30. Increasing order of reactivity of the following compounds for $\text{S}_\text{N}1$ substitution is

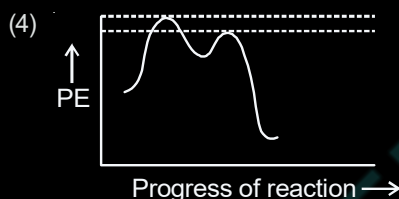
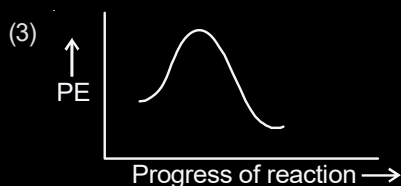
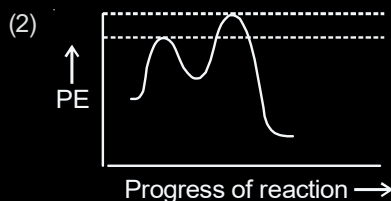
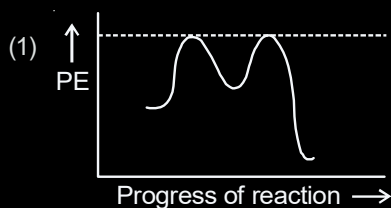
[JEE (Main)-2019]



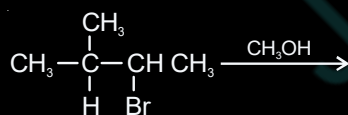
- (1) (B) < (C) < (A) < (D) (2) (B) < (C) < (D) < (A)
 (3) (B) < (A) < (D) < (C) (4) (A) < (B) < (D) < (C)

31. Which of the following potential energy (PE) diagrams represents the S_N1 reaction?

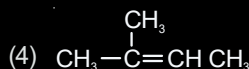
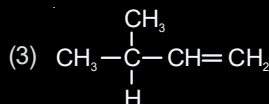
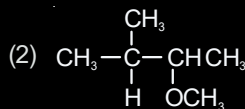
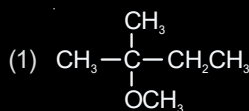
[JEE (Main)-2019]



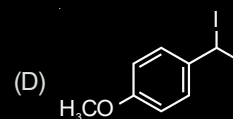
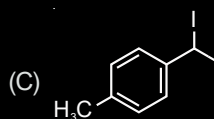
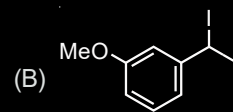
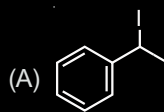
32. The major product of the following reaction is :



[JEE (Main)-2019]



33. Increasing rate of S_N1 reaction in the following compounds is :



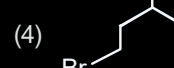
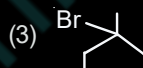
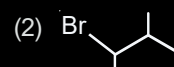
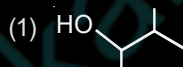
[JEE (Main)-2019]

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

34. The major product 'Y' in the following reaction is :



[JEE (Main)-2019]



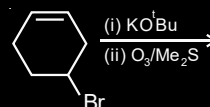
35. The increasing order of nucleophilicity of the following nucleophiles is :

- (a) CH_3CO_2^- (b) H_2O
(c) CH_3SO_3^- (d) ^-OH

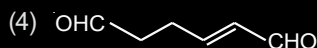
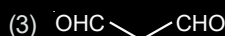
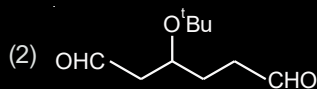
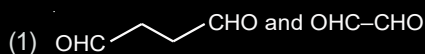
[JEE (Main)-2019]

- (1) (d) < (a) < (c) < (b) (2) (b) < (c) < (d) < (a)
(3) (a) < (d) < (c) < (b) (4) (b) < (c) < (a) < (d)

36. The major product(s) obtained in the following reaction is/are



[JEE (Main)-2019]



37. An 'Assertion' and a 'Reason' are given below. Choose the correct answer from the following options :

Assertion (A) : Vinyl halides do not undergo nucleophilic substitution easily.

Reason (R) : Even though the intermediate carbocation is stabilized by loosely held π -electrons, the cleavage is difficult because of strong bonding. **[JEE (Main)-2019]**

- (1) Both (A) and (R) are correct statements and (R) is the correct explanation of (A).
 (2) Both (A) and (R) are correct statements but (R) is not the correct explanation of (A).
 (3) Both (A) and (R) are wrong statements.
 (4) (A) is a correct statement but (R) is a wrong statement.
38. Which one of the following is likely to give a precipitate with AgNO_3 solution?

[JEE (Main)-2019]

- (1) $\text{CH}_2 = \text{CH} - \text{Cl}$ (2) CHCl_3
 (3) CCl_4 (4) $(\text{CH}_3)_3\text{CCl}$

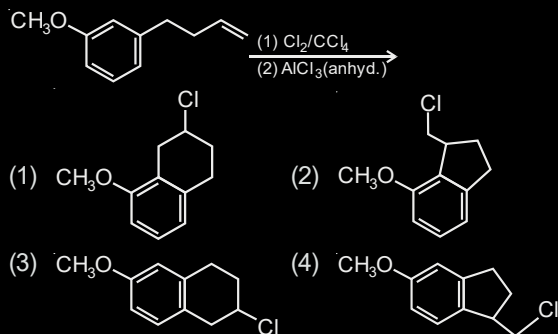
39. Consider the following reactions :

- (a) $(\text{CH}_3)_3\text{CCH}(\text{OH})\text{CH}_3 \xrightarrow{\text{conc. H}_2\text{SO}_4}$
 (b) $(\text{CH}_3)_2\text{CHCH}(\text{Br})\text{CH}_3 \xrightarrow{\text{alc. KOH}}$
 (c) $(\text{CH}_3)_2\text{CHCH}(\text{Br})\text{CH}_3 \xrightarrow{(\text{CH}_3)_3\text{CO}^\ominus \text{K}^\oplus}$
 (d) $(\text{CH}_3)_2\underset{\text{OH}}{\text{C}} - \text{CH}_2 - \text{CHO} \xrightarrow{\Delta}$

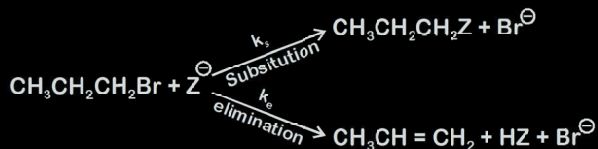
Which of these reaction(s) will not produce Saytzeff product ? **[JEE (Main)-2020]**

- (1) (a), (c) and (d) (2) (c) only
 (3) (b) and (d) (4) (d) only

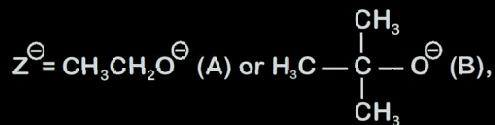
40. The major product of the following reaction is



41. For the following reactions



where,



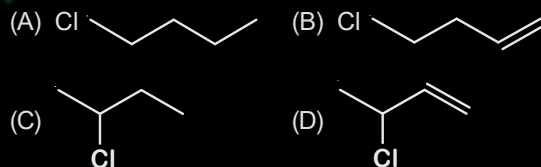
k_s and k_e , are, respectively, the rate constants for

substitution and elimination, and $\mu = \frac{k_s}{k_e}$, the

correct option is _____. **[JEE (Main)-2020]**

- (1) $\mu_B > \mu_A$ and $k_e(\text{A}) > k_e(\text{B})$
 (2) $\mu_A > \mu_B$ and $k_e(\text{A}) > k_e(\text{B})$
 (3) $\mu_B > \mu_A$ and $k_e(\text{B}) > k_e(\text{A})$
 (4) $\mu_A > \mu_B$ and $k_e(\text{B}) > k_e(\text{A})$

42. The decreasing order of reactivity towards dehydrohalogenation (E_1) reaction of the following compounds is



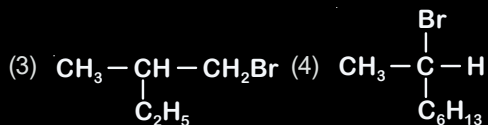
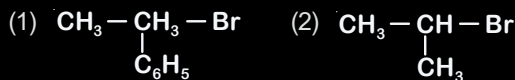
[JEE (Main)-2020]

- (1) $\text{B} > \text{A} > \text{D} > \text{C}$
 (2) $\text{B} > \text{D} > \text{A} > \text{C}$
 (3) $\text{B} > \text{D} > \text{C} > \text{A}$
 (4) $\text{D} > \text{B} > \text{C} > \text{A}$

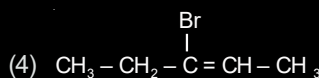
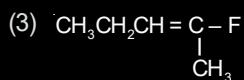
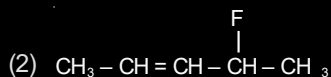
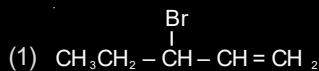
43. Which of the following reactions will not produce a racemic product? **[JEE (Main)-2020]**

- (1) $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2 \xrightarrow{\text{HBr}}$
 (2)
 (3)
 (4) $\text{CH}_3-\text{C}(=\text{O})\text{CH}_2\text{CH}_3 \xrightarrow{\text{HCN}}$

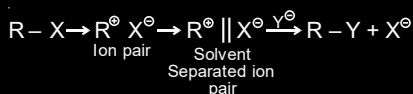
44. Which of the following compounds will show retention in configuration on nucleophilic substitution by OH^- ion? [JEE (Main)-2020]



45. The major product obtained from E_2 - elimination of 3-bromo-2-fluoropentane is [JEE (Main)-2020]



46. The mechanism of $\text{S}_\text{N}1$ reaction is given as



A student writes general characteristics based on the given mechanism as

- The reaction is favoured by weak nucleophiles.
- R^\oplus would be easily formed if the substituents are bulky.
- The reaction is accompanied by racemization.
- The reaction is favoured by non-polar solvents.

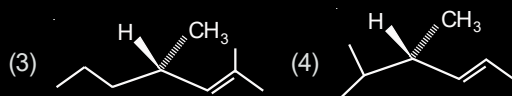
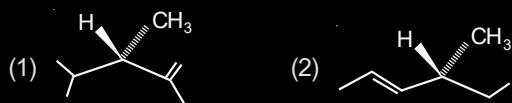
Which observations are correct?

[JEE (Main)-2020]

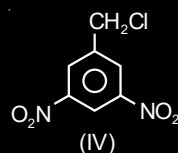
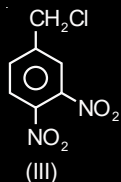
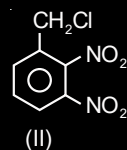
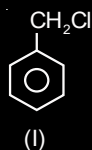
- (b) and (d)
- (a) and (c)
- (a) and (b)
- (a), (b) and (c)

47. Which of the following compounds produces an optically inactive compound on hydrogenation?

[JEE (Main)-2020]



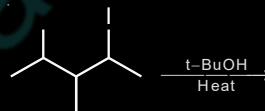
48. The decreasing order of reactivity of the following compounds towards nucleophilic substitution ($\text{S}_\text{N}2$) is



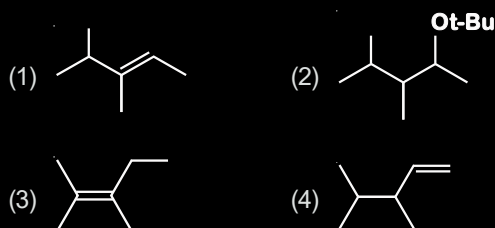
[JEE (Main)-2020]

- (II) > (III) > (IV) > (I)
- (II) > (III) > (I) > (IV)
- (III) > (II) > (IV) > (I)
- (IV) > (II) > (III) > (I)

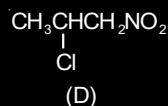
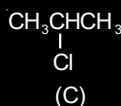
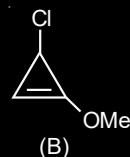
49. The major product in the following reaction is



[JEE (Main)-2020]



50. The decreasing order of reactivity of the following organic molecules towards AgNO_3 solution is

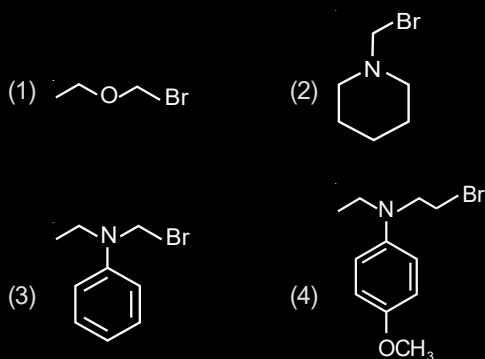


[JEE (Main)-2020]

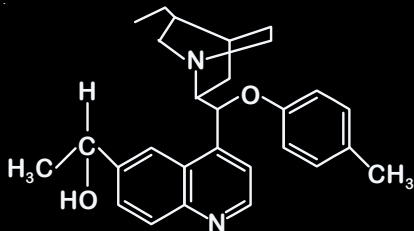
- (B) > (A) > (C) > (D)
- (A) > (B) > (D) > (C)
- (A) > (B) > (C) > (D)
- (C) > (D) > (A) > (B)

51. Which of the following compounds will form the precipitate with aq. AgNO_3 solution most readily?

[JEE (Main)-2020]



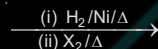
52. The number of chiral carbons present in the molecule given below is _____.



[JEE (Main)-2020]

53. The total number of monohalogenated organic products in the following (including stereoisomers) reaction is _____.

A



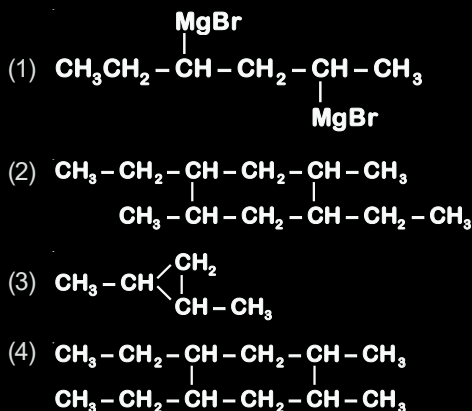
(Simplest optically active alkene)

[JEE (Main)-2020]

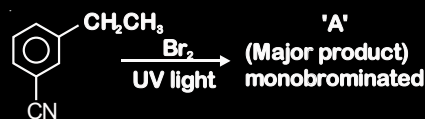
54. The product formed in the first step of the reaction of $\text{CH}_3-\text{CH}_2-\text{CH}(\text{Br})-\text{CH}_2-\text{CH}(\text{Br})-\text{CH}_3$ with excess

$\text{Mg}/\text{Et}_2\text{O}$ ($\text{Et} = \text{C}_2\text{H}_5$) is:

[JEE (Main)-2021]

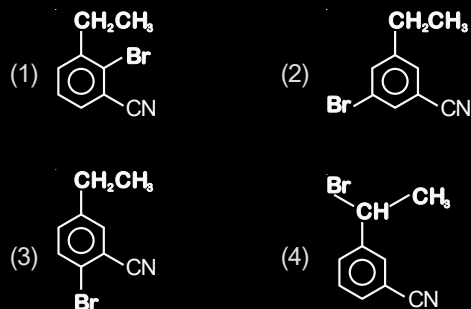


55. For the given reaction :

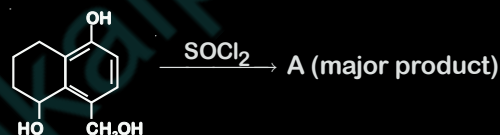


What is 'A'?

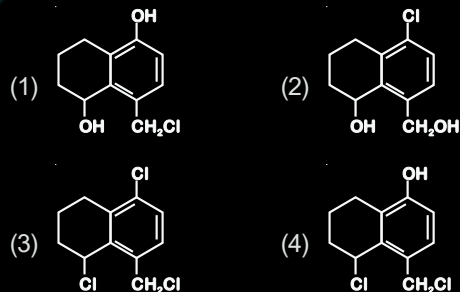
[JEE (Main)-2021]



56. Identify A in the given reaction,



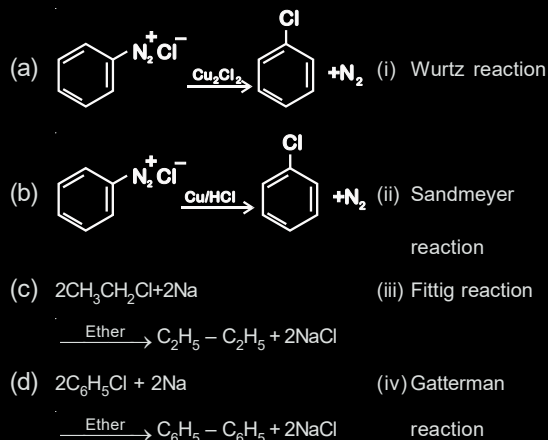
[JEE (Main)-2021]



57. Match List-I with List-II

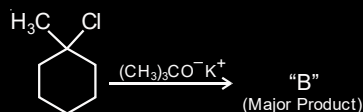
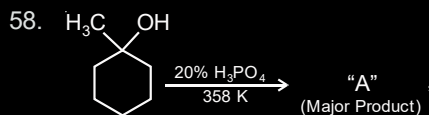
List-I

List-II

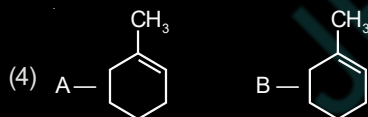
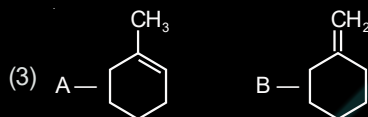
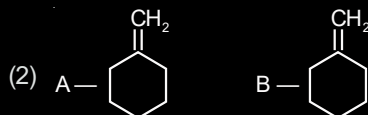
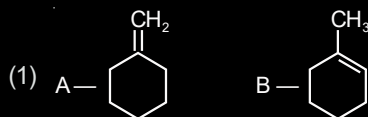


Choose the correct answer from the options given below
[JEE (Main)-2021]

- (1) (a)-(iii); (b)-(iv); (c)-(i); (d)-(ii)
(2) (a)-(ii); (b)-(iv); (c)-(i); (d)-(iii)
(3) (a)-(iii); (b)-(i); (c)-(iv); (d)-(ii)
(4) (a)-(ii); (b)-(i); (c)-(iv); (d)-(iii)



The products "A" and "B" formed in above reactions are
[JEE (Main)-2021]



59. The correct pair(s) of the ambident nucleophiles is (are):
[JEE (Main)-2021]

- (A) AgCN/KCN
(B) RCOOAg/RCOOK
(C) AgNO₂/KNO₂
(D) AgI/KI

- (1) (B) and (C) only
(2) (B) only
(3) (A) only
(4) (A) and (C) only

60. Given below are two statements :

Statement I : C₂H₅OH and AgCN both can generate nucleophile.

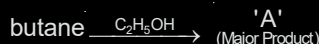
Statement II : KCN and AgCN both will generate nitrile nucleophile with all reaction conditions.

Choose the **most appropriate** option.

[JEE (Main)-2021]

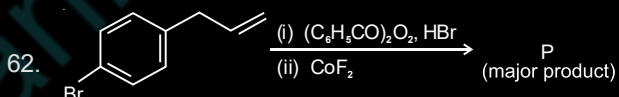
- (1) Statement I is true but statement II is false
(2) Statement I is false but statement II is true
(3) Both statement I and statement II are true
(4) Both statement I and statement II are false

61. In the given reaction 3-Bromo-2,2-dimethyl



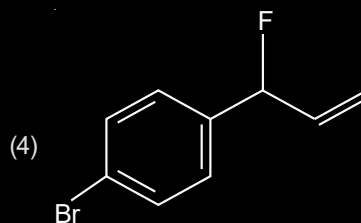
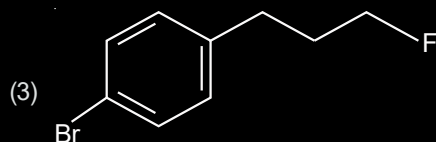
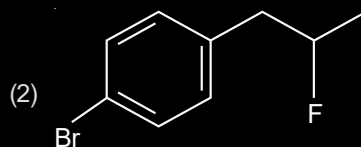
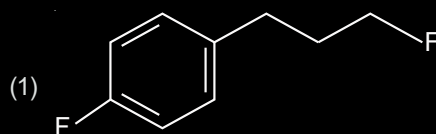
[JEE (Main)-2021]

- (1) 1-Ethoxy-3,3-dimethyl butane.
(2) 2-Hydroxy-3,3-dimethyl butane.
(3) 2-Ethoxy-2,3-dimethyl butane.
(4) 2-Ethoxy-3,3-dimethyl butane.

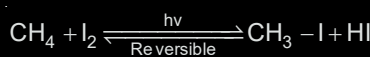


Major product P of above reaction, is

[JEE (Main)-2021]

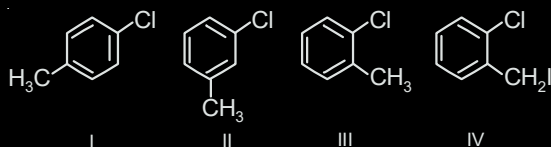


63. Presence of which reagent will affect the reversibility of the following reaction, and change it to a irreversible reaction



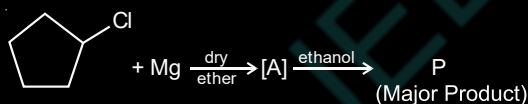
[JEE (Main)-2021]

- (1) Dilute HNO_2 (2) Liquid NH_3
 (3) HOCl (4) Concentrated HIO_3
64. Among the following compounds I-IV, which one forms a yellow precipitate on reacting sequentially with (i) NaOH (ii) dil. HNO_3 (iii) AgNO_3 ?



[JEE (Main)-2021]

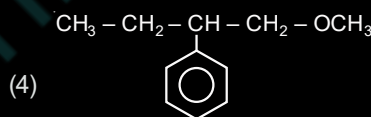
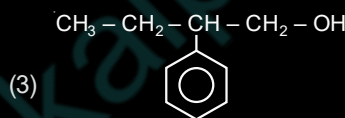
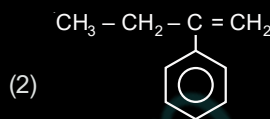
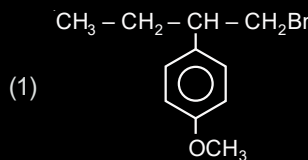
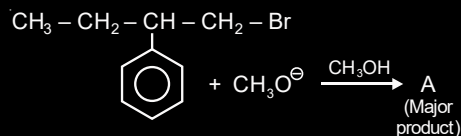
- (1) III (2) II
 (3) IV (4) I
65. The number of stereoisomers possible for 1, 2-dimethyl cyclopropane is : [JEE (Main)-2021]
- (1) Two (2) Three
 (3) One (4) Four
66. In the following sequence of reactions the P is :



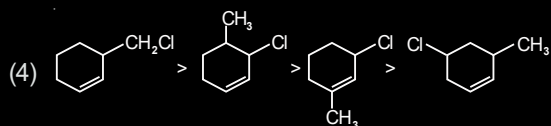
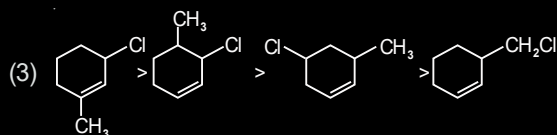
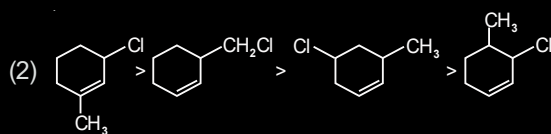
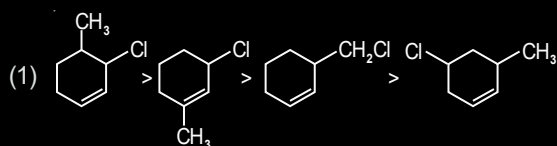
[JEE (Main)-2021]

- (1)
- (2)
- (3)
- (4)

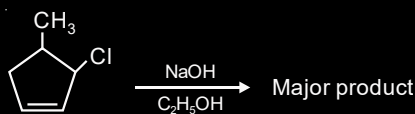
67. The major product (A) formed in the reaction given below is : [JEE (Main)-2021]



68. The correct order of reactivity of the given chlorides with acetate in acetic acid is : [JEE (Main)-2021]



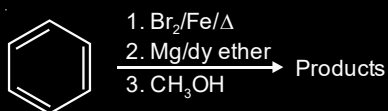
69. The major product of the following reaction is



[JEE (Main)-2021]

- (1)
- (2)
- (3)
- (4)

70. For the following sequence of reactions, the correct products are :



[JEE (Main)-2021]

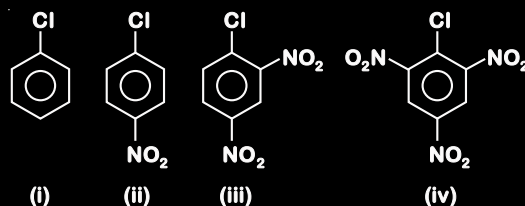
- (1) + $\text{Mg} \begin{matrix} \text{OCH}_3 \\ \text{Br} \end{matrix}$
- (2) + HMgBr
- (3) + $\text{Mg} \begin{matrix} \text{H} \\ \text{OCH}_3 \end{matrix}$
- (4) + $\text{Mg} \begin{matrix} \text{OH} \\ \text{Br} \end{matrix}$

71. The stereoisomers that are formed by electrophilic addition of bromine to *trans*-but-2-ene is/are :

[JEE (Main)-2021]

- (1) 1 racemic and 2 enantiomers
- (2) 2 identical mesomers
- (3) 2 enantiomers
- (4) 2 enantiomers and 2 mesomers

72. The correct order of the following compounds showing increasing tendency towards nucleophilic substitution reaction is : [JEE (Main)-2021]



- (1) (iv) < (i) < (ii) < (iii)
- (2) (iv) < (i) < (iii) < (ii)
- (3) (iv) < (iii) < (ii) < (i)
- (4) (i) < (ii) < (iii) < (iv)

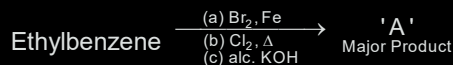
73. The major product of the following reaction is:



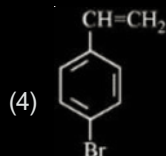
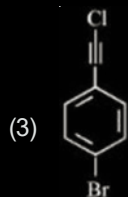
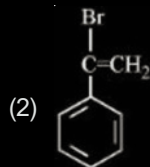
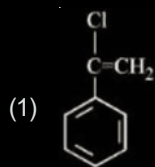
[JEE (Main)-2022]

- (1)
- (2)
- (3)
- (4)

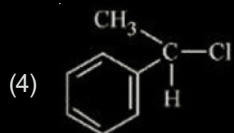
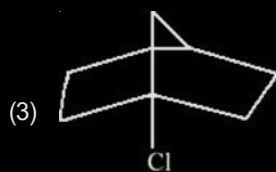
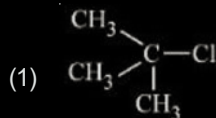
74. Product 'A' of following sequence of reactions is



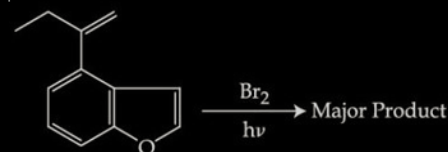
[JEE (Main)-2022]



75. Which one of the following compounds is inactive towards S_N1 reaction? [JEE (Main)-2022]



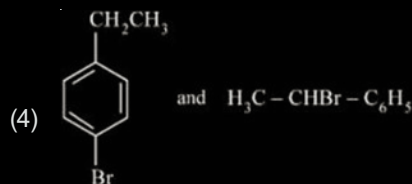
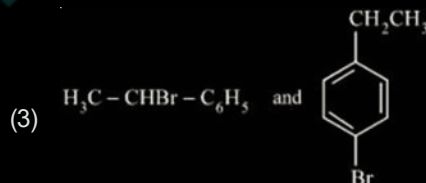
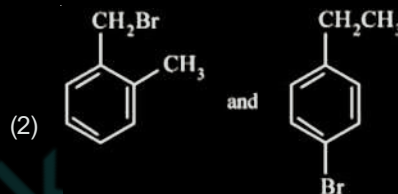
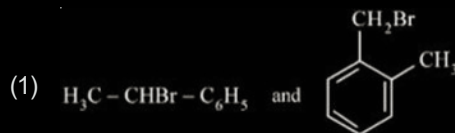
76. The major product of the following reaction contains _____ bromine atom(s).



[JEE (Main)-2022]

77. Two isomers (A) and (B) with Molar mass 184 g/mol and elemental composition C, 52.2%; H, 4.9% and Br 42.9% gave benzoic acid and p-bromobenzoic acid, respectively on oxidation with KMnO_4 . Isomer 'A' is optically active and gives a pale yellow precipitate when warmed with alcoholic AgNO_3 . Isomers 'A' and 'B' are, respectively

[JEE (Main)-2022]

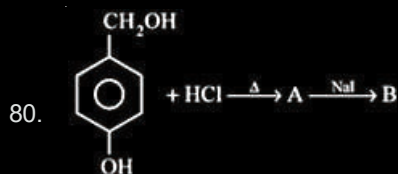


78. The total number of monobromo derivatives formed by the alkanes with molecular formula C_5H_{12} is (excluding stereo isomers)_____.

[JEE (Main)-2022]

79. Total number of isomers (including stereoisomers) obtained on monochlorination of methylcyclohexane is_____.

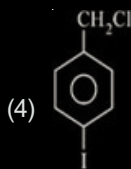
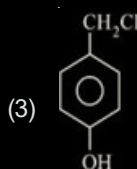
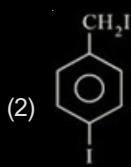
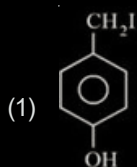
[JEE (Main)-2022]



In the above reaction product B is:

Product B is

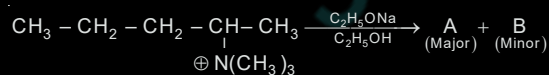
[JEE (Main)-2022]



81. Optical activity of an enantiomeric mixture is $+12.6^\circ$ and the specific rotation of (+) isomer is $+30^\circ$. The optical purity is _____%.

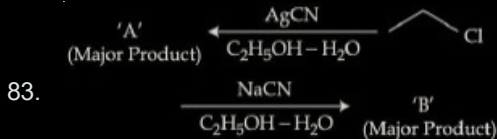
[JEE (Main)-2022]

82. Identify the correct statement for the below given transformation.



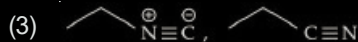
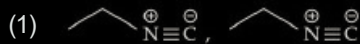
[JEE (Main)-2022]

- (1) A- $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}-\text{CH}_3$, B- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}=\text{CH}_2$, Saytzeff products
- (2) A- $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}-\text{CH}_3$, B- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}=\text{CH}_2$, Hofmann products
- (3) A- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}=\text{CH}_2$, B- $\text{CH}_3\text{CH}_2\text{CH}=\text{CHCH}_3$, Hofmann products
- (4) A- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}=\text{CH}_2$, B- $\text{CH}_3\text{CH}_2\text{CH}=\text{CHCH}_3$, Saytzeff products



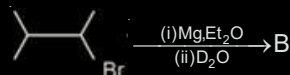
Considering the above reactions, the compound 'A' and compound 'B' respectively are :

[JEE (Main)-2022]



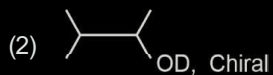
84. Compound 'A' undergoes following sequence of reactions to give compound 'B'. The correct structure and chirality of compound 'B' is

[where Et is $-\text{C}_2\text{H}_5$]



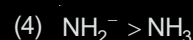
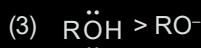
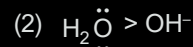
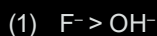
Compound 'A'

[JEE (Main)-2022]



85. The correct order of nucleophilicity is

[JEE (Main)-2022]



86. Total number of possible stereoisomers of dimethyl cyclopentane is _____.

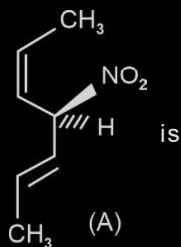
[JEE (Main)-2022]

87. The number of chiral alcohol(s) with molecular formula $C_4H_{10}O$ is ____.

[JEE (Main)-2022]

88. Given below are two statements.

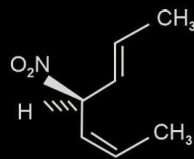
Statement I: The compound



is

optically active.

Statement II:



is mirror image

of above compound A.

In the light of the above statement, choose the **most appropriate** answer from the options given below.

[JEE (Main)-2022]

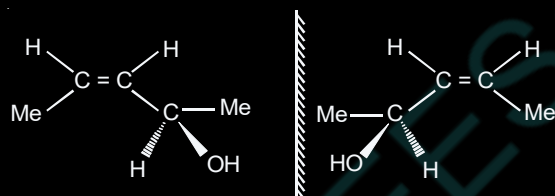
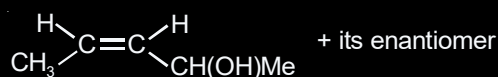
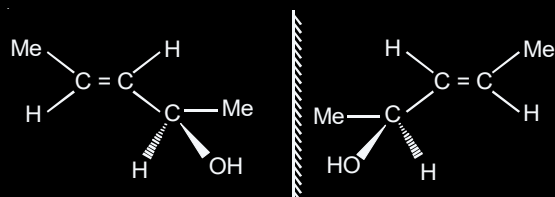
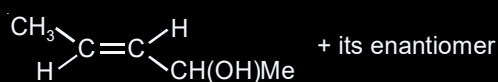
- (1) Both **Statement I** and **Statement II** are correct.
- (2) Both **Statement I** and **Statement II** are incorrect.
- (3) **Statement I** is correct but **Statement II** is incorrect.
- (4) **Statement I** is incorrect but **Statement II** is correct.



Haloalkanes and Haloarenes

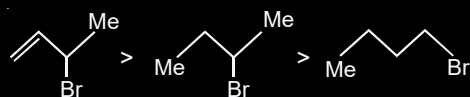
1. Answer (2)

$\text{CH}_3\text{CH}=\text{CH}-\overset{*}{\text{CH}}(\text{OH})\text{Me}$ has



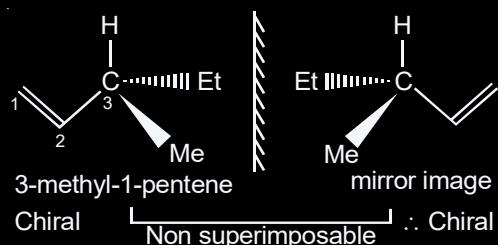
2. Answer (2)

Formation of carbocation is rate determining step in $\text{S}_{\text{N}}1$ reaction. Hence alkyl halide which gives more stable carbocation is more reactive towards $\text{S}_{\text{N}}1$ reaction



decreasing order of $\text{S}_{\text{N}}1$ reactivity

3. Answer (4)



4. Answer (1)

Fact.

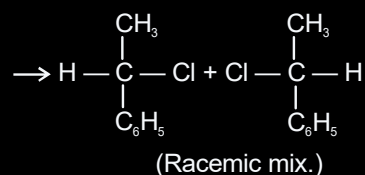
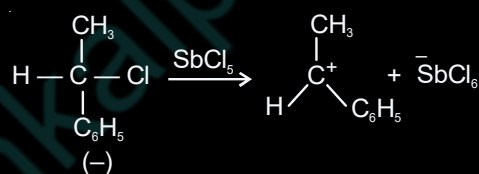
5. Answer (3)

On moving down a group basicity decreases but nucleophilicity increases.

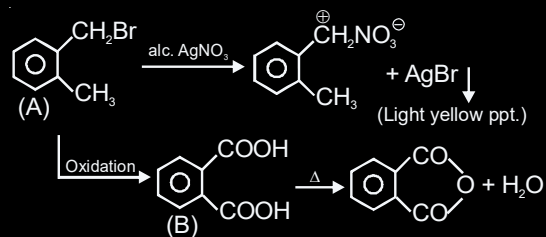
6. Answer (2)

7. Answer (3)

8. Answer (3)



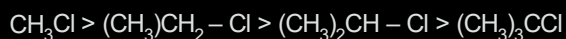
9. Answer (4)



Note: Compound (A) reacts with alc. AgNO_3 to give light yellow ppt. of AgBr and not white ppt. as given in the question.

10. Answer (2)

Rate of $\text{S}_{\text{N}}2$ reaction depends on steric crowding of alkyl halide. So order is

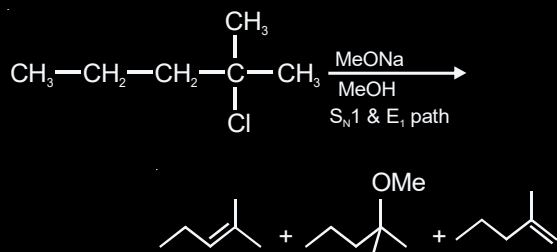


11. Answer (4)

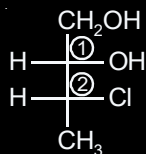
Swart's reaction



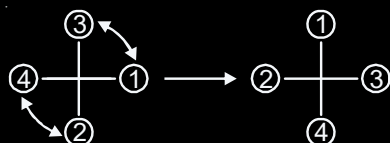
12. Answer (4)



13. Answer (1)

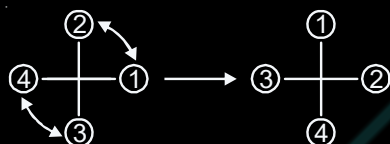


At (1),



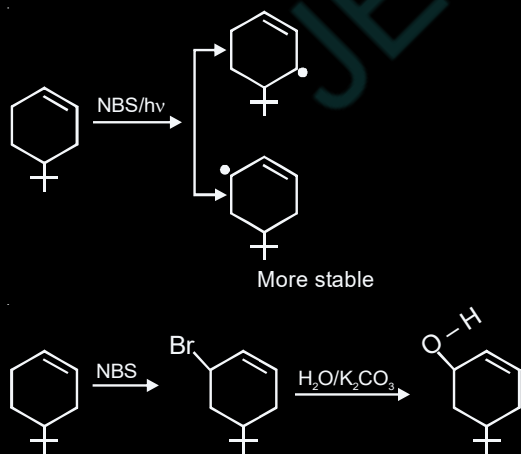
It is 'S' configured.

At (2),



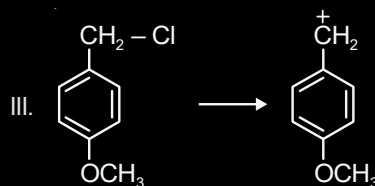
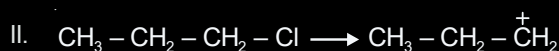
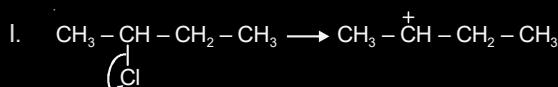
It is 'R' configured.

14. Answer (1)



15. Answer (4)

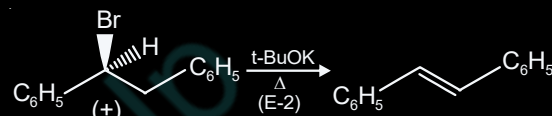
Rate of $\text{S}_\text{N}1$ reaction \propto stability of carbocation



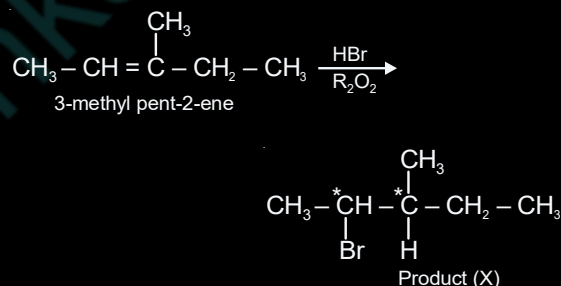
So, II < I < III

Increase stability of carbocation and hence increase reactivity of halides.

16. Answer (4)



17. Answer (2)



Since product (X) contains two chiral centres and it is unsymmetrical.

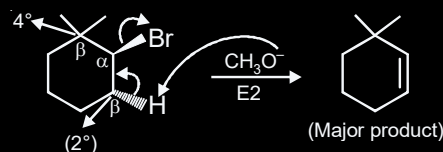
So, its total stereoisomers = $2^2 = 4$.

18. Answer (2)

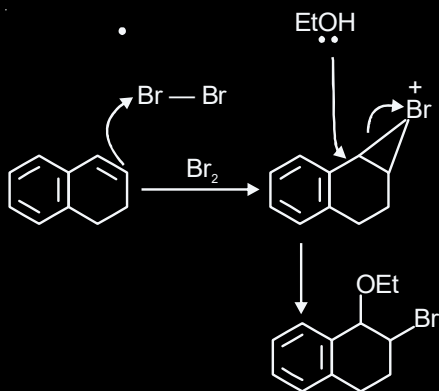
CH_3O^- is a strong base and strong nucleophile, so favourable condition is $\text{S}_\text{N}2/\text{E}2$.

Given alkyl halide is 2° and β C's are 4° and 2° , so sufficiently hindered, therefore, E2 dominates over $\text{S}_\text{N}2$.

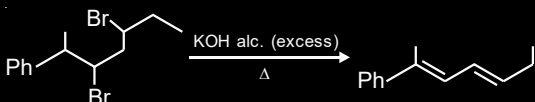
Also, polarity of CH_3OH (solvent) is not as high as H_2O , so E1 is also dominated by E2.



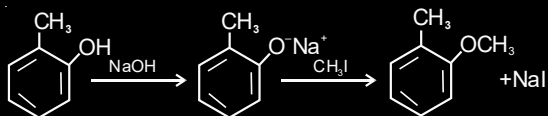
19. Answer (4)



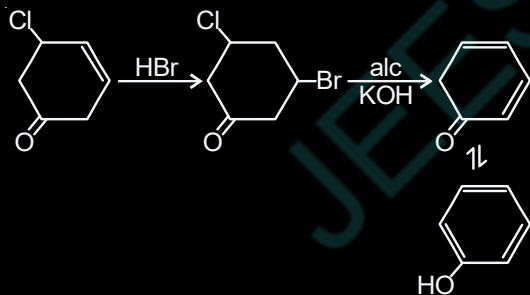
20. Answer (2)



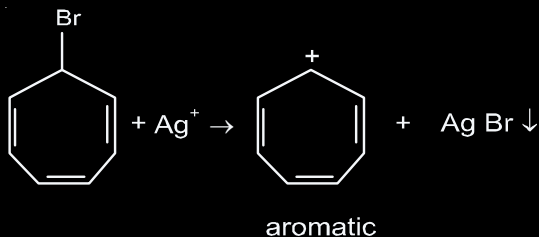
21. Answer (1)



22. Answer (1)

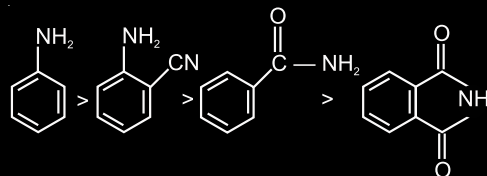


23. Answer (4)



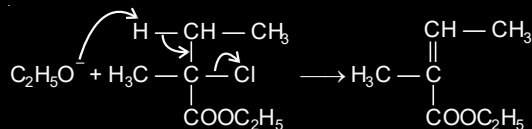
24. Answer (2)

Reactivity of compounds (nucleophiles) with alkyl halides will depend upon the availability of lone pair of electrons on nitrogen (amines or acid amides)

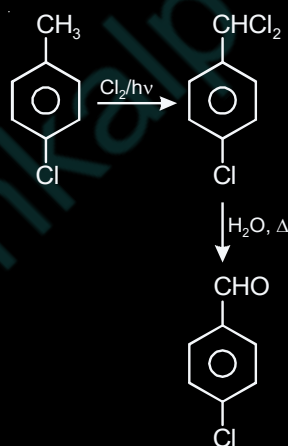


25. Answer (4)

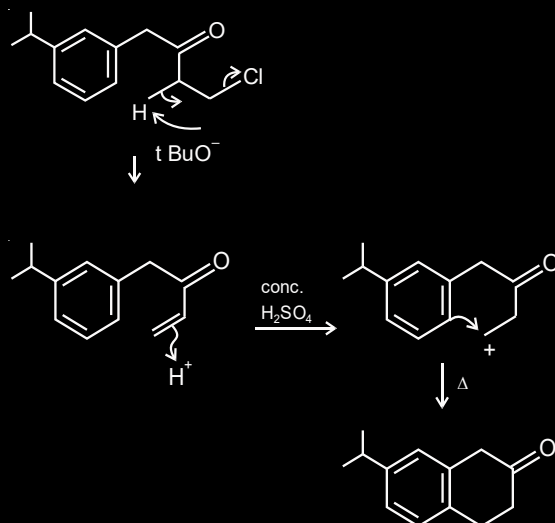
High temperature and strong base favours elimination reaction forming more stable alkene according to Saytzeff rule.



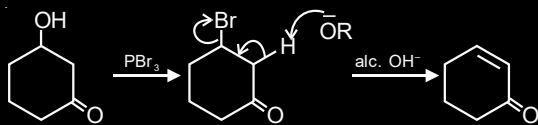
26. Answer (3)



27. Answer (2)

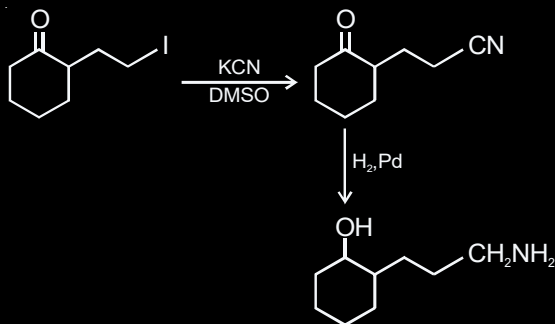


28. Answer (2)



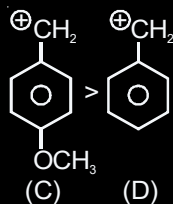
More stable product due to conjugation

29. Answer (4)



30. Answer (3)

S_N1 reaction proceeds via formation of carbocation.



On comparing (A) and (B), in (A) there is formation of tertiary carbocation $\text{CH}_3-\text{C}^+(\text{CH}_3)_2$ after rearrangement while (B) is primary.

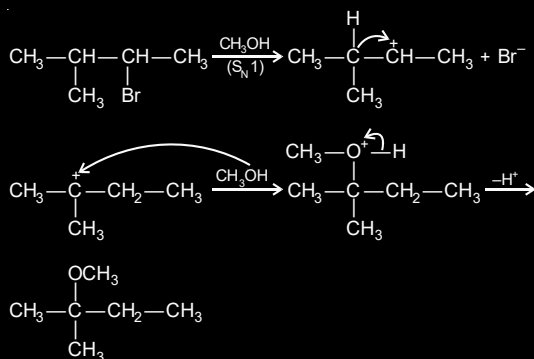
So, (C) > (D) > (A) > (B).

31. Answer (4)

In S_N1 reaction, formation of carbocation (1st step) is rate determining step (RDS)

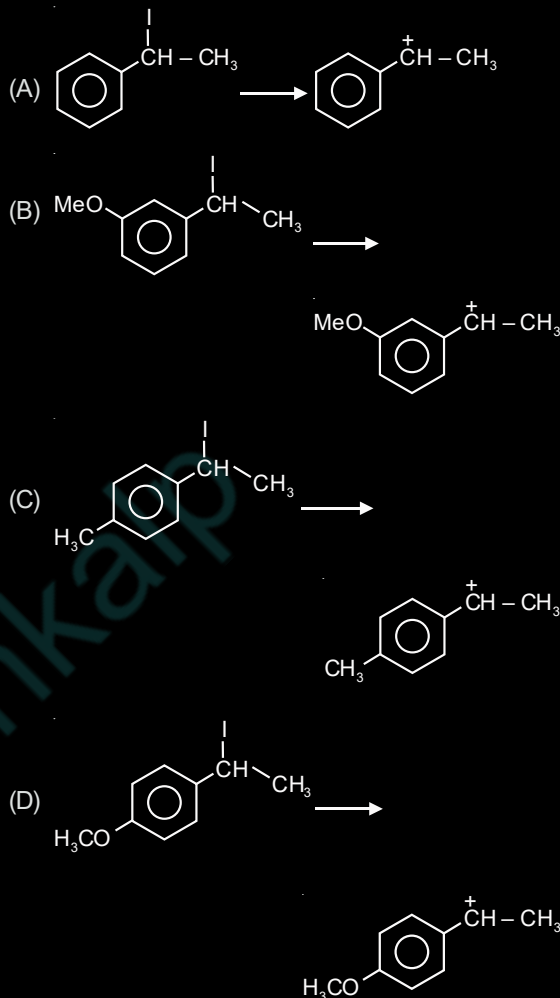
\therefore Correct graph is given in option-4.

32. Answer (1)



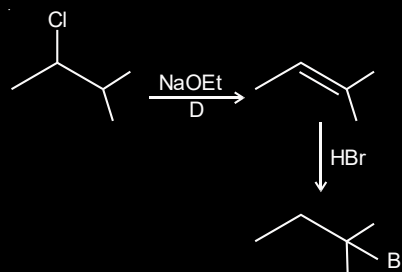
33. Answer (1)

The rate of S_N1 is decided by the stability of carbocation formed in the rate determining step.



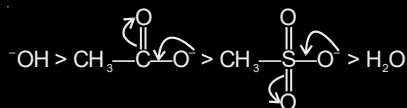
Carbocation (D) is most stable due to +R effect of CH_3O group, (C) is stabilised by +I and +H effect of CH_3 group; (B) is least stable due to -I effect of MeO group. So increasing order of rate of S_N1 is (B) < (A) < (C) < (D)

34. Answer (3)

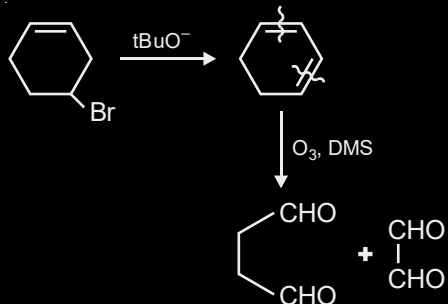


35. Answer (4)

Greater the negative charge Present on a nucleophilic centre greater would be its nucleophilicity.



36. Answer (1)



37. Answer (4)

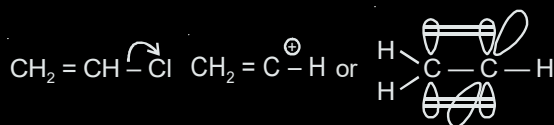


Fig. (1)

Fig. (2)

Fig. (3)

Also,



Due to partial double bond character of C - Halogen bond, Halogen leaves with great difficulty, if at all it does. Hence, vinyl halides do not undergo nucleophilic substitution easily.

Assertion is correct.

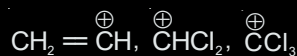
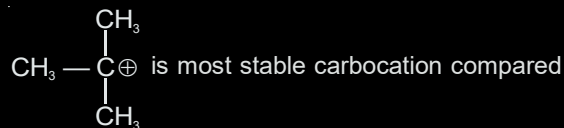
Intermediate carbocation is not stabilised by loosely held π -electrons because empty orbital (see Fig. (3)), being at 90° , cannot overlap with p-orbitals of π bond. Reason is wrong.

38. Answer (4)

Carbocation is formed on reaction with Ag^+

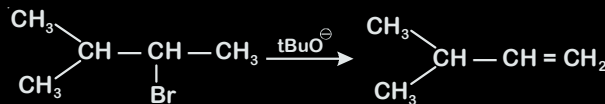


The more the stability of R^+ , the more $\text{R} - \text{Cl}$ is likely to give precipitate

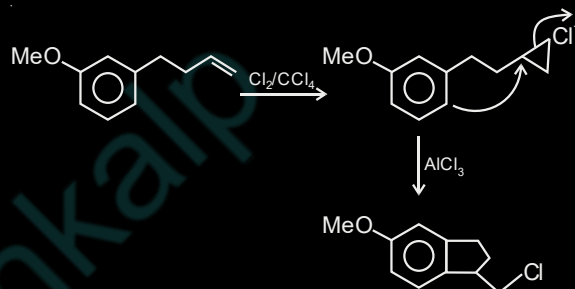


39. Answer (2)

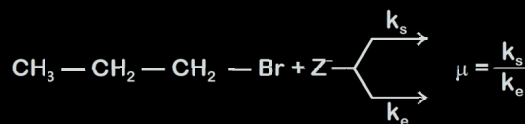
Tertiary butoxide is a bulky base and it extracts the least hindered hydrogen



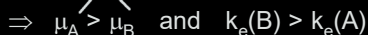
40. Answer (4)



41. Answer (4)

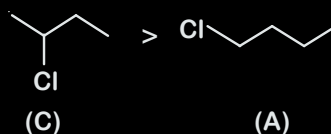
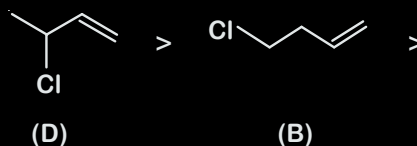


when

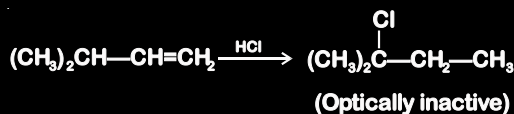
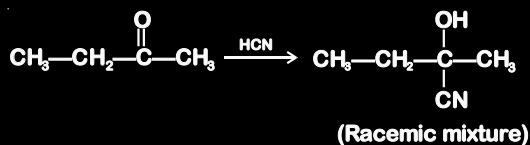


42. Answer (4)

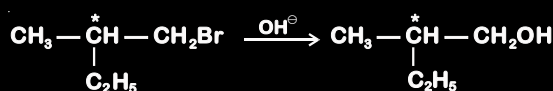
Dehydrohalogenation of the given halides by E_1 mechanism is decided by the stability of carbocation formed in the first step. The correct decreasing order of the given halides towards dehydrohalogenation by E_1 mechanism is



43. Answer (3)



44. Answer (3)

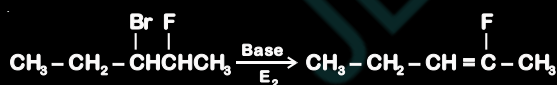


Here, no bond to the stereocenter is broken, so the product will have the same configuration of groups around the stereocenter as that of reactant. This is a case of retention of configuration.

(Reference → NCERT Page 308)

45. Answer (3)

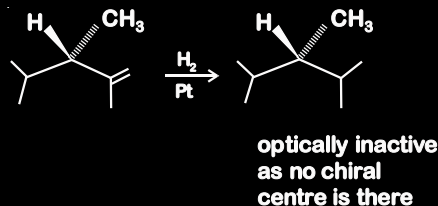
Base abstracts most acidic hydrogen and departure of better leaving group takes place simultaneously.



46. Answer (4)

$\text{S}_{\text{N}}1$ reaction mechanism is favoured by polar solvents, weak nucleophiles, bulky substituents and the reaction is accompanied by racemization.

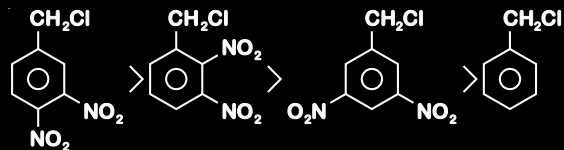
47. Answer (1)



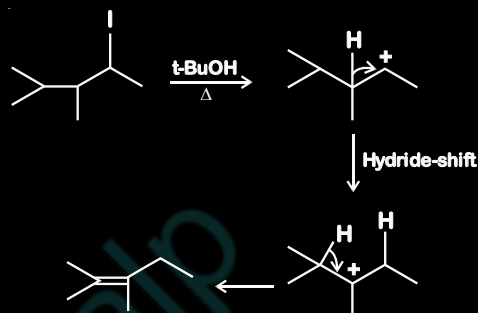
48. Answer (3)

—NO₂ group present at ortho and para position deactivate the benzene ring and making the carbon attached to ring (—CH₂—Cl) group more

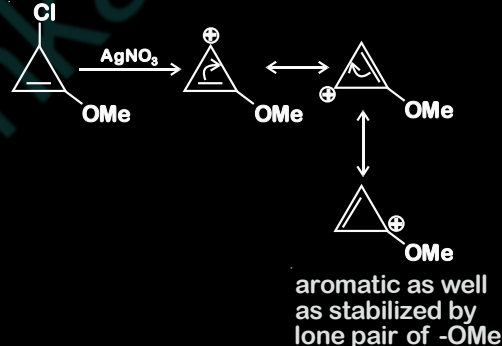
electrophilic for the incoming nucleophile to give $\text{S}_{\text{N}}2$ reaction but rate of $\text{S}_{\text{N}}2$ reaction decreases as hindrance increases around the electrophilic carbon. Hence correct order of nucleophilic substitution reaction ($\text{S}_{\text{N}}2$) will be



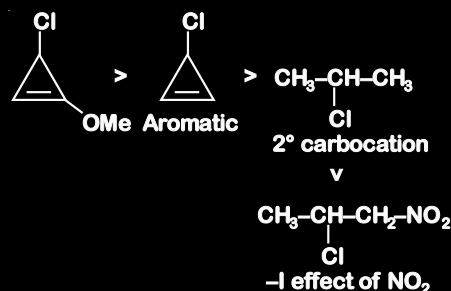
49. Answer (3)



50. Answer (1)

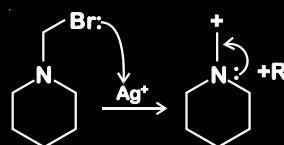


So the order is



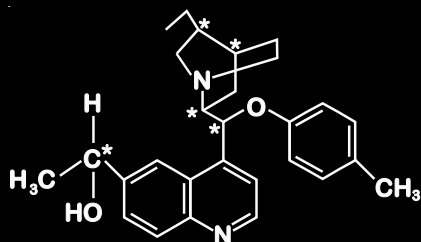
51. Answer (2)

Ease of precipitation of AgBr depends upon the rate of formation of carbocation



Most stable carbocation due to +R effect of N.

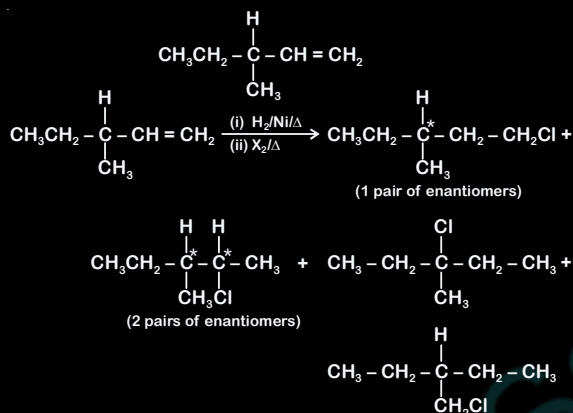
52. Answer (5)



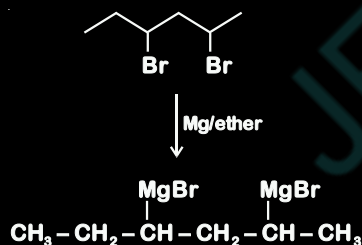
Chiral carbon atom is bonded to 4 different atoms or group of atoms. The given structure has 5 chiral carbon-atoms.

53. Answer (8)

The simplest optically active alkene is

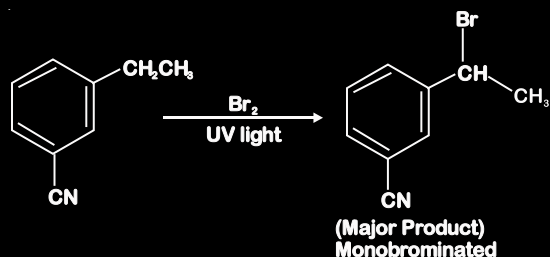


54. Answer (1)



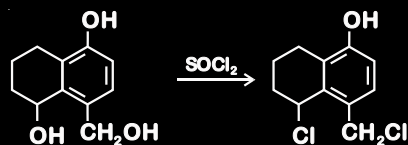
Intramolecular substitution reaction

55. Answer (4)



So the correct option should be (4)

56. Answer (4)



57. Answer (2)

(a) – Sandmeyer reaction

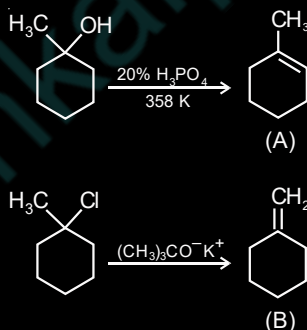
(b) – Gatterman reaction

(c) – Wurtz reaction

(d) – Fittig reaction

(a)-(ii); (b)-(iv); (c)-(i); (d)-(iii)

58. Answer (3)



59. Answer (4)

$\text{AgCN/KCN} \rightarrow$ ambident nucleophile

Nucleophilic site is N and C in the above two case.

$\text{AgNO}_2/\text{KNO}_2 \rightarrow$ ambident nucleophiles

N and O are the nucleophilic site in these two cases

While in B and D, there is only one nucleophilic site.

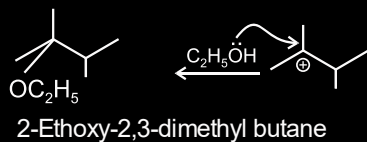
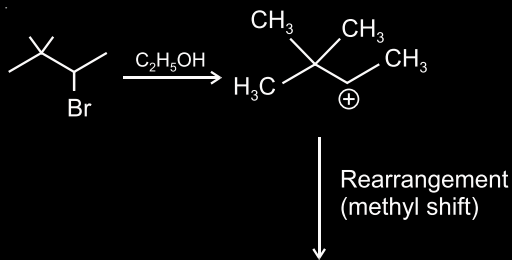
60. Answer (1)

Both $\text{C}_2\text{H}_5\text{OH}$ and AgCN can generate nucleophile.

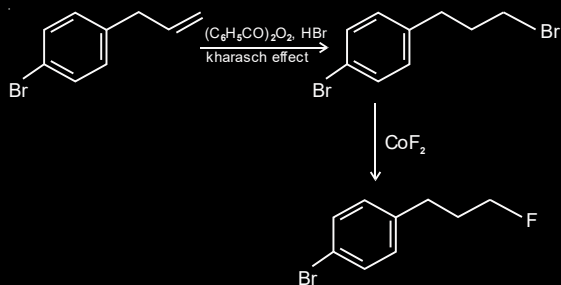
KCN generates nitriles on substitution reactions with haloalkanes where AgCN generates isonitriles on substitution reactions with haloalkanes.

Because KCN is ionic and has 'C' nucleophilic centre whereas AgCN is covalent and has 'N' nucleophilic centre.

61. Answer (3)

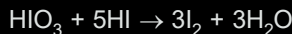


62. Answer (3)

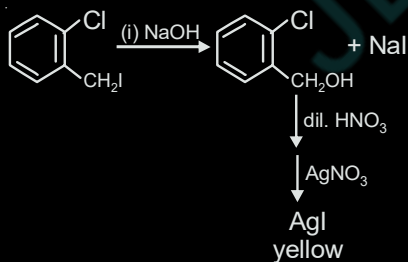


63. Answer (4)

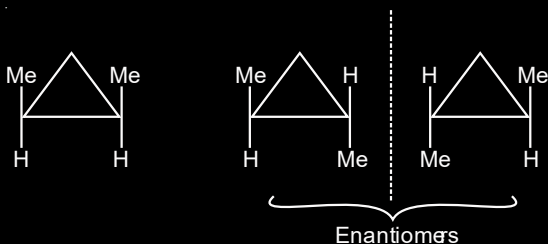
Iodination is very slow and a reversible reaction. It can be carried out in the presence of oxidizing agents like HIO_3 or HNO_3 .



64. Answer (3)

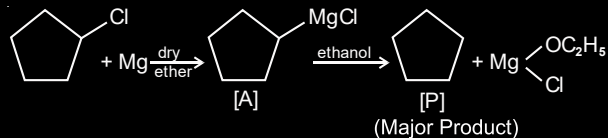


65. Answer (2)



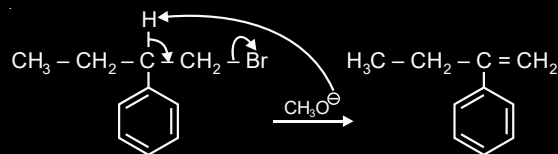
Total three stereoisomers

66. Answer (3)



The alkyl part of Grignard's reagent [A] picks up proton from ethanol forming cyclopentane as major product.

67. Answer (2)

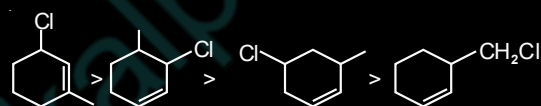


68. Answer (3)

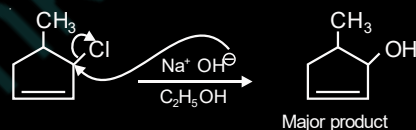
Acetate in acetic acid with R-X cause $\text{S}_{\text{N}}1$

• Allylic halides undergo faster $\text{S}_{\text{N}}1$

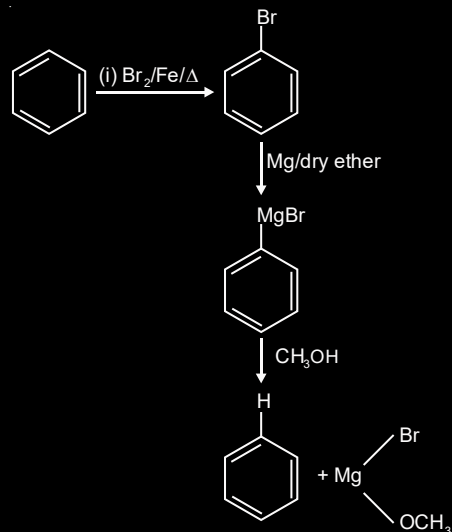
∴ Correct order is



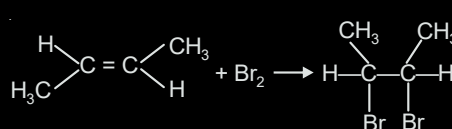
69. Answer (1)



70. Answer (1)



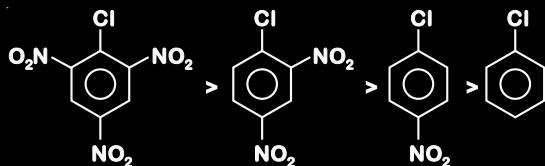
71. Answer (2)



anti-addition on trans 2-butene will form mesomer

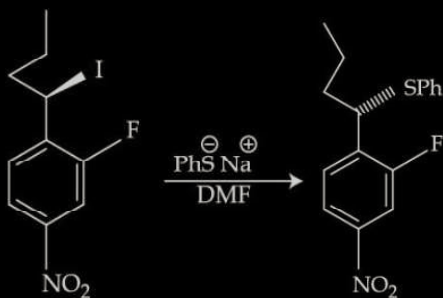
72. Answer (4)

More the number of EWG attached to benzene ring, more will be the tendency towards nucleophilic substitution reaction



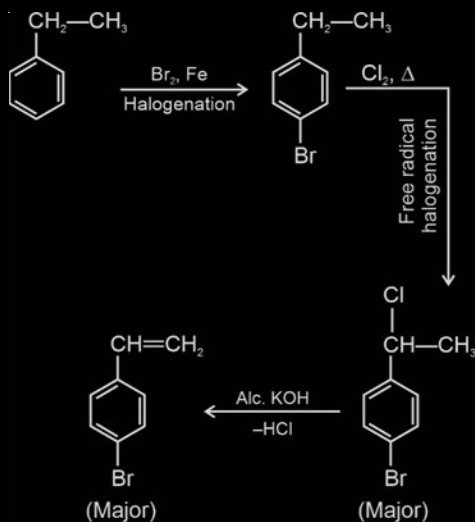
iv > iii > ii > i

73. Answer (1)

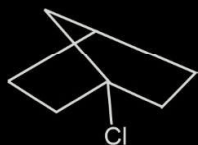


Rate of $\text{S}_{\text{N}}2 > \text{S}_{\text{N}}2$ (AR)

74. Answer (4)



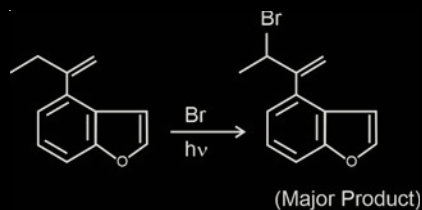
75. Answer (3)



is inactive towards $\text{S}_{\text{N}}1$ as

halogen is attached to bridge head carbon atom, where formation of carbocation is not possible.

76. Answer (1)

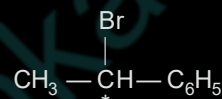


77. Answer (3)

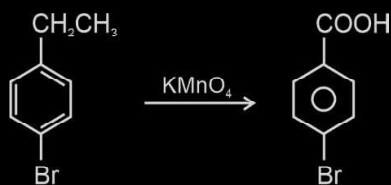
	moles	relative ratio	simplest ratio
C	52.2 = 52.2 / 12 =	4.35	→ 8.7
H	4.9 = 4.9 / 1 =	4.9	→ 9.8
Br	42.9 = 42.9 / 80 =	0.5	→ 1

$\text{C}_8\text{H}_9\text{Br}$

A is optically active



B forms para bromo benzoic acid on reaction with KMnO_4 .



78. Answer (8)

Total monobromo derivatives = 8

