Haloalkanes and Haloarenes

Question1

The correct statement regarding nucleophilic substitution reaction in a chiral alkyl halide is ;
[27-Jan-2024 Shift 1]

Options:

A. Retention occurs in S_N1 reaction and inversion occurs in S_N2 reaction.

B. Racemisation occurs in S_N1 reaction and retention occurs in S_N2 reaction.

C. Racemisation occurs in both S_N1 and S_N2 reactions.

D. Racemisation occurs in S_N1 reaction and inversion occurs in S_N2 reaction.

Answer: D

Solution:

Solution:

Question2

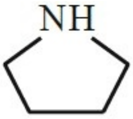
Identify B formed in the reaction.

$$\text{Cl}-(\text{CH}_2)_4-\text{Cl}\xrightarrow{\text{excess } \text{NH}_3}\text{A}\xrightarrow{\text{NaOH}}\text{B}+\text{H}_2\text{O}+\text{NaCl}$$

[27-Jan-2024 Shift 2]

Options:

A.



B. $\text{H}_2\text{N}-(\text{CH}_2)_4-\text{NH}_2$

C. $\text{Cl}\overset{+}{\text{N}}\text{H}_3-(\text{CH}_2)_4-\overset{+}{\text{N}}\text{H}_3\text{Cl}^-$

D.

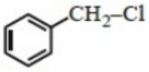
Answer: B

Solution:

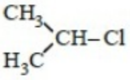
Question3

Which among the following halide/s will not show S_N1 reaction:
(A) $H_2C = CH - CH_2Cl$
(B) $CH_3 - CH = CH - Cl$

(C)



(D)



Choose the most appropriate answer from the options given below:
[27-Jan-2024 Shift 2]

Options:

A. (A), (B) and (D) only

B. (A) and (B) only

C. (B) and (C) only

D. (B) only

Answer: D

Solution:

Solution:

Question4

Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R :
Assertion A : Aryl halides cannot be prepared by replacement of hydroxyl group of phenol by halogen atom.
Reason R : Phenols react with halogen acids violently. In the light of the above statements, choose the most appropriate from the options given below:
[29-Jan-2024 Shift 1]

Options:

A. Both A and R are true but R is NOT the correct explanation of A

B. A is false but R is true

C. A is true but R is false

D. Both A and R are true and R is the correct explanation of A

Answer: C

Solution:

Solution:

Question5

Alkyl halide is converted into alkyl isocyanide by reaction with
[29-Jan-2024 Shift 2]

Options:

A. NaCN

B. NH_4CN

C. KCN

D. AgCN

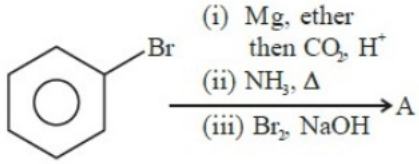
Answer: D

Solution:

Solution:

Question6

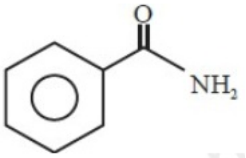
The final product A, formed in the following multistep reaction sequence is:



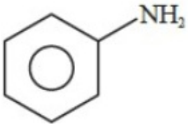
[30-Jan-2024 Shift 1]

Options:

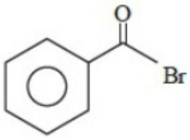
A.



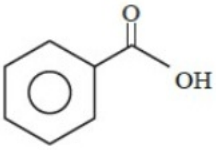
B.



C.



D.



Answer: B

Question7

Given below are two statements:
Statement - I: High concentration of strong nucleophilic reagent with secondary alkyl halides which do not have bulky substituents will follow S_N2 mechanism.
Statement - II: A secondary alkyl halide when treated with a large excess of ethanol follows S_N1 mechanism.
In the the light of the above statements, choose the most appropriate from the questions given below:
[30-Jan-2024 Shift 2]

Options:

A. Statement I is true but Statement II is false.

B. Statement I is false but Statement II is true.

C. Both statement I and Statement II are false.

D. Both statement I and Statement II are true.

Answer: D

Solution:

Solution:

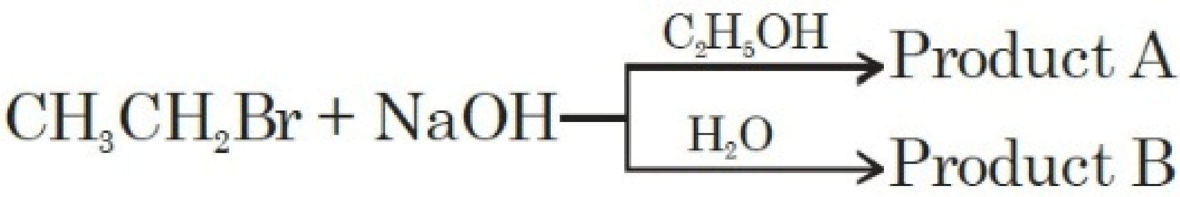
Question8

2-chlorobutane +Cl_2 → $C_4H_8Cl_2$ (isomers)
Total number of optically active isomers shown by $C_4H_8Cl_2$, obtained in the above reaction is____
[30-Jan-2024 Shift 2]

Answer: 6

Solution:

Question9

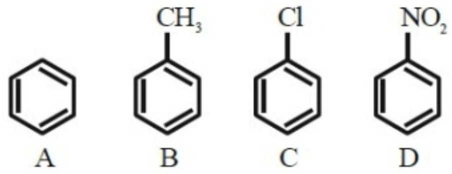


The total number of hydrogen atoms in product A and product B is_____
[31-Jan-2024 Shift 1]

Answer: 10

Question10

The correct order of reactivity in electrophilic substitution reaction of the following compounds is :



[31-Jan-2024 Shift 2]

Options:

A. B > C > A > D

B. D > C > B > A

C. A > B > C > D

D. B > A > C > D

Answer: D

Question11

Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A) : Haloalkanes react with KCN to form alkyl cyanides as a main product while with AgCN form isocyanide as the main product.
Reason (R) : KCN and AgCN both are highly ionic compounds.
In the light of the above statement, choose the most appropriate answer from the options given below:
[1-Feb-2024 Shift 1]

Options:

A. (A) is correct but (R) is not correct

B. Both (A) and (R) are correct but (R) is not the correct explanation of (A)

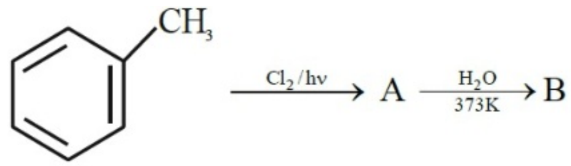
C. (A) is not correct but (R) is correct

D. Both (A) and (R) are correct and (R) is the correct explanation of (A)

Answer: A

Question12

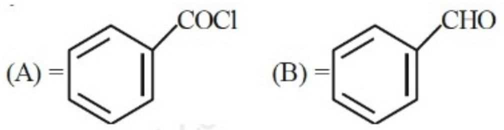
Identify A and B in the following sequence of reaction



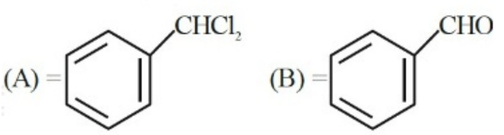
[1-Feb-2024 Shift 1]

Options:

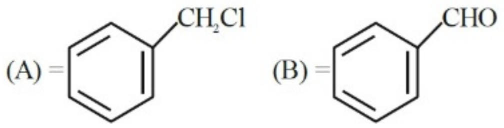
A.



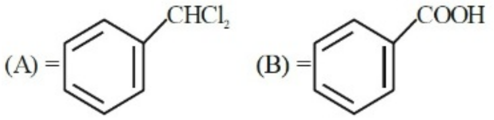
B.



C.



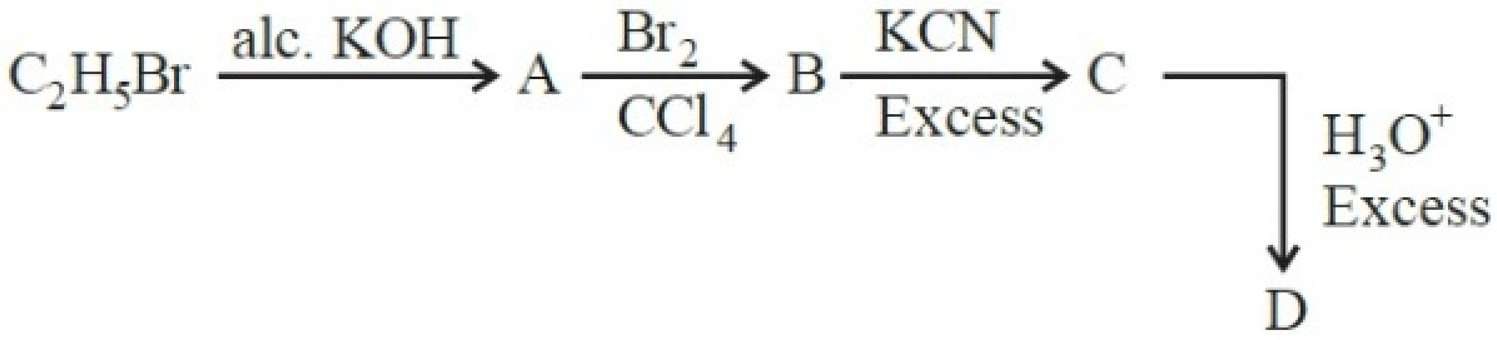
D.



Answer: B

Question13

Acid D formed in above reaction is :



[1-Feb-2024 Shift 2]

Options:

A. Gluconic acid

B. Succinic acid

C. Oxalic acid

D. Malonic acid

Answer: B

Question14

Assertion A : Hydrolysis of an alkyl chloride is a slow reaction but in the presence of NaI, the rate of the hydrolysis increases.
Reason R: $I^{-}$is a good nucleophile as well as a good leaving group.
In the light of the above statements, choose the correct answer from the options given below.
[24-Jan-2023 Shift 1]

Options:

A. A is false but R is true

B. A is true but R is false

C. Both A and R are true and R is the correct explanation of A

D. Both A and R are true but R is NOT the correct explanation of A

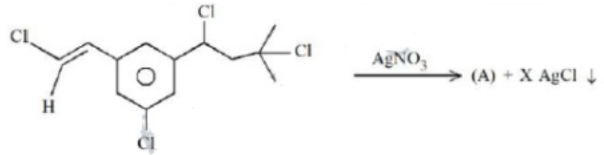
Answer: C

Solution:

Solution:
The rate of hydrolysis of alkyl chloride improves because of better Nucleophilicity of I^{-}.

Question15

Number of moles of AgCl formed in the following reaction is



[24-Jan-2023 Shift 1]

Answer: 2

Solution:

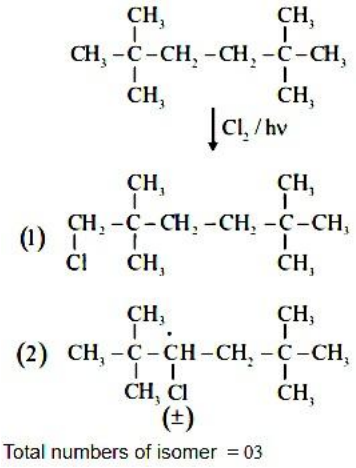
Solution:
Benzylic and tertiary carbocations are stable.

Question16

Maximum number of isomeric monochloro derivatives which can be obtained from 2,2,5,5tetramethylhexane by chlorination is
[24-Jan-2023 Shift 2]

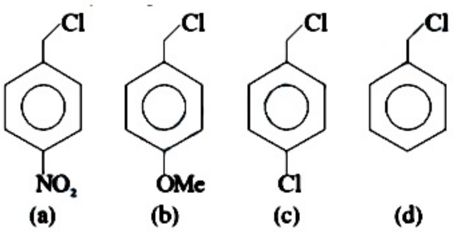
Answer: 3

Solution:



Question17

Decreasing order towards S_N1 reaction for the following compounds is:



[30-Jan-2023 Shift 2]

Options:

A. a > c > d > b

B. a > b > c > d

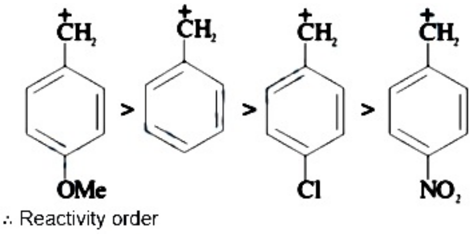
C. b > d > c > a

D. d > b > c > a

Answer: C

Solution:

The rate of S_N1 reaction depends upon stability of carbocation which follows the order



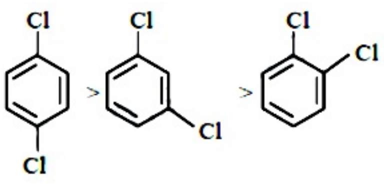
(b) > (d) > (c) > (a)

Question18

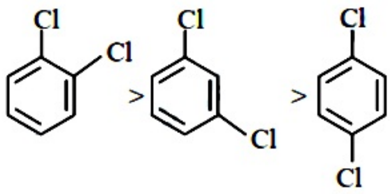
The correct order of melting point of dichlorobenzenes is [31-Jan-2023 Shift 1]

Options:

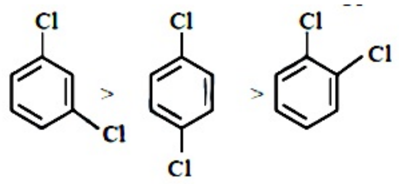
A.



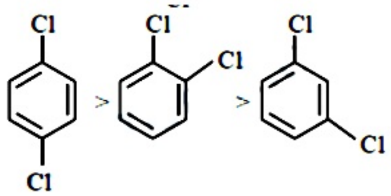
B.



C.

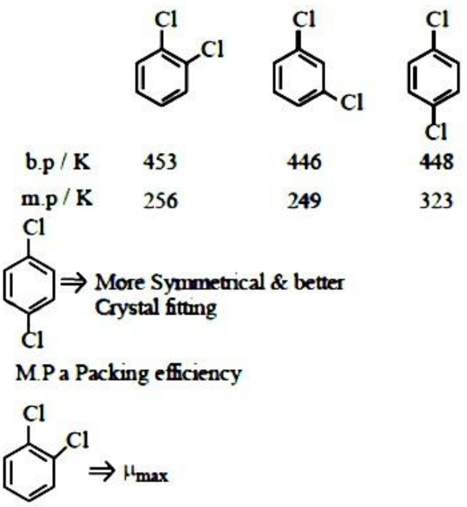


D.



Answer: D

Solution:



b.p / K	453	446	448
m.p / K	256	249	323

⇒ More Symmetrical & better Crystal fitting

M.P α Packing efficiency

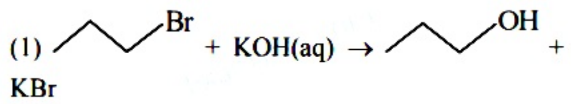
⇒ μ_{max}

Question19

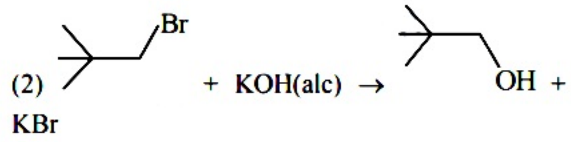
Identify the incorrect option from the following: [1-Feb-2023 Shift 1]

Options:

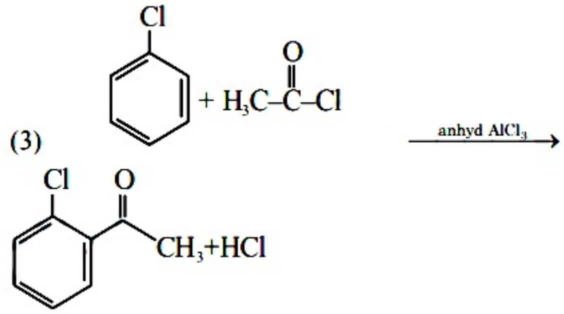
A.



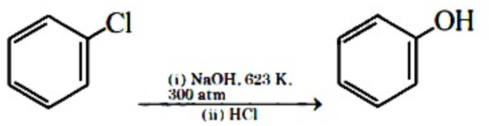
B.



C.



D.



Answer: B

Solution:

Solution:
In alcoholic KOH, elimination reaction takes place.

Question20

For the reaction:

$$RCH_2Br + I^- \xrightarrow{\text{Acetone}} \underset{\text{major}}{RCH_2I} + Br^-$$

The correct statement is :
[6-Apr-2023 shift 1]

Options:

A. The transition state formed in the above reaction is less polar than the localised anion.

B. The reaction can occur in acetic acid also.

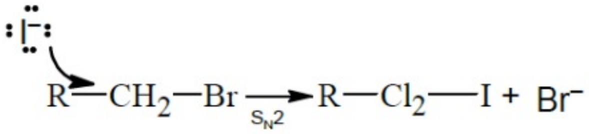
C. The solvent used in the reaction solvates the ions formed in rate determining step.

D. Br^-can act as competing nucleophile.

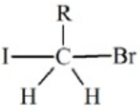
Answer: A

Solution:

Solution:
This is finkelstein reaction



Transition state

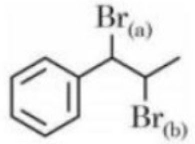


Clearly, the transition state is less polar than free anions. $Br^-$and I^-
Acetic acid is protic which does not support S_N2 Acetone does not solvate anion Br^-gets precipitated and hence can not compete with I^-
So only (1)is correct

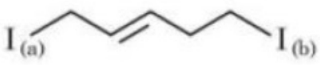
Question21

Choose the halogen which is most reactive towards S_N1 reaction in the given compounds (A, B, C, & D)

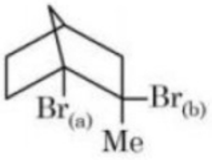
A.



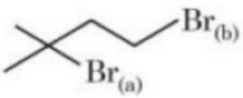
B.



C.



D.



[8-Apr-2023 shift 1]

Options:

A. $A - Br_{(a)}$; $B - I_{(a)}$; $C - Br_{(b)}$; $D - Br_{(a)}$

B. $A - Br_{(b)}$; $B - I_{(a)}$; $C - Br_{(a)}$; $D - Br_{(a)}$

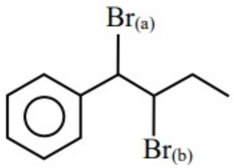
C. $A - Br_{(b)}$; $B - I_{(b)}$; $C - Br_{(b)}$; $D - Br_{(b)}$

D. $A - Br_{(a)}$; $B - I_{(a)}$; $C - Br_{(a)}$; $D - Br_{(a)}$

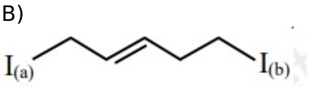
Answer: A

Solution:

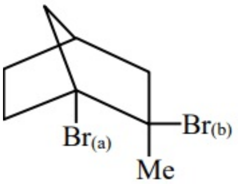
Solution:
(A)



→ Because formed intermediate carbocation formed by $Br_{(a)}$ get stabilised by conjugation with phenyl
(B)

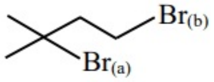


→ Because the intermediate carbocation formed by $I_{(a)}$ become more stable by conjugation
(C)



→ Because, we con't remove $Br_{(a)}$ from bridge head carbon (Bredt's rule)

(D)

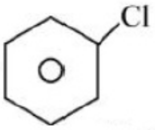


→ Because, formed intermediate by $Br_{(a)}$, 3° carbocation is more stable (stability of carbocation $3^{\circ} > 2^{\circ} > 1^{\circ}$)

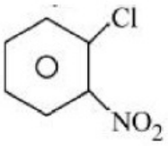
Question22

The correct order of reactivity of following haloarenes towards nucleophilic substitution with aqueous NaOH is

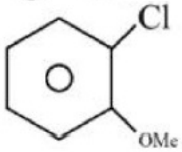
A.



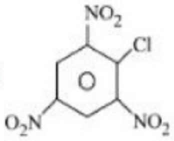
B.



C.



D.



Choose the correct answer from the options given below:
[8-Apr-2023 shift 2]

Options:

A. D > B > A > C

B. A > B > D > C

C. C > A > D > B

D. D > C > B > A

Answer: A

Solution:

Rate α EWG α $\frac{1}{\text{EDG}}$

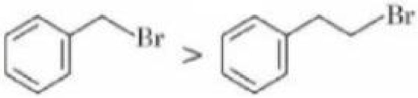
NO_2 → − Meffect

OMe → +M effect

Question23

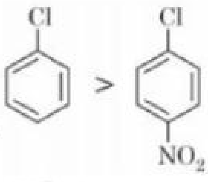
(A) S_N2

(B) S_N1



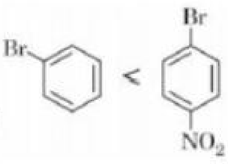
Electrophilic substitution

(C)



Nucleophilic substitution

(D)



Choose the correct answer from the options given below:

[10-Apr-2023 shift 1]

Options:

A. (A), (C) and (D) only

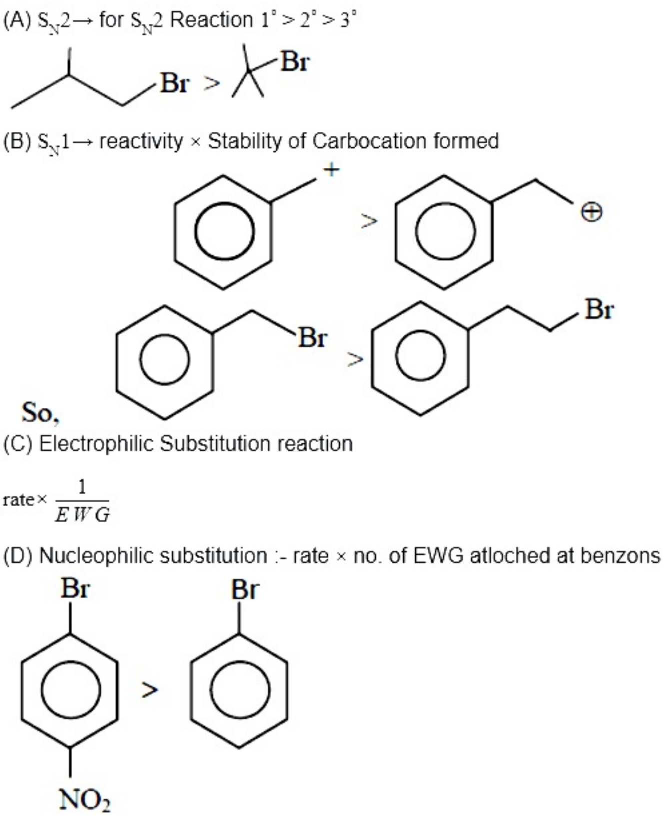
B. (A), (B) and (D) only

C. (B), (C) and (D) only

D. (A), (B), (C) and (D)

Answer: D

Solution:



(A) $S_N2 \rightarrow$ for S_N2 Reaction $1^\circ > 2^\circ > 3^\circ$

(B) $S_N1 \rightarrow$ reactivity × Stability of Carbocation formed

So,

(C) Electrophilic Substitution reaction

rate × $\frac{1}{EWG}$

(D) Nucleophilic substitution :- rate × no. of EWG atloched at benzons

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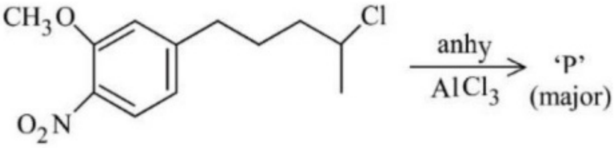
Question24

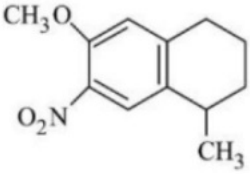
The major product ' P ' formed in the given reaction is:



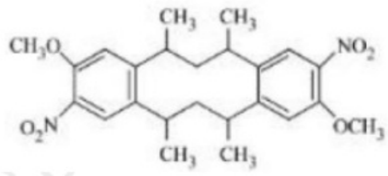
[10-Apr-2023 shift 2]

Options:

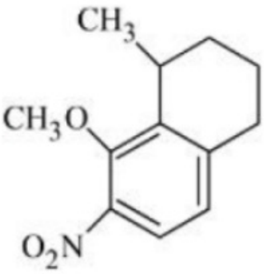
A.



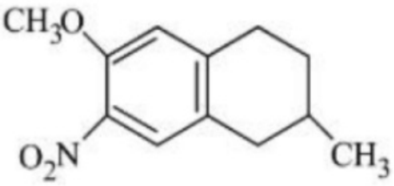
B.



C.

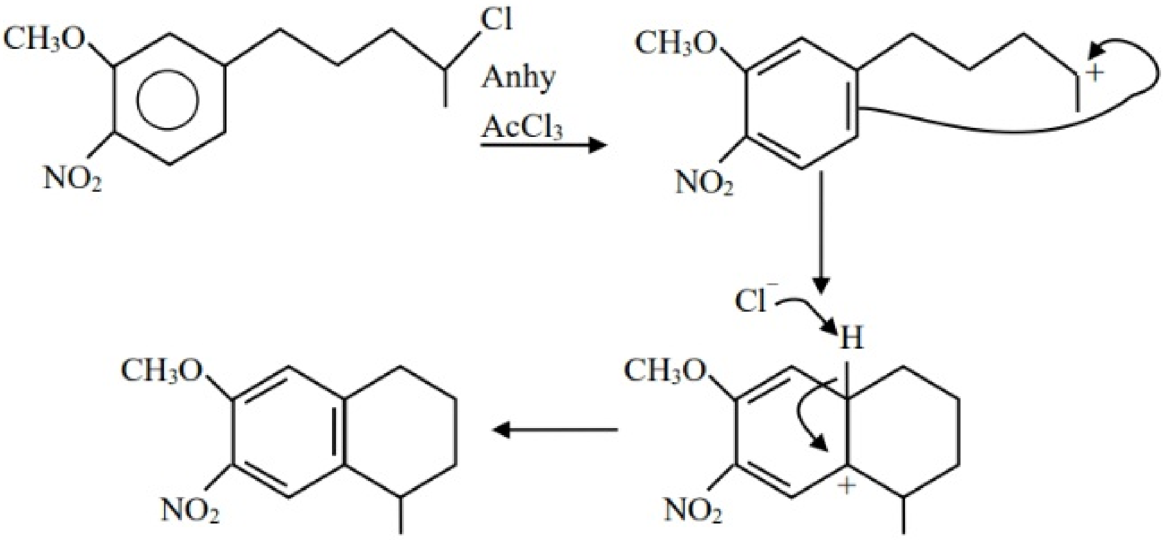


D.



Answer: A

Solution:



Question25

2-Methyl propyl bromide reacts with $C_2H_5O^-$and gives ' A ' whereas on reaction with C_2H_5OH it gives ' B '. The mechanism followed in these reactions and the products ' A ' and ' B ' respectively are :
[13-Apr-2023 shift 1]

Options:

A. S_N1, A = tert-butyl ethyl ether; S_N1, B = 2-butyl ethyl ether

B. S_N2, A = 2-butyl ethyl ether; S_N2, B = iso-butyl ethyl ether

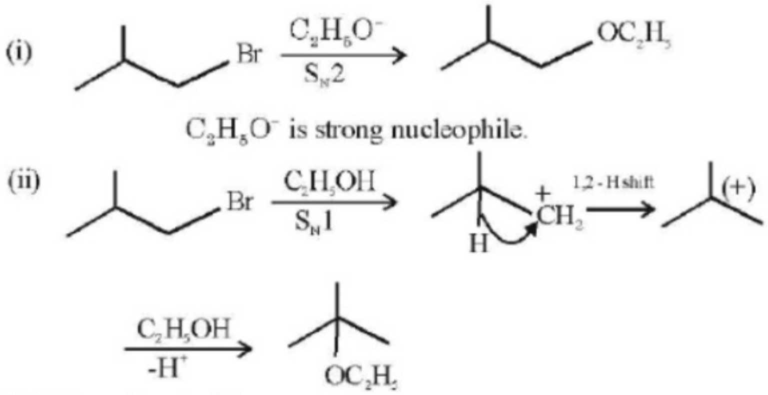
C. S_N, A = iso-butyl ethyl ether; S_N1, B = tert-butyl ethyl ether

D. S_N1, A = tert-butyl ethyl ether; S_N2, B = iso-butyl ethyl ether

Answer: C

Solution:

Solution:



$C_2H_5O^-$ is strong nucleophile.

C_2H_5OH is weak nucleophile.

Question26

Match List I with List II
I - Bromopropane is reacted with reagents in List I to give product in List II

LIST I-Reagent	LIST II - Product
A $KOH(alc)$	I. Nitrile
B. KCN (alc)	II. Ester
C. $AgNO_2$	III. Alkene
D. $H_3CCOOAg$	IV. Nitroalkane

Choose the correct answer from the options given below : [13-Apr-2023 shift 2]

Options:

A. A-IV, B-III, C-II, D-I

B. A-I, B-III, C-IV, D-II

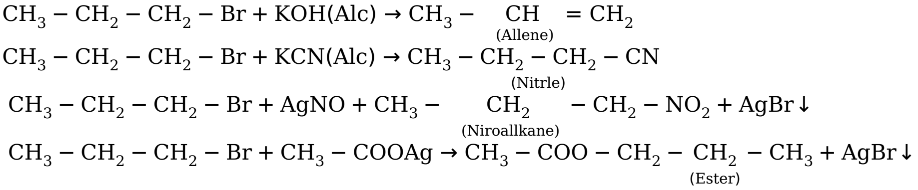
C. A-I, B-II, C-III, D-IV

D. A-III, B-I, C-IV, D-II

Answer: D

Solution:

Solution:



$$CH_3-CH_2-CH_2-Br+KOH(Alc)\rightarrow CH_3-\underset{\text{(Allene)}}{CH}=CH_2$$

$$CH_3-CH_2-CH_2-Br+KCN(Alc)\rightarrow \underset{\text{(Nitrle)}}{CH_3-CH_2-CH_2-CN}$$

$$CH_3-CH_2-CH_2-Br+AgNO+CH_3-\underset{\text{(Niroalkane)}}{CH_2}-CH_2-NO_2+AgBr\downarrow$$

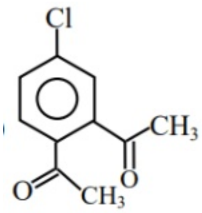
$$CH_3-CH_2-CH_2-Br+CH_3-COOAg\rightarrow CH_3-COO-CH_2-\underset{\text{(Ester)}}{CH_2}-CH_3+AgBr\downarrow$$

Question27

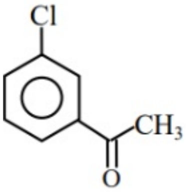
The major product in the Friedel-Craft acylation of chlorobenzene is :
[15-Apr-2023 shift 1]

Options:

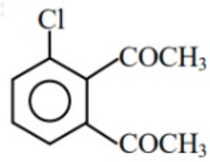
A.



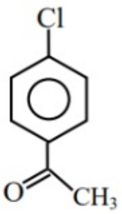
B.



C.



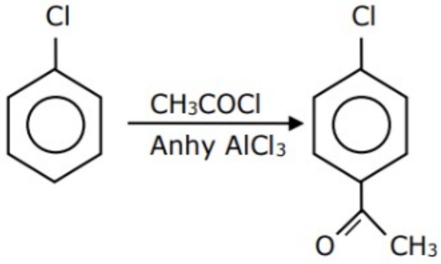
D.



Answer: D

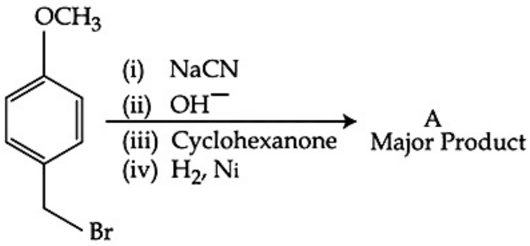
Solution:

Solution:



Chlorine is ortho/para directing, para is major.

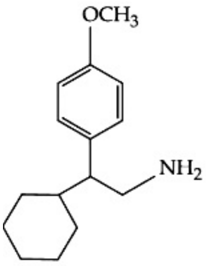
Question28



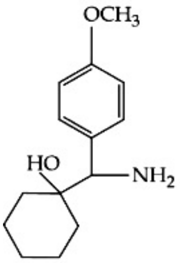
[24-Jun-2022-Shift-1]

Options:

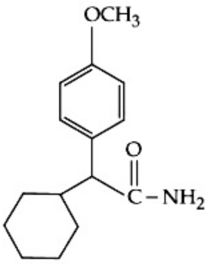
A.



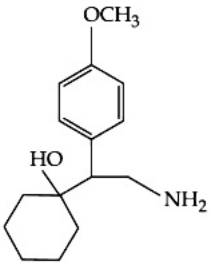
B.



C.



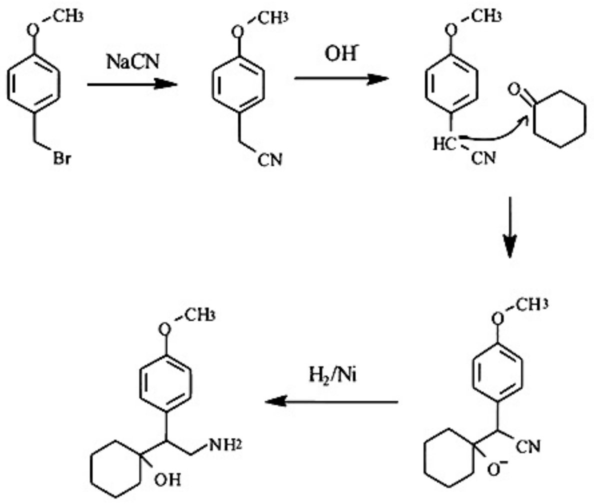
D.



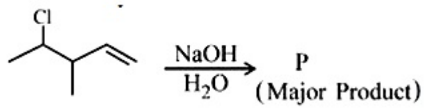
Answer: D

Solution:

Solution:



Question29

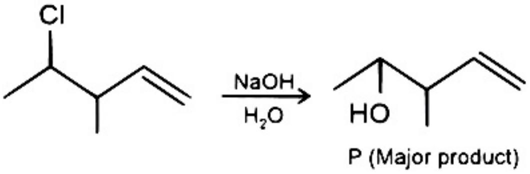


Consider the above reaction. The number of pi electrons present in the product ' P ' is_____

[24-Jun-2022-Shift-2]

Answer: 2

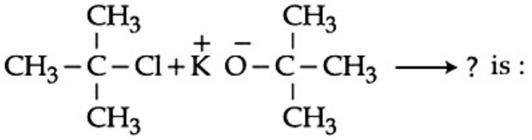
Solution:



The given reaction undergoes nucleophilic substitution by SN2 mechanism at room temperature
∴ No. of π electrons present in P = 2

Question30

The major product in the reaction



$$CH_3-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-Cl+\overset{+}{K}\ \overset{-}{O}-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}-CH_3 \longrightarrow ?\text{ is :}$$

[25-Jun-2022-Shift-1]

Options:

A. t-Butyl ethyl ether

B. 2,2-Dimethyl butane

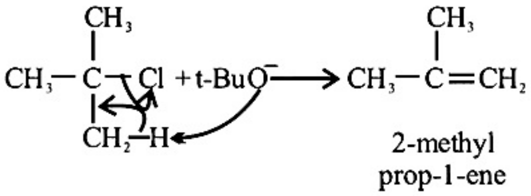
C. 2-Methyl pent-1-ene

D. 2-Methyl prop-1-ene

Answer: D

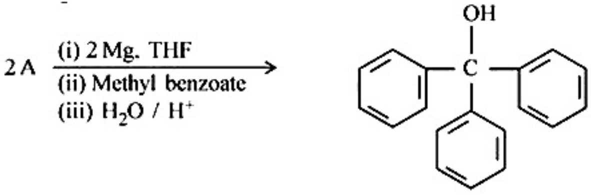
Solution:

Solution:
We have been given a bulky base, hence elimination will take place & not substitution.



Question31

In the given reaction 'A' can be



[25-Jun-2022-Shift-2]

Options:

A. benzyl bromide

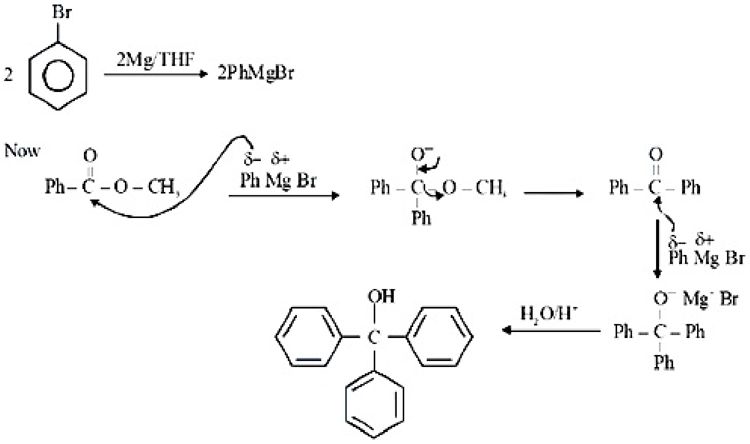
B. bromobenzene

C. cyclohexyl bromide

D. methyl bromide

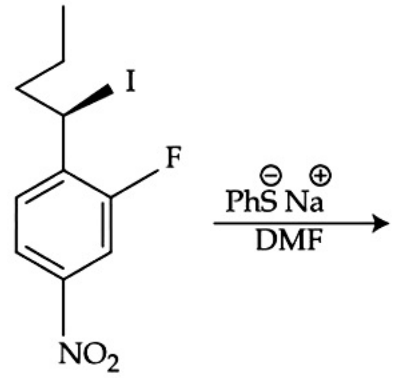
Answer: B

Solution:



Question32

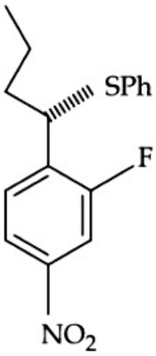
The major product of the following reaction is :



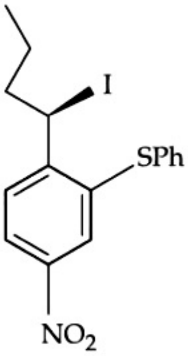
[27-Jun-2022-Shift-1]

Options:

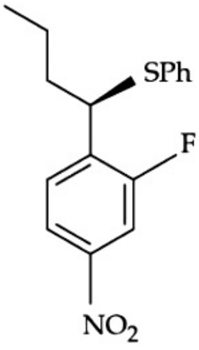
A.



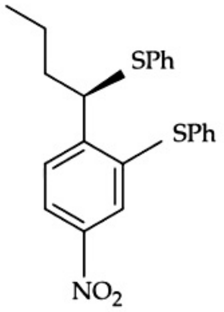
B.



C.



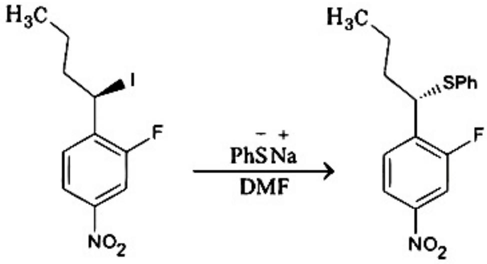
D.



Answer: A

Solution:

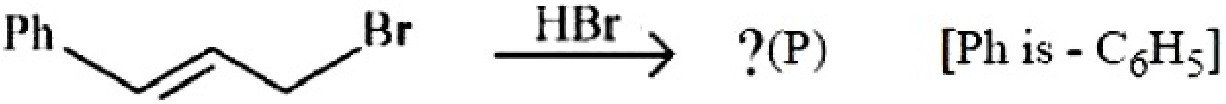
Solution:



It is bimolecular nucleophilic substitution (SN^2) which occur at benzylic carbon by inversion in configuration. This reaction cannot undergo substitution at benzene ring.

Question33

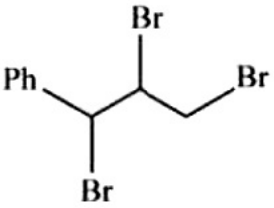
The major product (P) in the reaction



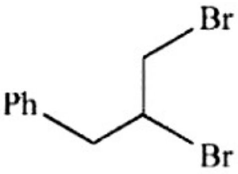
[28-Jun-2022-Shift-1]

Options:

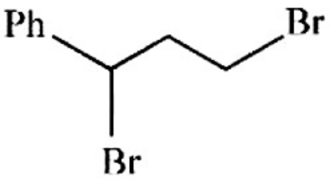
A.



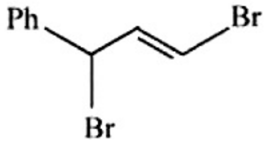
B.



C.

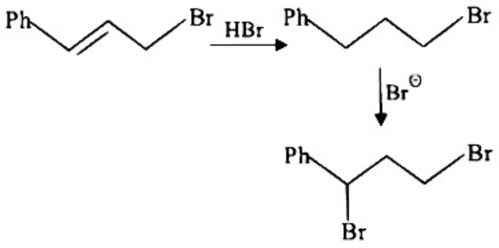


D.



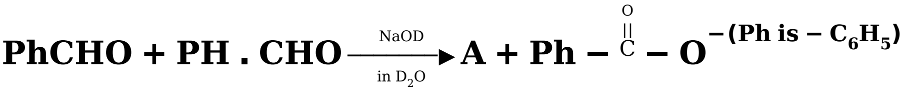
Answer: C

Solution:



Question34

The correct structure of product 'A' formed in the following reaction.



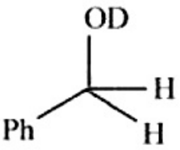
$$\mathbf{PhCHO + PH\,.\,CHO \xrightarrow[\text{in } D_2O]{\text{NaOD}} A + Ph - \overset{\overset{\text{O}}{||}}{C} - O^{-}(Ph\ is - C_6H_5)}$$

is

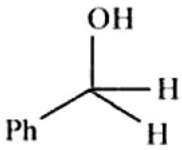
[28-Jun-2022-Shift-1]

Options:

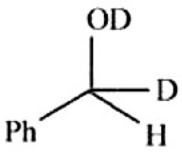
A.



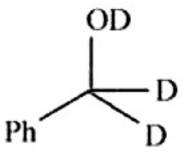
B.



C.

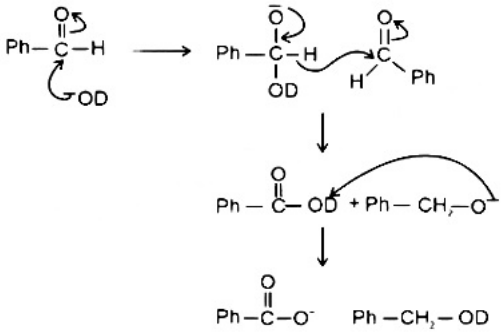


D.



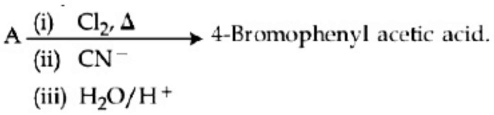
Answer: A

Solution:



Question35

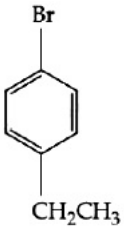
In the above reaction 'A' is



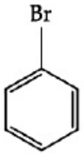
[28-Jun-2022-Shift-2]

Options:

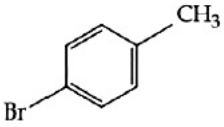
A.



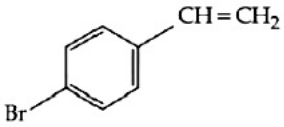
B.



C.

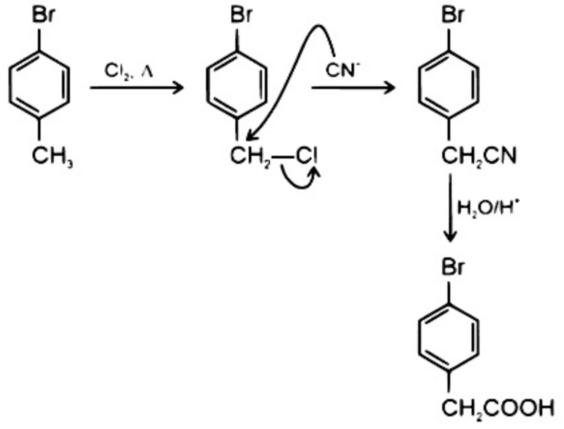


D.



Answer: C

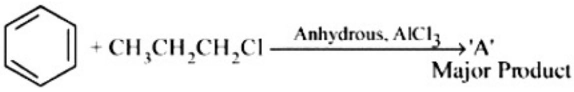
Solution:



4-bromophenyl
acetic acid

Question36

The stable carbocation formed in the above reaction is



[29-Jun-2022-Shift-2]

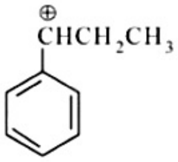
Options:

A. $CH_3CH_2\overset{\oplus}{C}H_2$

B. $CH_3\overset{\oplus}{C}H_2$

C. $CH_3-\overset{\oplus}{CH}-CH_3$

D.



Answer: C

Solution:

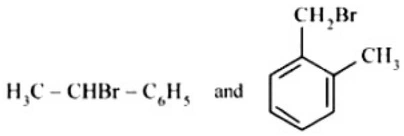
Solution:
Initially $CH_3-CH_2-CH_2^+$is formed. On rearrangement $CH_3-CH-CH_3$ stable carbocation is formed.

Question37

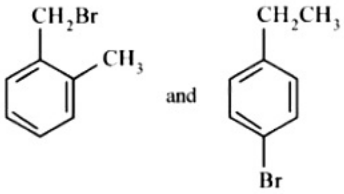
Two isomers (A) and (B) with Molar mass 184g / mol and elemental composition C, 52.2%; H, 4.9% and Br 42.9% gave benzoic acid and p-bromobenzoic acid, respectively on oxidation with $KMnO_4$. Isomer 'A' is optically active and gives a pale yellow precipitate when warmed with alcoholic $AgNO_3$. Isomer ' A ' and ' B ' are, respectively
[29-Jun-2022-Shift-2]

Options:

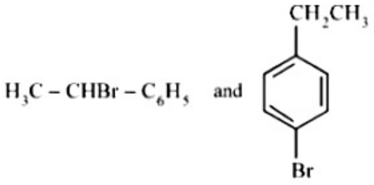
A.



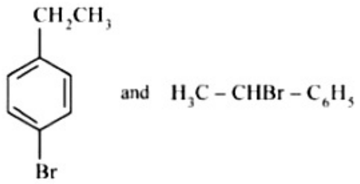
B.



C.

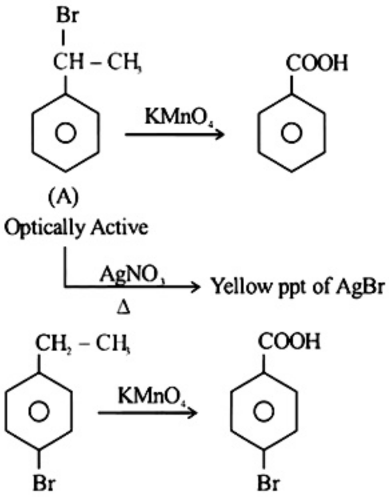


D.

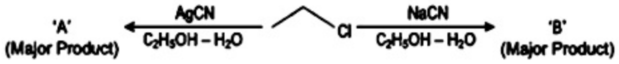


Answer: C

Solution:



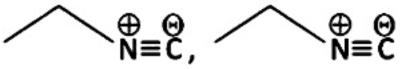
Question38



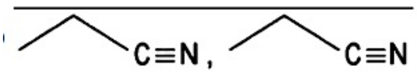
Considering the above reactions, the compound ' A ́ and compound ' B ' respectively are :
[29-Jul-2022-Shift-1]

Options:

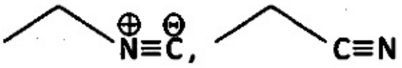
A.



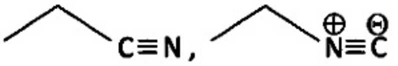
B.



C.

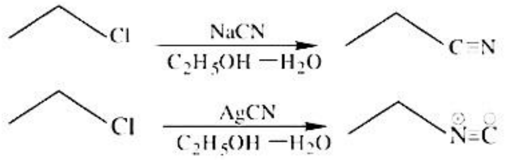


D.



Answer: C

Solution:

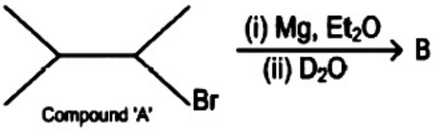


In NaCN; carbon is more nucleophilic atom.

Whereas in AgCN; Ag − C has covalent bond.

Question39

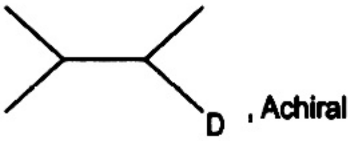
Compound 'A' undergoes following sequence of reactions to give compound ' B '. The correct structure and chirality of compound ' B ' is
[where Et is $-C_2H_5$]



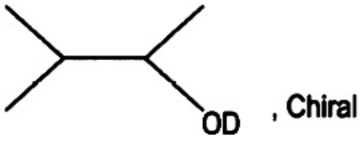
[29-Jul-2022-Shift-2]

Options:

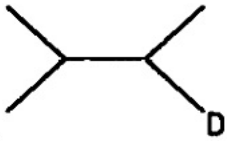
A.



B.

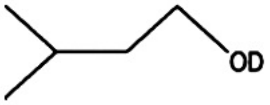


C.



, Chiral

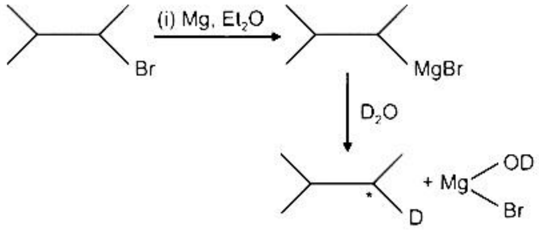
D.



, Achiral

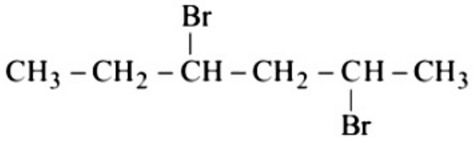
Answer: C

Solution:



Question40

The product formed in the first step of the reaction of

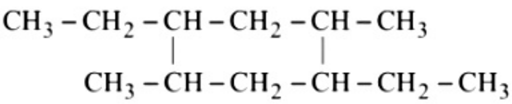


$$\begin{array}{c}\mathrm{Br}\\ |\\ \mathrm{CH_3-CH_2-CH-CH_2-CH-CH_3}\\ \qquad\qquad\qquad\qquad\qquad|\\ \qquad\qquad\qquad\qquad\qquad\mathrm{Br}\end{array}$$

with excess Mg / Et_2O ($Et = C_2H_5$) text
[24 Feb 2021 Shift 1]

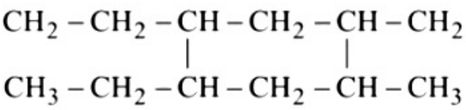
Options:

A.



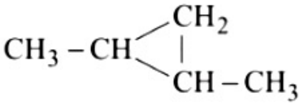
$$\begin{array}{l}\mathrm{CH_3-CH_2-CH-CH_2-CH-CH_3}\\ \qquad\qquad\quad|\qquad\qquad\quad|\\ \qquad\quad\mathrm{CH_3-CH-CH_2-CH-CH_2-CH_3}\end{array}$$

B.

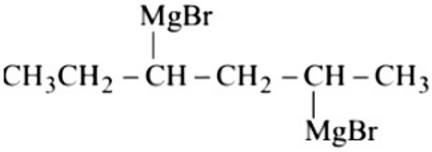


$$\begin{array}{l}\mathrm{CH_2-CH_2-CH-CH_2-CH-CH_2}\\ \qquad\qquad\qquad|\qquad\qquad\quad|\\ \mathrm{CH_3-CH_2-CH-CH_2-CH-CH_3}\end{array}$$

C.



D.

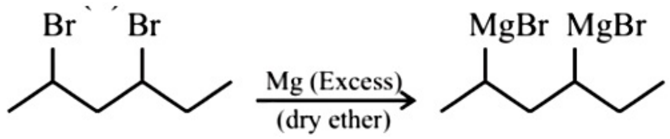


$$\begin{array}{l}\qquad\qquad\mathrm{MgBr}\\ \qquad\qquad\quad|\\ \mathrm{CH_3CH_2-CH-CH_2-CH-CH_3}\\ \qquad\qquad\qquad\qquad\quad|\\ \qquad\qquad\qquad\qquad\mathrm{MgBr}\end{array}$$

Answer: D

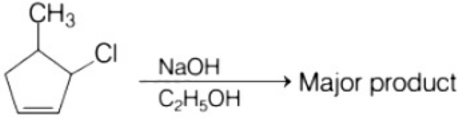
Solution:

Solution:



Question41

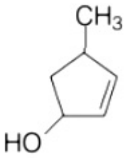
The major product of the following reaction is



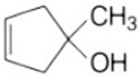
[31 Aug 2021 Shift 2]

Options:

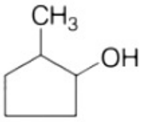
A.



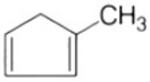
B.



C.



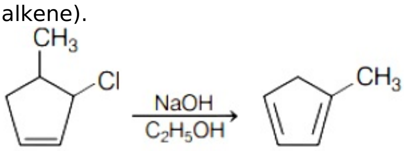
D.



Answer: D

Solution:

In the given reaction E_2 elimination reaction takes place in which two substituents are removed from a molecule to form double bond (alkene).



1-methyl cyclopent -1-3-diene (Major product)

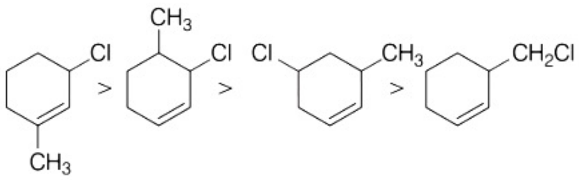
Question42

The correct order of reactivity of the given chlorides with acetate in acetic acid is

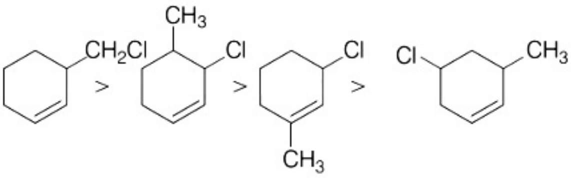
[31 Aug 2021 Shift 1]

Options:

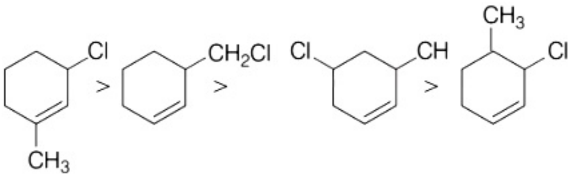
A.



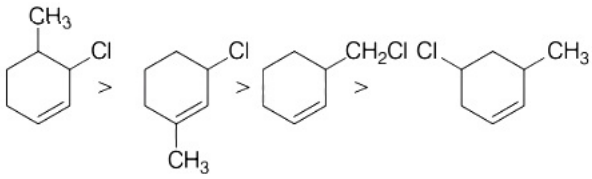
B.



C.



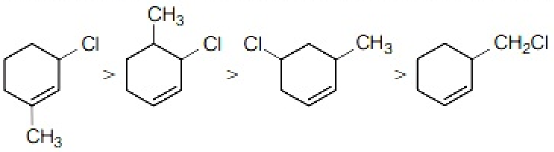
D.



Answer: A

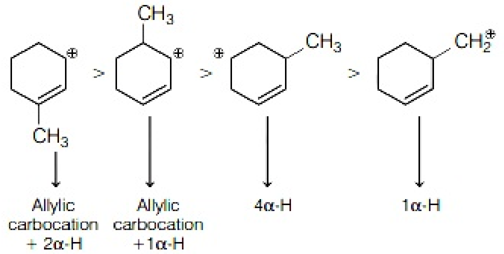
Solution:

The correct order of reactivity of chlorides with acetate in acetic acid is



The given chlorides undergoes S_N1 reaction. So, as the stability of carbocation formed increases, rate of reaction increases.

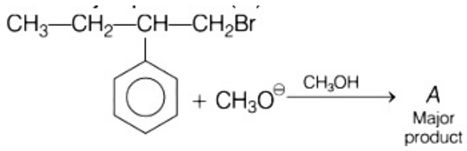
Stability of carbocation is as follows



Hence, correct option is (a).

Question43

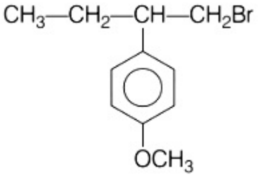
The major product (A) formed in the reaction given below is



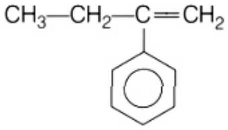
[27 Aug 2021 Shift 2]

Options:

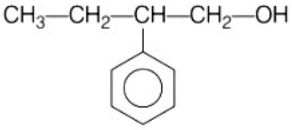
A.



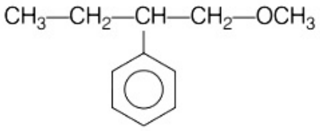
B.



C.



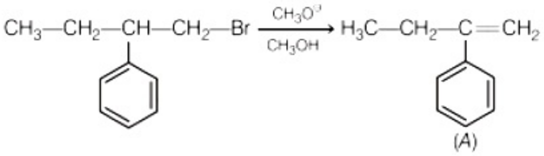
D.



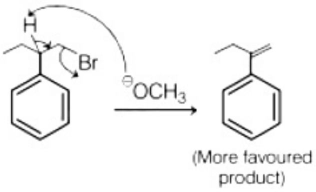
Answer: B

Solution:

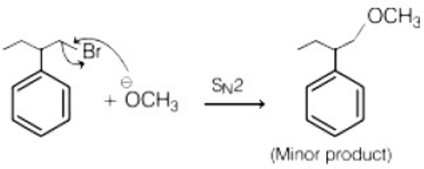
Solution:
On reaction of haloalkane with methoxide ion, alkene is formed.



Mechanism



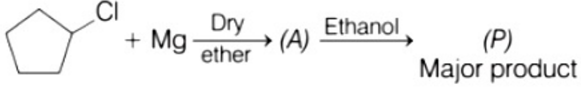
- $\overset{\ominus}{O}CH_3$ will act as a base due to its small size and high electron density and therefore, abstracts proton to form double bond which is in conjugation with aromatic ring.
- The $\overset{\ominus}{O}CH_3$ when acts as nucleophile undergoes nucleophilic substitution and replaces $Br^{\ominus}$ to form ether, which is a minor product.



So, option (b) is correct.

Question44

In the following sequence of reactions the P is

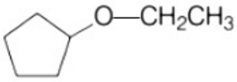


[27 Aug 2021 Shift 1]

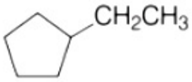
Options:

A.

B.



C.

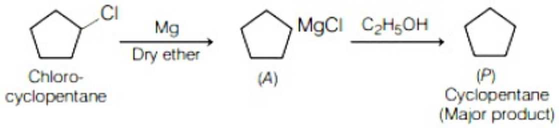


D.

Answer: A

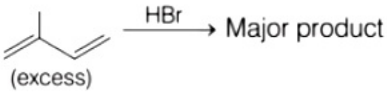
Solution:

In the first step, Grignard reagent is obtained. In the second step, acid-base reaction occurs. Due to presence of an acidic hydrogen in alcohol, neutralisation reaction takes place that produces alkane and water.
The reaction is



Question45

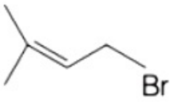
The major product formed in the following reaction is



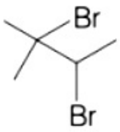
[26 Aug 2021 Shift 1]

Options:

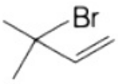
A.



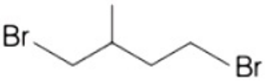
B.



C.

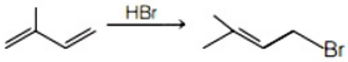


D.

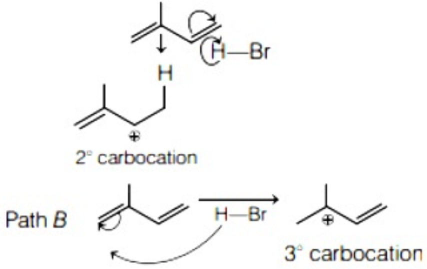


Answer: A

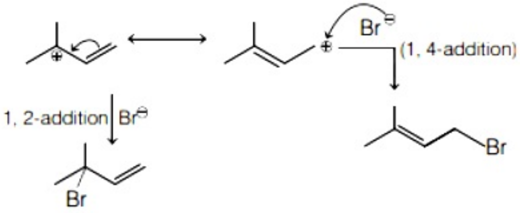
Solution:



2 - methylbut - 1, 3 - diene 1 - bromo 3 - methylbut - 2 - ene
This addition is known as 1, 4 - addition.
Mechanism This reaction can undergoes two pathways Path A



Out of the two intermediates formed in two paths, the path B intermediate is more stable as it has more stable carbocation. So, major product will be formed because of path B.



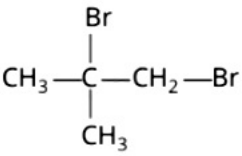
1, 2 -addition product is formed at low temperature and will be less stable as double bond is less substituted. 1, 4 - addition is thermodynamically stable product as double bond is more substituted. As diene is in excess and HBr is limited in reaction, so diene cannot be formed.
So option (b) is incorrect.

Question46

Excess of isobutane on reaction with Br_2 in presence of light at 125°C gives which one of the following, as the major product?
[26 Aug 2021 Shift 1]

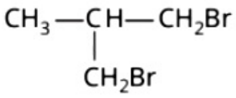
Options:

A.



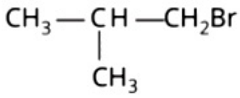
$$CH_3-\underset{CH_3}{\overset{Br}{C}}-CH_2-Br$$

B.



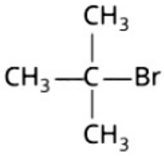
$CH_3-\underset{CH_2Br}{\underset{|}{CH}}-CH_2Br$

C.



$CH_3-\underset{CH_3}{\underset{|}{CH}}-CH_2Br$

D.

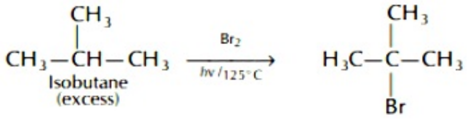


$CH_3-\overset{CH_3}{\overset{|}{\underset{CH_3}{\underset{|}{C}}}}-Br$

Answer: D

Solution:

Excess of isobutane reacts with Br_2 in presence of light at $125°C$ gives 1 - bromo - 2 - methyl propane as major product.

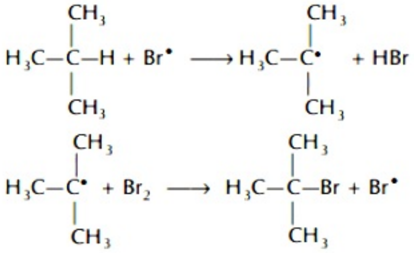


Mechanism The above reaction is halogenation of alkane via free radical substitution reaction.

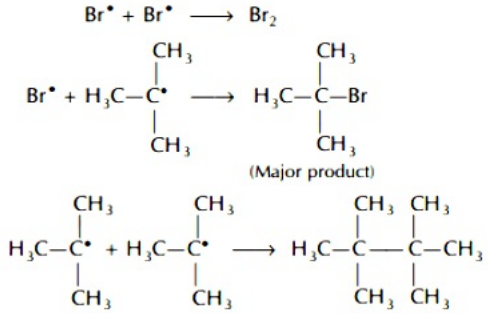
Initiation step

$Br_2\xrightarrow{hv}Br^{\bullet}+Br^{\bullet}$

Propagation step



Termination step

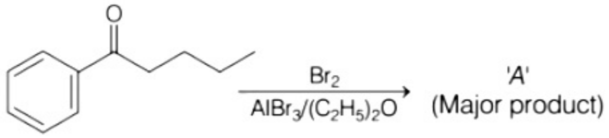


Reactivity order of abstraction of H towards bromination of alkane as more stable alkyl free radical is formed as follows

$3°H > 2°H > 1°H$

Since, isobutane is in excess, so dibromination of single isobutane is not favourable reaction. This make (a) and (b) incorrect options.

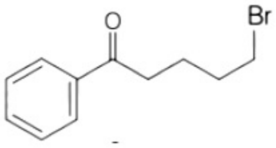
Question47



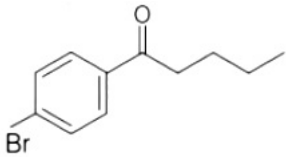
Consider the given reaction, the product A is [26 Aug 2021 Shift 2]

Options:

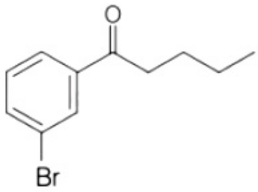
A.



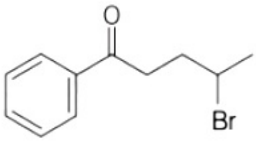
B.



C.

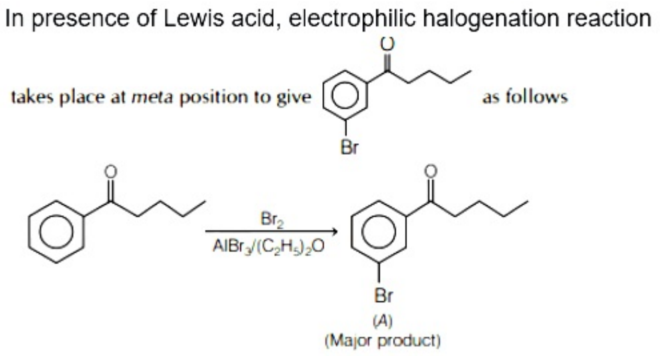


D.



Answer: C

Solution:



In presence of Lewis acid, electrophilic halogenation reaction takes place at *meta* position to give as follows

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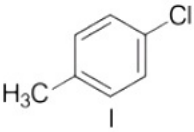
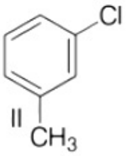
Question48

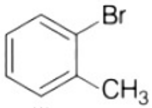
Among the following compounds I - IV, which one forms a yellow precipitate on reacting sequentially with
(i) NaOH
(ii) dil. HNO_3
(iii) $AgNO_3$?



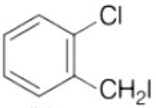
I



II



III



IV

[26 Aug 2021 Shift 1]

Options:

A. II

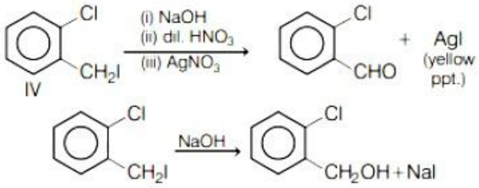
B. IV

C. I

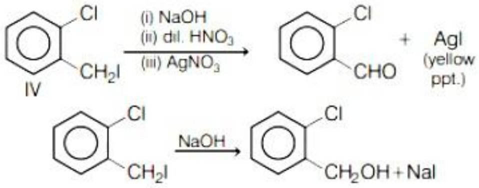
D. III

Answer: B

Solution:



This compound halide will only give yellow ppt. as benzyl carbocation formed shown below is highly stable by conjugation.



Other compounds halide cannot be removed because their corresponding carbocation is highly unstable.

Question49

In the following sequence of reactions,

$$C_3H_6 \xrightarrow{H^+/H_2O} A \xrightarrow[\text{dil. KOH}]{\text{KIO}} B + C$$

The compounds B and C respectively are
[1 Sep 2021 Shift 2]

Options:

A. Cl_3COOK, HCOOH

B. Cl_3COOK, CH_3I

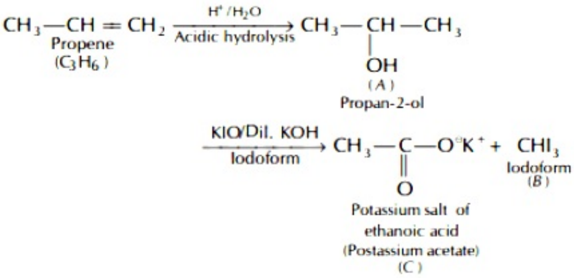
C. CH_3, HCOOK

D. CHI_3, CH_3COOK

Answer: D

Solution:

Propene (C_3H_6) undergoes acidic hydrolysis to give A which is 2° alcohol. This alcohol undergoes iodoform reaction in presence of KIO and dil. KOH to give iodoform along with potassium salt of carboxylic acid.
This reaction is known as iodoform test.

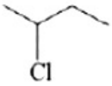


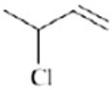
Question50

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

(A) 

(B) 

(C) 

(D) 

[Jan. 08,2020 (I)]

Options:

A. D > B > C > A

B. B > D > A > C

C. B > D > C > A

D. B > A > D > C

Answer: A

Solution:

Solution:
E_1 reaction proceeds via carbocation formation, therefore greater the stability of carbocation, faster will be the E_1 reaction. Thus correct decreasing order of the given halides towards dehydrohalogenation by E_1 is
D > B > C > A

Question51

Consider the following reactions:

(1) $(CH_3)_3CCH(OH)CH_3 \xrightarrow{\text{conc. } H_2SO_4}$

(2) $(CH_3)_2CH\,CH(Br)CH_3 \xrightarrow{\text{alc KOH}}$

(3) $(CH_3)_2CH\,CH(Br)CH_3 \xrightarrow{(CH_3)_3O^-K^{\oplus}}$

(4) $-CH_2-CHO \xrightarrow{\Delta}$

Which of these reaction(s) will not produce Saytzeff product?
[Jan. 07,2020 (I)]

Options:

A. (1), (3) and (4)

B. (4) only

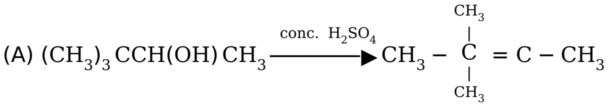
C. (3) only

D. (2) and (4)

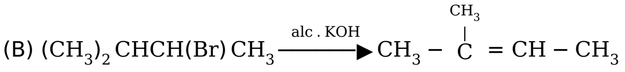
Answer: C

Solution:

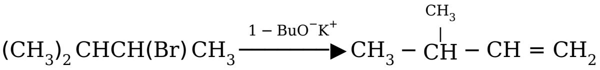
Solution:



$$\text{(A) } (CH_3)_3CCH(OH)CH_3 \xrightarrow{\text{conc. } H_2SO_4} CH_3-\underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}}=C-CH_3$$

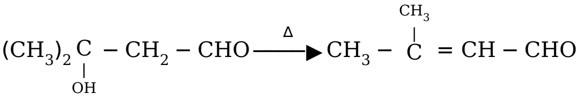


$$\text{(B) } (CH_3)_2CHCH(Br)CH_3 \xrightarrow{\text{alc. KOH}} CH_3-\overset{CH_3}{\overset{|}{C}}=CH-CH_3$$

(C) 

$(CH_3)_2CHCH(Br)CH_3 \xrightarrow{1-BuO^-K^+} CH_3-\overset{CH_3}{CH}-CH=CH_2$

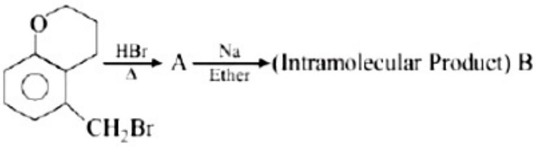
Due to bulky nature of tertiary butoxide, the least hindered hydrogen is eliminated. Therefore, Hoffiman product is formed.

(D) 

$(CH_3)_2\underset{OH}{C}-CH_2-CHO \xrightarrow{\Delta} CH_3-\overset{CH_3}{C}=CH-CHO$

Question52

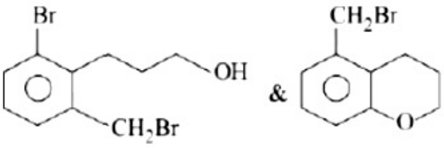
In the following reaction sequence, structures of A and B, respectively will be:



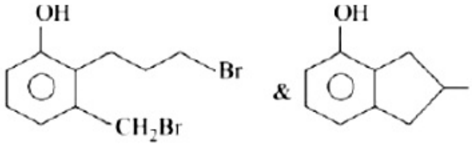
[Jan. 07, 2020 (II)]

Options:

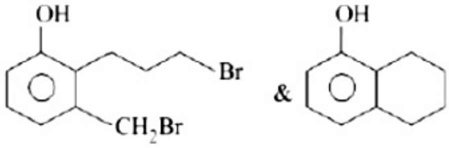
A.



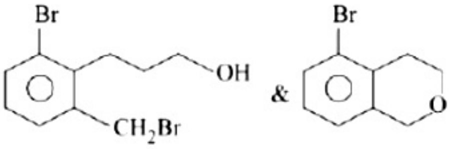
B.



C.

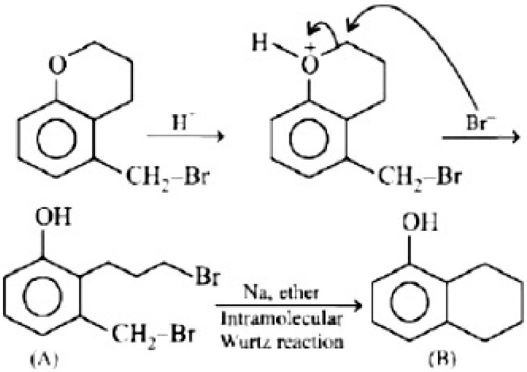


D.



Answer: C

Solution:

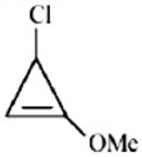


Question53

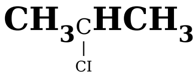
The decreasing order of reactivity of the following organic molecules towards $AgNO_3$, solution is:

(A)

(B)



(C)



$CH_3\underset{|\atop Cl}{C}HCH_3$

(D)

$CH_3\underset{|\atop Cl}{C}HCH_2NO_2$

[Sep. 04,2020 (I)]

Options:

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

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

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

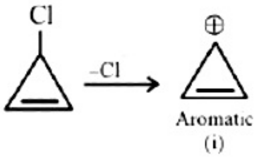
D. (B) > (A) > (C) > (D)

Answer: D

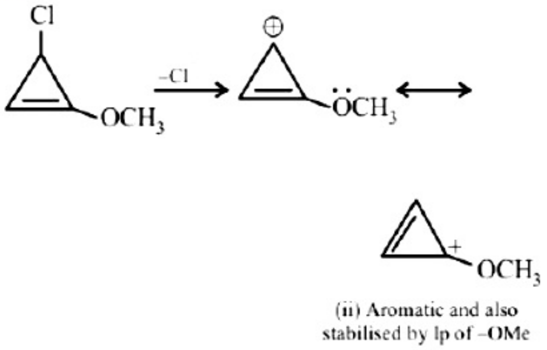
Solution:

Given reaction is S_N1 reaction. In S_N1 reaction Rate of reaction ∝ Stability of C^+

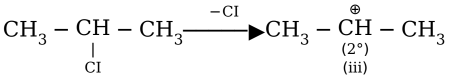
(A)



(B)

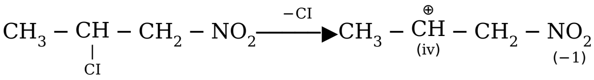


(C)



$CH_3-\underset{|\atop Cl}{CH}-CH_3\xrightarrow{-Cl}CH_3-\underset{(2°)\atop(iii)}{\overset{\oplus}{CH}}-CH_3$

(D)



$CH_3-\underset{|\atop Cl}{CH}-CH_2-NO_2\xrightarrow{-Cl}CH_3-\underset{(iv)}{\overset{\oplus}{CH}}-CH_2-\underset{(-1)}{NO_2}$

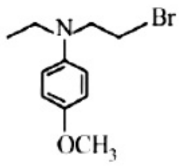
Stability of C^+ : ii > i > iii > iv
Reactivity order : B > A > C > D

Question54

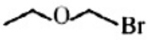
Which of the following compounds will form the precipitate with aq. $AgNO_3$ solution most readily?
[Sep. 04,2020 (II)]

Options:

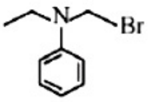
A.



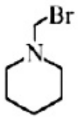
B.



C.



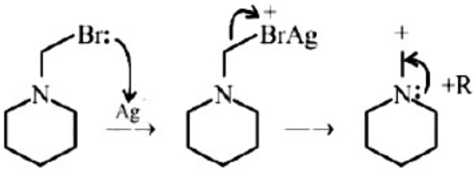
D.



Answer: D

Solution:

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



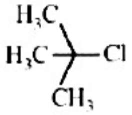
Most stable carbocation due to +R effect of N .

Question55

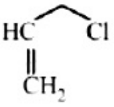
Among the following compounds, which one has the shortest C - Cl bond? [Sep. 04,2020 (II)]

Options:

A.

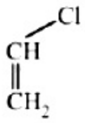


B.



C. H_3C-CI

D.



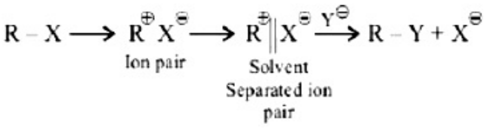
Answer: D

Solution:

Solution:
Due to conjugation of lonepair of Cl with π bond, partial double bond character decreases bond length that's why compound (d) has shortest C − Cl bond length.

Question56

The mechanism of S_N1 reaction is given as:



$$R-X \longrightarrow \underset{\text{Ion pair}}{\overset{\oplus}{R}\overset{\ominus}{X}} \longrightarrow \underset{\text{Solvent Separated ion pair}}{\overset{\oplus}{R}\|\overset{\ominus}{X}} \xrightarrow{Y^{\ominus}} R-Y+\overset{\ominus}{X}$$

A student writes general characteristics based on the given mechanism as:
(1) The reaction is favoured by weak nucleophiles.
(2) $R^{\oplus}$ would be easily formed if the substituents are bulky.
(3) The reaction is accompanied byracemization.
(4) The reaction is favoured by non-polar solvents. Which observations are correct? [Sep. 03,2020 (I)]

Options:

A. (1) and (2)

B. (1) and (3)

C. (1), (2) and (3)

D. (2) and (4)

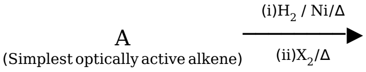
Answer: C

Solution:

Solution:
Above reaction is S_N1 reaction as it proceeds via formation of carbocation. Polar protic solvent is more suitable for S_N1 and so racemisation takes place.

Question57

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



$$\underset{\text{(Simplest optically active alkene)}}{A} \xrightarrow[\text{(ii)}X_2/\Delta]{\text{(i)}H_2/Ni/\Delta}$$

[NV, Sep. 03,2020 (I)]

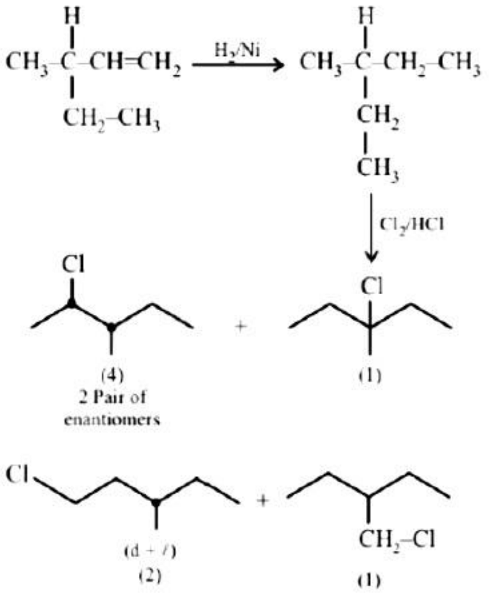
Options:

A.

D.

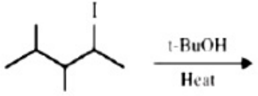
Answer: 8

Solution:



Question58

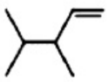
The major product in the following reaction is:



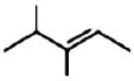
[Sep. 03,2020 (II)]

Options:

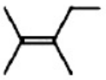
A.



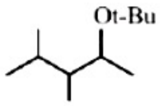
B.



C.

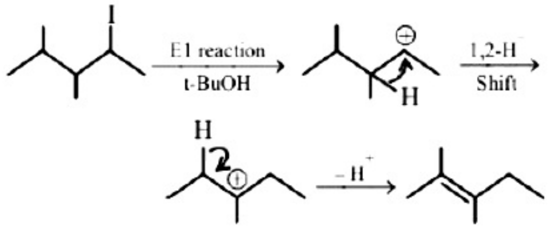


D.



Answer: C

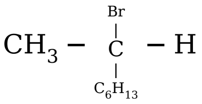
Solution:

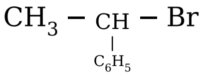


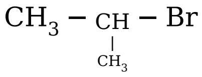
Question59

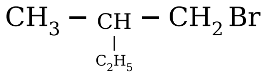
Which of the following compounds will show retention in configuration on nucleophic substitution by OH$^-$ ion?
[Sep. 02,2020 (I)]

Options:

A. 
$CH_3-\overset{Br}{\underset{C_6H_{13}}{C}}-H$

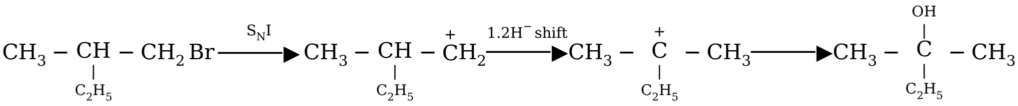
B. 
$CH_3-\underset{C_6H_5}{CH}-Br$

C. 
$CH_3-\underset{CH_3}{CH}-Br$

D. 
$CH_3-\underset{C_2H_5}{CH}-CH_2Br$

Answer: D

Solution:

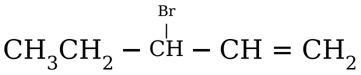


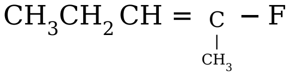
$$CH_3-\underset{C_2H_5}{CH}-CH_2Br \xrightarrow{S_NI} CH_3-\underset{C_2H_5}{CH}-\overset{+}{C}H_2 \xrightarrow{1.2H^-\text{ shift}} CH_3-\underset{C_2H_5}{\overset{+}{C}}-CH_3 \longrightarrow CH_3-\overset{OH}{\underset{C_2H_5}{C}}-CH_3$$

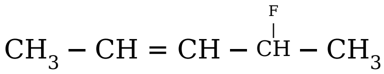
Question60

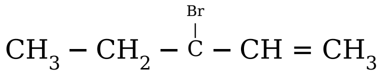
The major product obtained from E 2 -elimination of 3-bromo-2-fluoropentane is:
[Sep. 02,2020 (II)]

Options:

A. 
$CH_3CH_2-\overset{Br}{CH}-CH=CH_2$

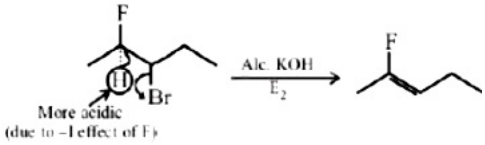
B. 
$CH_3CH_2CH=\underset{CH_3}{C}-F$

C. 
$CH_3-CH=CH-\overset{F}{CH}-CH_3$

D. 
$CH_3-CH_2-\overset{Br}{C}-CH=CH_3$

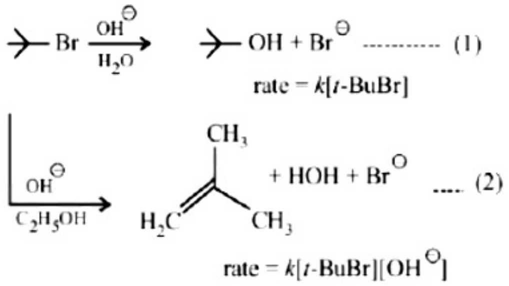
Answer: B

Solution:



Question61

Consider the reaction sequence given below:



Which of the following statements is true? [Sep. 02,2020 (II)]

Options:

A. Changing the base from $OH^{\ominus}$ to $^{\ominus}OR$ will have no effect on reaction (2).

B. Changing the concentration of base will have no effect on reaction (1).

C. Doubling the concentration of base will double the rate of both the reactions.

D. Changing the concentration of base will have no effect on reaction (2).

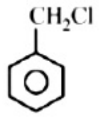
Answer: B

Solution:

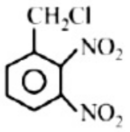
First reaction is S_N1 in which rate does not depend on conc. of nucleophile but depends on reactant conc. Second reaction is E 2 reaction in which rate depends on conc. of base as well as reactant conc. Therefore, changing in the concentration of base will have no effect on rate of reaction (1).

Question62

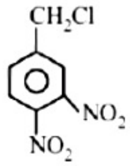
The decreasing order of reactivity of the following compounds towards nucleophilic substitution (S_N2) is :



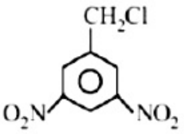
(I)



(II)



(III)



(IV)

[Sep. 03,2020 (II)]

Options:

A. (I I) > (I I I) > (I) > (I V)

B. (I I) > (I I I) > (I V) > (T)

C. (I I I) > (I I) > (I V) > (I)

D. (I V) > (I I) > (I I I) > (I)

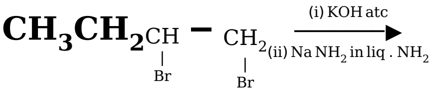
Answer: B

Solution:

$S_N{}^2$ reactions depend upon $-I$ and $-M$ effect on substrate. On increasing $-I$ and $-M$ effect, rate of S_N2 reaction will increase.

Question63

The major product of the following reaction is:



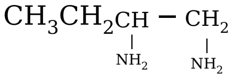
$CH_3CH_2\underset{\underset{Br}{|}}{CH}-\underset{\underset{Br}{|}}{CH_2}\xrightarrow[\text{(ii) Na}NH_2\text{ in liq . }NH_2]{\text{(i) KOH atc}}$

[Jan. 12,2019(II)]

Options:

A. $CH_3CH = C = CH_2$

B.



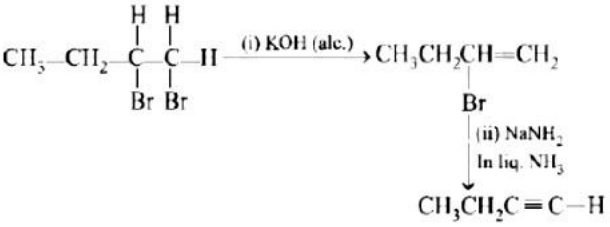
$CH_3CH_2\underset{\underset{NH_2}{|}}{CH}-\underset{\underset{NH_2}{|}}{CH_2}$

C. $CH_3CH = CHCH_2NH_2$

D. $CH_3CH_2C \equiv CH$

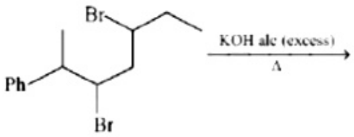
Answer: D

Solution:



Question64

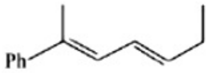
The major product of the following reaction is:



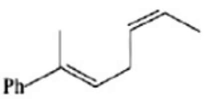
[Jan. 10,2019(I)]

Options:

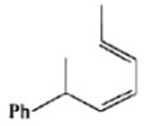
A.



B.



C.

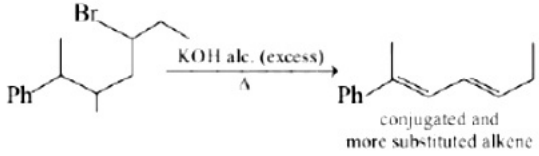


D.

Answer: A

Solution:

Dehydrohalogenation (β -elimination) occurs as:



Question65

Which hydrogen in compound (E) is easily replaceable during bromination reaction in presence of light?

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

[Jan. 10,2019(I)]

Options:

A. α - hydrogen

B. γ - hydrogen

C. δ - hydrogen

D. β - hydrogen

Answer: B

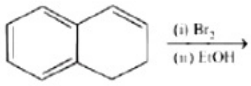
Solution:

Allylic H is easily replaced due to the greater stability of allylic free radical.

$CH_3 - CH_2 - CH = CH_2 + Br_2 \xrightarrow{hv} CH_3 - \underset{\underset{Br}{|}}{CH} - CH = CH_2$

Question66

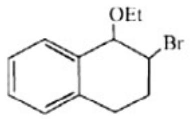
The major product of the following reaction is:



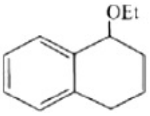
[Jan. 9, 2019(I)]

Options:

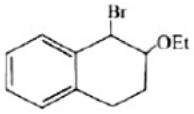
A.



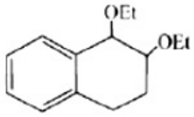
B.



C.



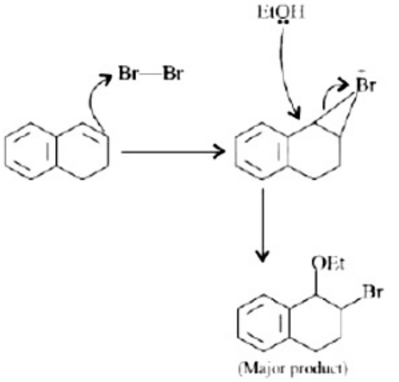
D.



Answer: A

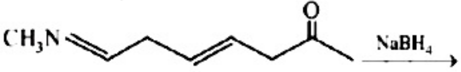
Solution:

Mechanism involved for the given reaction is:



Question67

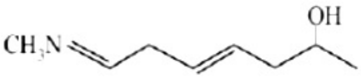
The major product of the following reaction is:



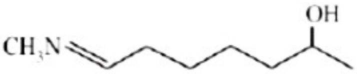
[Jan. 10,2019(II)]

Options:

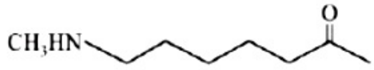
A.



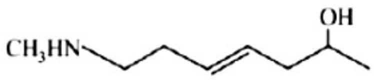
B.



C.



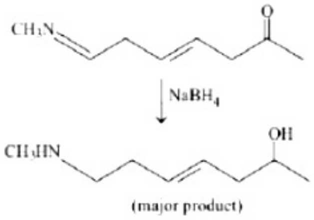
D.



Answer: D

Solution:

Solution:
Sodium borohydride is a selective reducing agent. It reduces carbonyl group to alcoholic group, N methylimino group ($\mathrm{M\,eN}\ = \mathrm{CH}\ -$) to 2° amines, but does not reduce an isolated carbon-carbon double bond. Reaction involved:



Question68

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 - clectrons, the cleavage is difficult because of strong bonding.
[April 12, 2019 (II)]

Options:

A. Both (A) and (R) are wrong statements.

B. Both (A) and (R) are correct statements and (R) is the correct explanation of (A)

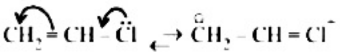
C. Both(A) and (R) are correct statements but (R) is not the correct explanation of (A).

D. (A) is a correct statement but (R) is a wrong statement.

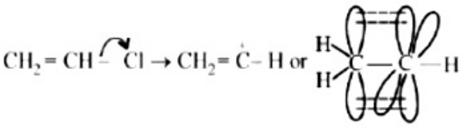
Answer: D

Solution:

Solution:



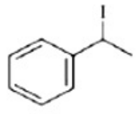
Due to partial double bond character of C -halogen bond, halogen leaves with great difficulty, if at all it does. Hence, vinyl halides do not undergo nucleophilic substitution easily. So, assertion is correct.

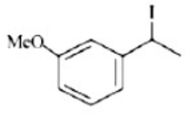


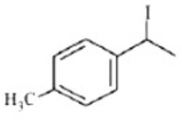
Intermediate carbocation is not stabilised by loosely heldπ electrons because empty orbital, being at 90°, cannot overlap with p -orbitals of π bond. So, reason is wrong.

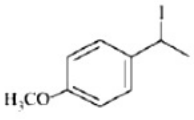
Question69

Increasing rate of $\mathrm{S_N}1$ reaction in the following compounds is :


(A)


(B)


(C)


(D)

[April 10, 2019 (I)]

Options:

A. (A) < (B) < (C) < (D)

B. (B) < (A) < (C) < (D)

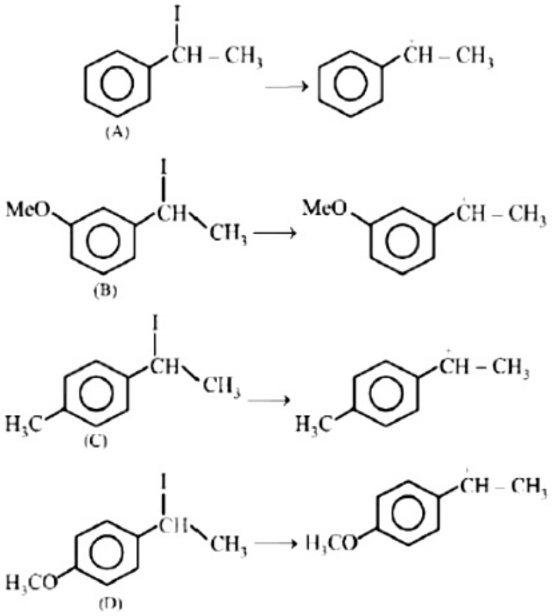
C. (B) < (A) < (D) < (B)

D. (A) < (B) < (D) < (C)

Answer: B

Solution:

Solution:
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 $-OCH_3$ group; (C) is stabilised by $+I$ and $+H$ effects of the CH_3 group; (B) is least stable due to $-$ I effect of MeO group and (A) is stabilised by $-CH_3$ as well as phenyl group. So increasing order of rate of S_N1 is (B) < (A) < (C) < (D)

Question70

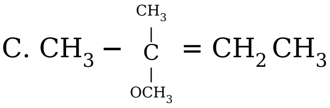
The major product of the following reaction is $CH_3-\underset{H}{\overset{CH_3}{C}}=\underset{Br}{CHCH_3}\xrightarrow{CH_3OH}$

[April 10, 2019 (I)]

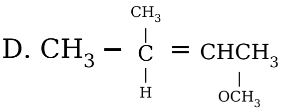
Options:

A. $CH_3-\underset{H}{\overset{CH_3}{C}}=CH=CH_2$

B. $CH_3-\overset{CH_3}{C}=CHCH_3$

C. 

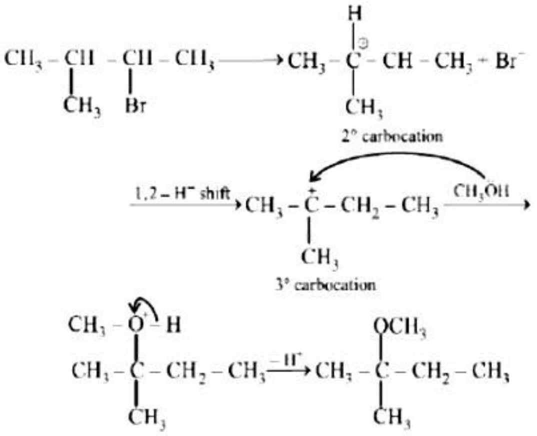
$CH_3-\underset{OCH_3}{\overset{CH_3}{C}}=CH_2CH_3$

D. 

$CH_3-\underset{H}{\overset{CH_3}{C}}=\underset{OCH_3}{CHCH_3}$

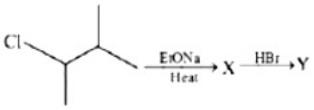
Answer: C

Solution:



Question71

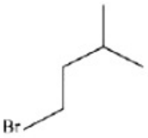
The major product ' Y ' in the following reaction is:



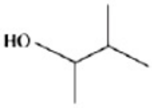
[April 10, 2019 (II)]

Options:

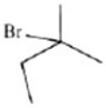
A.



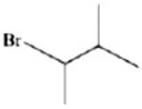
B.



C.

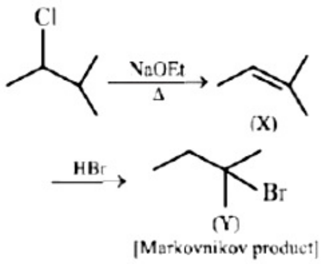


D.



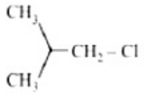
Answer: C

Solution:

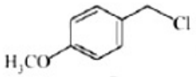


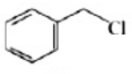
Question72

Increasing order of reactivity of the following compounds for S_N1 substitution is:


(A)


(B)


(C)


(D)

[April 9, 2019 (II)]

Options:

A. (B) < (C) < (D) < (A)

B. (B) < (C) < (A) < (D)

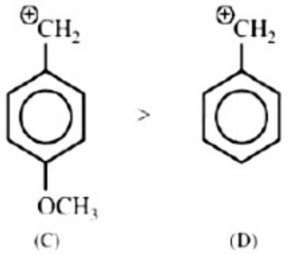
C. (B) < (A) < (D) < (C)

D. (A) < (B) < (D) < (C)

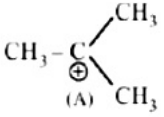
Answer: C

Solution:

In S_N1 reaction carbocation acts as an intermediate.



Carbocation produced by (C) is more stable than carbocation produced by (D) due to $+I$ effect of $-OCH_3$ group.
Further in (A) there is formation of tertiary carbocation after rearrangement while (B) is primary carbocation.


$CH_3-\overset{\oplus}{C}(CH_3)_2$
(A)

So, the correct order is (C) > (D) > (A) > (B)

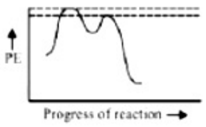
Question73

Which of the following potential energy (PE) diagrams represents the S_N I reaction?

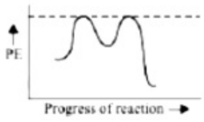
[April 9, 2019 (II)]

Options:

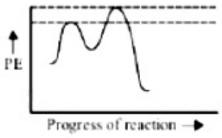
A.



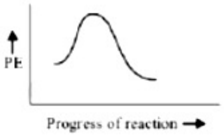
B.



C.



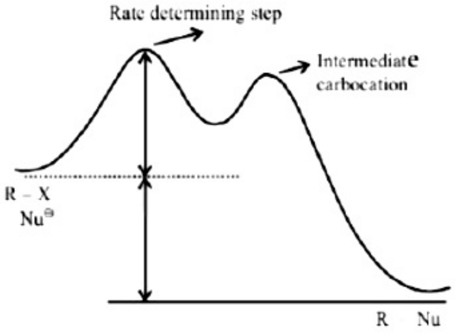
D.



Answer: A

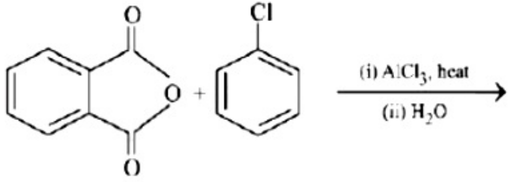
Solution:

The S_N1 reaction energy diagram illustrates the dominant part of the substrate with respect to the reaction rate. The rate determining step is the formation of the intermediate carbocation.



Question74

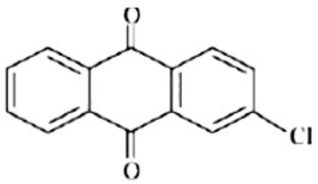
The major product of the following reaction is:



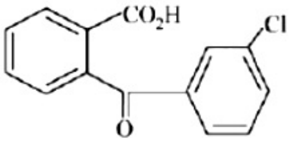
[April 8,2019 (1)]

Options:

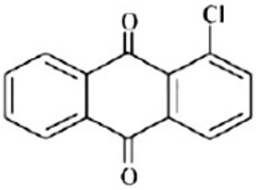
A.



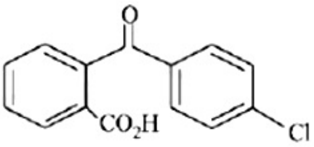
B.



C.

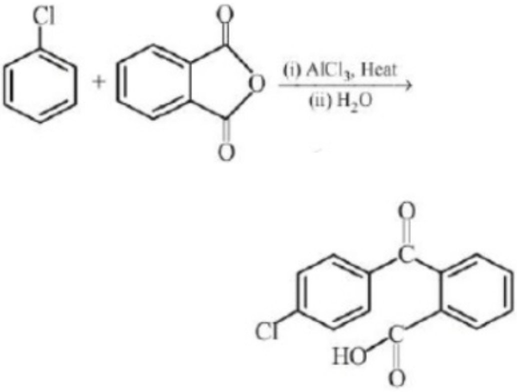


D.



Answer: D

Solution:



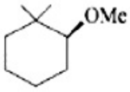
Question75

The major product of the following reaction is:

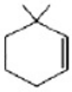
[2018]

Options:

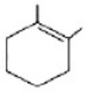
A.



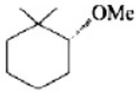
B.



C.



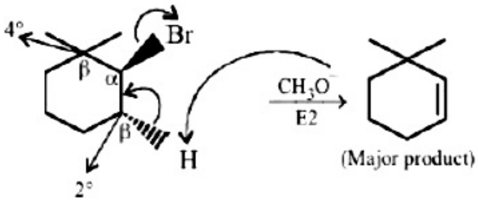
D.



Answer: B

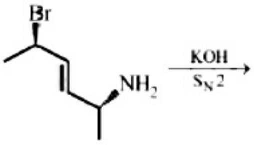
Solution:

CH_3O^- is a strong base and strong nucleophile, so favourable condition is S_N2 / $E2$.
The given alkyl halide is 2° and β carbons are 4° and 2°, so sufficiently hindered, thus $E2$ dominates over S_N2



Question76

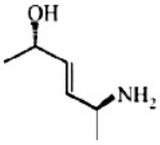
The major product of the following reaction is:



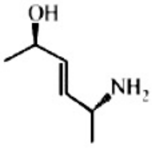
[Online April 16,2018]

Options:

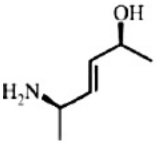
A.



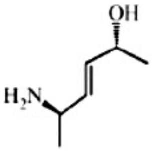
B.



C.

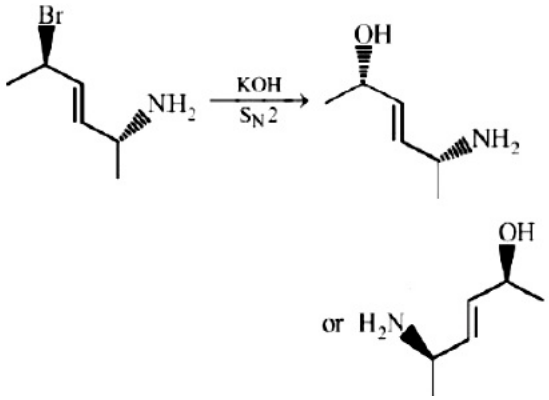


D.



Answer: C

Solution:



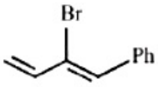
Inversion takes place at the carbon containing bromine atom.

Question77

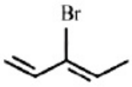
Which of the following will most readily give the dehydrohalogenation product? [Online April 15,2018(I)]

Options:

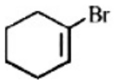
A.



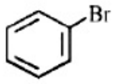
B.



C.



D.



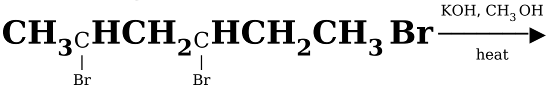
Answer: A

Solution:

Here dehydrohalogenation goes by E 1cB and most stable carbanion formation is favoured in (a).

Question78

The major product of the following reaction is:



$$CH_3\underset{\substack{|\\ Br}}{C}HCH_2\underset{\substack{|\\ Br}}{C}HCH_2CH_3\,Br \xrightarrow[\text{heat}]{\text{KOH, }CH_3OH}$$

[Online April 8,2017]

Options:

A. $CH_2 = CHCH_2CH = CHCH_3$

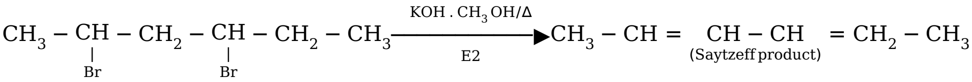
B. $CH_2 = CHCH = CHCH_2CH_3$

C. $CH_3CH = C = CHCH_2CH_3$

D. $CH_3CH = CH - CH = CHCH_3$

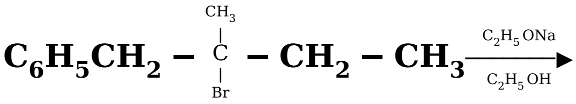
Answer: D

Solution:



$$CH_3 - \underset{Br}{\underset{|}{CH}} - CH_2 - \underset{Br}{\underset{|}{CH}} - CH_2 - CH_3 \xrightarrow[E2]{KOH\ .\ CH_3OH/\Delta} CH_3 - CH = \underset{\text{(Saytzeff product)}}{CH - CH} = CH_2 - CH_3$$

Question79

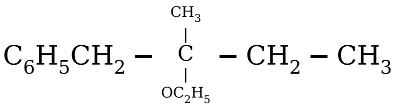


The major product of the following reaction is $C_6H_5CH_2 - \overset{CH_3}{\overset{|}{\underset{Br}{\underset{|}{C}}}} - CH_2 - CH_3 \xrightarrow[C_2H_5OH]{C_2H_5ONa}$

[Online April 8,2017]

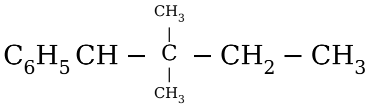
Options:

A.



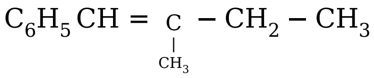
$C_6H_5CH_2 - \overset{CH_3}{\overset{|}{\underset{OC_2H_5}{\underset{|}{C}}}} - CH_2 - CH_3$

B.



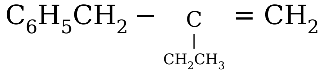
$C_6H_5CH - \overset{CH_3}{\overset{|}{\underset{CH_3}{\underset{|}{C}}}} - CH_2 - CH_3$

C.



$C_6H_5CH = \underset{CH_3}{\underset{|}{C}} - CH_2 - CH_3$

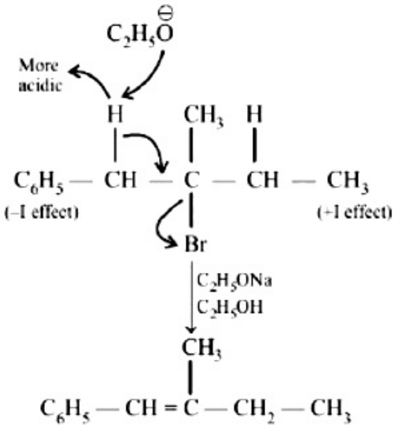
D.



$C_6H_5CH_2 - \underset{CH_2CH_3}{\underset{|}{C}} = CH_2$

Answer: C

Solution:



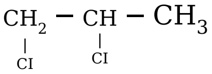
Question80

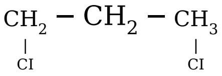
In the following reaction sequence:

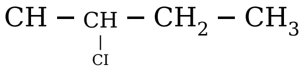
$$\underset{(C_3H_6CI_2)}{I} \xrightarrow{KOH(aq)} \mathbf{II} \xrightarrow[(ii)H_2O/H^+]{(i)CH_3MgBr} \mathbf{III} \xrightarrow{Anhy.\,ZnCI_2 + Conc.\,HCL}$$ **given turbidity immediately**

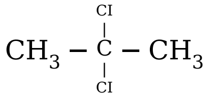
The compound I is :
[Online April 9,2017]

Options:

A. 
$\underset{CI}{CH_2} - \underset{CI}{CH} - CH_3$

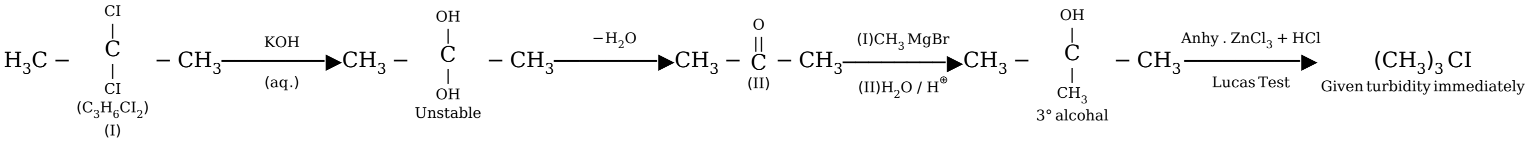
B. 
$\underset{CI}{CH_2} - CH_2 - \underset{CI}{CH_3}$

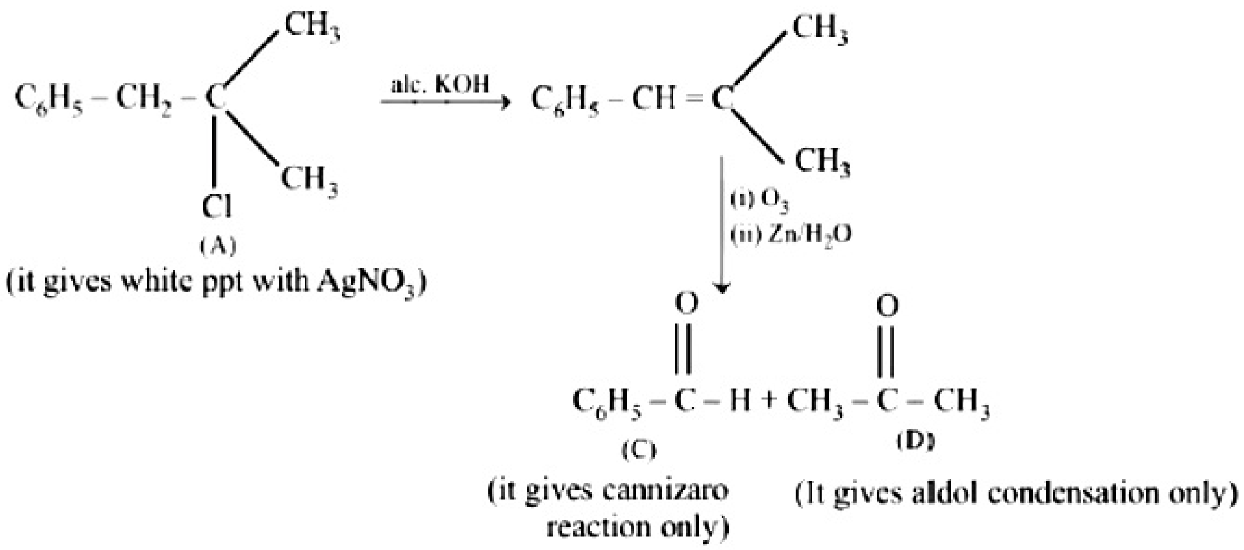
C. 
$CH - \underset{CI}{CH} - CH_2 - CH_3$

D. 
$CH_3 - \overset{CI}{\underset{CI}{C}} - CH_3$

Answer: D

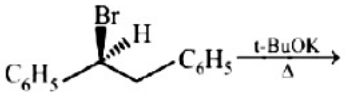
Solution:


$$\underset{\substack{(C_3H_6CI_2)\\(I)}}{H_3C - \overset{CI}{\underset{CI}{C}} - CH_3} \xrightarrow[(aq.)]{KOH} \underset{Unstable}{CH_3 - \overset{OH}{\underset{OH}{C}} - CH_3} \xrightarrow{-H_2O} \underset{(II)}{CH_3 - \overset{O}{\overset{||}{C}} - CH_3} \xrightarrow[(II)H_2O/H^{\oplus}]{(I)CH_3MgBr} \underset{3^\circ\,alcohal}{CH_3 - \overset{OH}{\underset{CH_3}{C}} - CH_3} \xrightarrow[Lucas\,Test]{Anhy.\,ZnCl_3 + HCl} \underset{Given\,turbidity\,immediately}{(CH_3)_3CI}$$



Question81

The major product obtained in the following reaction is:



[2017]

Options:

A. $(\pm)C_6H_5CH(O^tBu)CH_2C_6H_5$

B. $C_6H_5CH = CHC_6H_5$

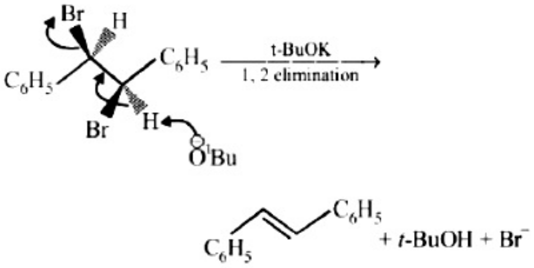
C. $(+)C_6H_5CH(O^tBu)CH_2C_6H_5$

D. $(-)C_6H_5CH(O^tBu)CH_2C_6H_5$

Answer: B

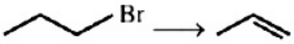
Solution:

Elimination reaction is highly favoured if (a) Bulkier base is used (b) Higher temperature is used Hence in given reaction biomolecular elimination reaction provides major product.



Question82

Which one of the following reagents is not suitable for the elimination reaction?



[Online April 10,2016]

Options:

A. NaI

B. NaOEt / EtOH

C. NaOH / H_2O

D. NaOH / H_2O – EtOH

Answer: A

Solution:

Alkyl chloride or bromide undergo substitution and get converted to an alkyl iodide on treatment with a solution of sodium iodide in acetone. e.g.

$CH_3CH_2CH_2Br + NaI \xrightarrow{\text{acetone}} CH_3CH_2CH_2I + NaBr$

This reaction is also known as Finkelstein Reaction.

Question83

The synthesis of alkyl fluorides is best accomplished by: [2015]

Options:

A. Finkelstein reaction

B. Swarts reaction

C. Free radical fluorination

D. Sandmeyer's reaction

Answer: B

Solution:

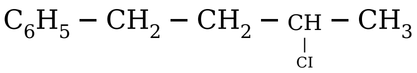
Alkyl fluorides are more conveniently prepared by heating suitable chloro − or bromo-alkanes with organic fluorides such as AsF_3, SbF_3, CoF_2, AgF, Hg_2F_2 etc. This reaction is called Swarts reaction.
$CH_3Br + AgF \longrightarrow CH_3F + AgBr$
$2CH_3CH_2Cl + Hg_2F_2 \longrightarrow 2CH_3CH_2F + Hg_2Cl_2$

Question84

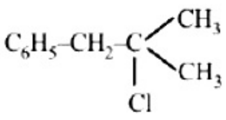
A compound A with molecular formula $C_{10}H_{13}Cl$ gives a white precipitate on adding silver nitrate solution. A on reacting with alcoholic KOH gives compound B as the main product. B on ozonolysis gives C and D. C gives Cannizaro reaction but not aldol condensation. D gives aldol condensation but not Cannizaro reaction. A is: [Online April 10,2015]

Options:

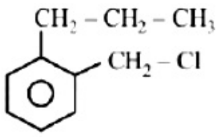
A. $C_6H_5 - CH_2 - CH_2 - CH_2 - CH_2 - Cl$

B. 
$C_6H_5 - CH_2 - CH_2 - \underset{\substack{| \\ Cl}}{CH} - CH_3$

C.



D.



Answer: C

Solution:

Compound A reacts with alc.KOH to give compound B which on further ozonolysis gives C (does not contains $\alpha - H$ atom) and D (contains $\alpha - H$ atom). This reaction sequence can be achieved by compounds in option (a) and (c). Since compound A gives white ppt. with $AgNO_3$ preferable option will be (c) as tert alkyl reacts with $AgNO_3$ more quickly.

Question85

**In S_N2 reactions, the correct order of reactivity for the following compounds: CH_3Cl, CH_3CH_2Cl, $(CH_3)_2CHCl$ and $(CH_3)_3CCl$ is:
[2014]**

Options:

A. $CH_3Cl > (CH_3)_2CHCl > CH_3CH_2Cl > (CH_3)_3CCl$

B. $CH_3Cl > CH_3CH_2Cl > (CH_3)_2CHCl > (CH_3)_3CCl$

C. $CH_3CH_2Cl > CH_3Cl > (CH_3)_2CHCl > (CH_3)_3CCl$

D. $(CH_3)_2CHCl > CH_3CH_2Cl > CH_3Cl > (CH_3)_3CCl$

Answer: B

Solution:

Steric hindrance around the carbon atom having Cl will slow down the S_N2 reaction, hence lesser the hindrance, faster will be the reaction.
So, the order of reactivity is $CH_3Cl > (CH_3)CH_2 - Cl > (CH_3)_2CH - Cl > (CH_3)_3CCl$

Question86

For the compounds CH_3Cl, CH_3Br, CH_3I and CH_3F, the correct order of increasing C-halogen bond length is:
[Online April 9,2014]

Options:

A. $CH_3F < CH_3Cl < CH_3Br < CH_3I$

B. $CH_3F < CH_3Br < CH_3Cl < CH_3I$

C. $CH_3F < CH_3I < CH_3Br < CH_3Cl$

D. $CH_3Cl < CH_3Br < CH_3F < CH_3I$

Answer: A

Solution:

Solution:
The correct order of increasing bond length is
$CH_3F < CH_3Cl < CH_3Br < CH_3I$

Question87

In a nucleophilic substitution reaction:
$R - Br + Cl^- \xrightarrow{DMF} R - Cl + Br^-$
which one of the following undergoes complete inversion of configuration?
[Online April 9. 2014]

Options:

A. $C_6H_5CH C_6H_5Br$

B. $C_6H_5CH_2Br$

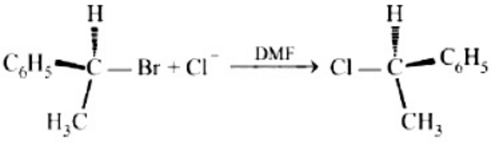
C. $C_6H_5CH CH_3Br$

D. $C_6H_5CCH_3C_6H_5Br$

Answer: C

Solution:

$C_6H_5CH CH_3Br$ being an optically active secondary alkyl bromide undergoes S_N2 nucleophilic substitution reaction. Hence it undergoes complete inversion of configuration.



Question88

The major organic compound formed by the reaction of 1, 1, 1 -trichloroethane with silver powder is:
[2014]

Options:

A. Acetylene

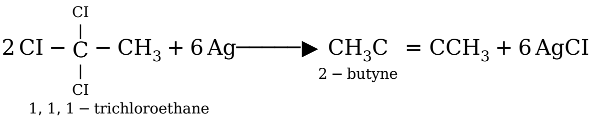
B. Ethene

C. 2 - Butyne

D. 2 - Butene

Answer: C

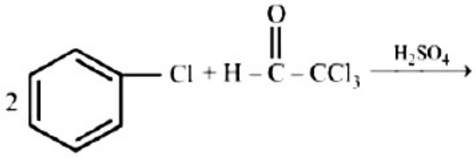
Solution:



$$\underset{1,\,1,\,1-\text{trichloroethane}}{2\,\mathrm{CI}-\underset{\mathrm{CI}}{\overset{\mathrm{CI}}{\mathrm{C}}}-\mathrm{CH_3}}+6\,\mathrm{Ag}\longrightarrow \underset{2-\text{butyne}}{\mathrm{CH_3C}\ =\mathrm{CCH_3}}+6\,\mathrm{AgCI}$$

Question89

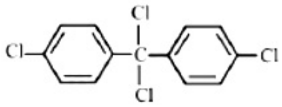
Chlorobenzne reacts with trichloro acetaldehyde in the presence of H $_2$SO$_4$



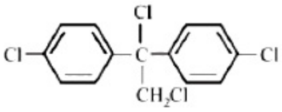
The major product formed is:
[Online April 11, 2014]

Options:

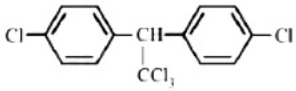
A.



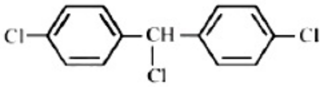
B.



C.



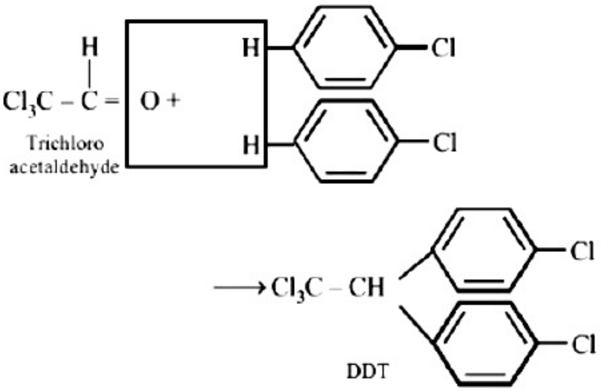
D.



Answer: C

Solution:

Chloral on reaction with chlorobenzene in the presence of a catalytic amount of sulphuric acid forms DDT (dichloro diphenyl trichloro ethane).



Question90

The major product formed when 1,1,1 -trichloro propane is treated with aqueous potassium hydroxide, is:
[Online April 19, 2014]

Options:

A. propyne

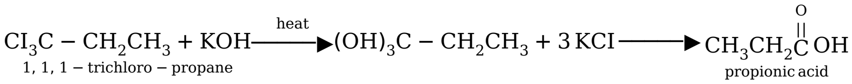
B. 1 -propanol

C. 2 -propanol

D. propionic acid

Answer: D

Solution:



$$\underset{1,1,1-\text{trichloro}-\text{propane}}{CI_3C-CH_2CH_3}+KOH\xrightarrow{\text{heat}}(OH)_3C-CH_2CH_3+3\,KCI\longrightarrow\underset{\text{propionic acid}}{CH_3CH_2\overset{O}{\overset{||}{C}}OH}$$

Question91

The order of reactivity of the given haloalkanes towards nucleophile is :
[Online April 23,2013]

Options:

A. RI $>$ RBr $>$ K Cl

B. RCl $>$ RBr $>$ RI

C. RBr $>$ RCl $>$ RI

D. RBr $>$ RI $>$ RCl

Answer: A

Solution:

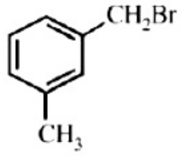
For a given alkyl group, the order of reactivity is
, $\underset{\text{increasing bond energy}}{\underline{R-I > R-Br > R-Cl > R-F}}$ decreasing halogen reactivity.
This order depends on the carbon-halogen bond energy; the carbon-fluorine bond energy is maximum and thus fluorides are least reactive while carbon iodine bond energy is minimum hence iodides are most reactive.

Question92

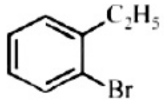
Compound (A), C_8H_9Br, gives a yellow precipitate when warmed with alcoholic $AgNO_3$. Oxidation of (A) gives an acid (B), $C_8H_6O_\_$. (B) easily forms anhydride on heating. Identify the compound (A).
[2013]

Options:

A.



B.



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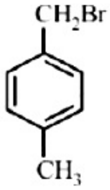

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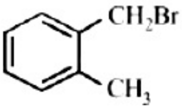
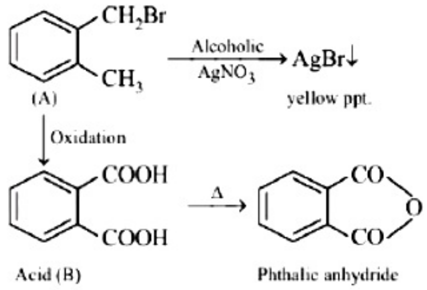


Answer: D

Solution:



Question93

The Wurtz-Fittig reaction involves condensation of :
[Online April 22. 2013]

Options:

A. two molecules of aryl halides

B. one molecule of each of aryl-halide and alkyl-halide.

C. one molecule of each of aryl-halide and phenol.

D. two molecules of aralkyl-halides.

Answer: B

Solution:

Reaction between alkyl halides, aryl halides and sodium in presence of dry ether to give substituted aromatic compounds is known as Wurtz fitting reaction $C_6H_5Cl + 2Na + ClCH_3 \longrightarrow \underset{Toluene}{C_6H_5CH_3} + 2NaCl$

Question94

Alkyl halides react with dialkyl copper reagents to give [2005]

Options:

A. alkenyl halides

B. alkanes

C. alkyl copper halides

D. alkenes

Answer: A

Solution:

Solution:
In Corey House synthesis of alkanes alkyl halides react with lithium dialkyl cuprate
$R'X + LiR_2Cu \longrightarrow R' - R + RCu + LiX$

Question95

Aryl fluoride may be prepared from arene diazonium chloride using: [Online April 9. 2013]

Options:

A. HBF_4/Δ

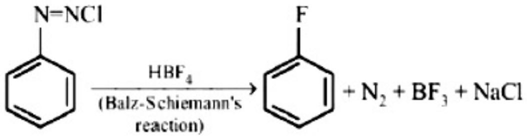
B. $HBF_4 / NaNO_2Cu, \Delta$

C. CuF / HF

D. Cu / HF

Answer: A

Solution:



Question96

Elimination of bromine from 2 -bromobutane results in the formation of -

[2005]

Options:

A. Predominantly 2 -butyne

B. Predominantly 1-butene

C. Predominantly 2 -butene

D. Equimolar mixture of 1 and 2 -butene

Answer: C

Solution:

Solution:

-+9 $CH_3 - \overset{\overset{Br}{|}}{CH} - CH_2 - CH_3 \xrightarrow{Alc.KOH} CH_3 - CH = CH - CH_3 + HBr$

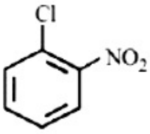
The formation of 2 -butene is in accordance to Saytzeff's rule (more substituted alkene is formed).

Question97

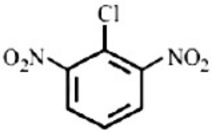
A major component of Borsch reagent is obtained by reacting hydrazine hydrate with which of the following?
[Online April 22. 2013]

Options:

A.



B.



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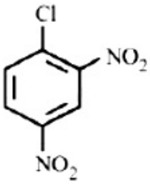
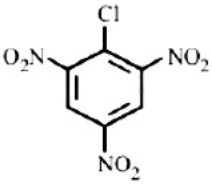


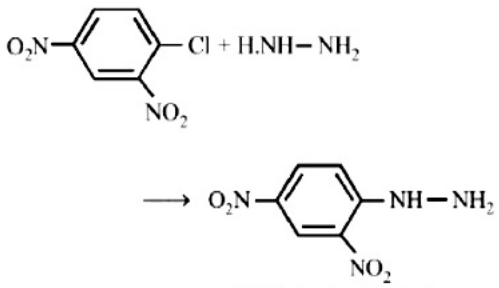
D.



Answer: C

Solution:

The major component of Borsch reagent is 2,4 dinitrophenyl hydrazine which can be obtained by reaction of 2,4 -dinitrochloro benzene and hydrazine



2,4 -Dinitrophenyl hydrazine

Question98

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

Options:

A. 8

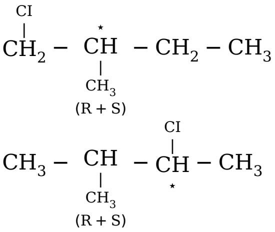
B. 2

C. 4

D. 6

Answer: D

Solution:



$$\overset{Cl}{CH_2} - \underset{\underset{(R+S)}{CH_3}}{\overset{*}{CH}} - CH_2 - CH_3$$

$$CH_3 - \underset{\underset{(R+S)}{CH_3}}{CH} - \underset{*}{\overset{Cl}{CH}} - CH_3$$

Four monochloro derivatives are chiral.

Question99

Phenyl magnesium bromide reacts with methanol to give
[2005]

Options:

A. a mixture of toluene and $Mg(OH)Br$

B. a mixture of phenol and $Mg(Me)Br$

C. a mixture of anisole and $Mg(OH)Br$

D. a mixture of benzene and $Mg(OMe)Br$

Answer: D

Solution:

Solution:
$CH_3OH + C_6H_5MgBr \longrightarrow CH_3OMgBr + C_6H_6$

Question100

$C_2H_5Br \xrightarrow{AgCN} X \xrightarrow[Zn-Hg/HCl]{Reduction} Y$, Here Y is
[Online May 7, 2012]

Options:

A. Ethyl methyl amine

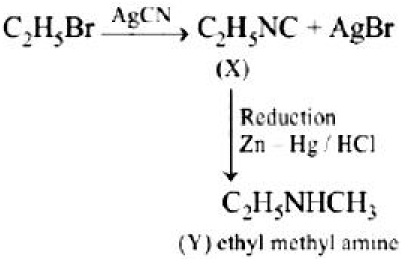
B. n -propylamine

C. Isopropylamine

D. Ethylamine

Answer: B

Solution:



$$\begin{tikzcd} C_2H_5Br \arrow[r, "AgCN"] & C_2H_5NC + AgBr \\ & (X) \arrow[d, "\begin{array}{l}Reduction\\ Zn-Hg/HCl\end{array}"] \\ & C_2H_5NHCH_3 \end{tikzcd}$$

(Y) ethyl methyl amine

Question101

The compound formed on heating chlorobenzene with chloral in the presence of concentrated sulphuric acid, is
[2004]

Options:

A. freon

B. DDT

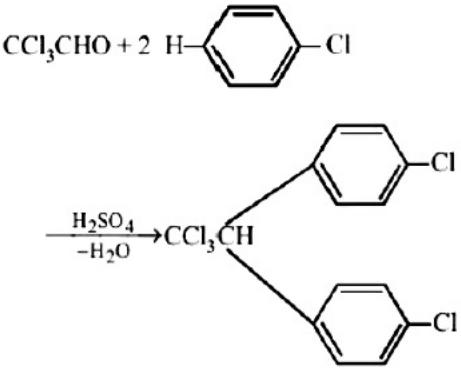
C. gammexene

D. hexachlorocthane

Answer: B

Solution:

DDT is prepared by heating chlorbenzene and chloral with concentrated sulphuric acid



1,1,1-Trichloro-2,2 bis
(p-chlorophenyl) ethane or DDT

Question102

Which of the following statements is wrong?
[Online May 12, 2012]

Options:

A. Ethyl chloride on reduction with Zn -Cu couple and alcohol gives ethane.

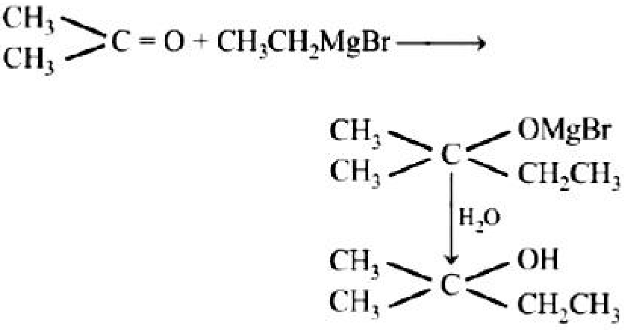
B. The reaction of methyl magnesium bromide with acetone gives butanol- 2 .

C. Alkyl halides follow the following reactivity sequence on reaction with alkenes.
$R-I > R-Br > R-Cl > R-I$

D. $C_2H_4Cl_2$ may exist in two isomeric forms

Answer: D

Solution:



2- Methyl butanol-2
(3° alcohol)

Question103

Bottles containing C_6H_5I and $C_6H_5CH_2I$ lost their original labels. Theywere labelled A and B for testing. A and B were separately taken in test tubes and boiled with $NaOH$ solution. The end solution in each tube was made acidic with dilute HNO_3 and then some $AgNO_3$ solution was added. Substance B gave a yellow precipitate. Which one of the following statements is true for this experiment?
[2003]

Options:

A. A is $C_6H_5CH_2I$

B. B is C_6H_5I

C. Addition of HNO_3 was unnecessary

D. A is C_6H_5I

Answer: D

Solution:

$$\underset{(A)}{C_6H_5I} \xrightarrow{NaOH} C_6H_6\,ONa \xrightarrow{HNO_3\,/\,H^+}$$

$C_6H_5\,OH \xrightarrow{AgNO_3}$ No yellow ppt.

$$\underset{(B)}{C_6H_5CH_2I} \xrightarrow{NaOH} C_6H_5CH_2\,ONa \xrightarrow{HNO_3\,/\,H^+} C_6\,H_5\,CH_2\,OH \xrightarrow{AgNO_3} \text{yellow ppt.}$$

Since benzyl iodide gives yellow ppt. hence this is compound B and A is phenyl iodide (C_6H_5I).

Question104

The reaction:
$(CH_3)_3C - Br \xrightarrow{H_2O} (CH_3)_3 - C - OH$
[2002]

Options:

A. elimination reaction

B. substitution reaction

C. free radical reaction

D. displacement reaction.

Answer: D

Solution:

Solution:
The hydrolysis of t -butyl bromide is an example of S_N1 reaction.

Question105

Among the following, the molecule with the lowest dipole moment is
[Online May 19,2012]

Options:

A. $CHCl_3$

B. CH_3Cl

C. CH_2Cl_2

D. CCl_4

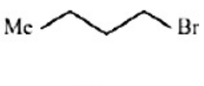
Answer: D

Solution:

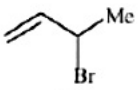
CCl_4 is a nonpolar moleculas and it has symmetrical tetrahedral structure. Although each of the c -cl bond is polar but the resultant of all there dipole moments is zero.

Question106

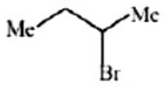
Consider the following bromides :



(A)



(B)



(C)

The correct order of $S_N I$ reactivity is
[2010]

Options:

A. B > C > A

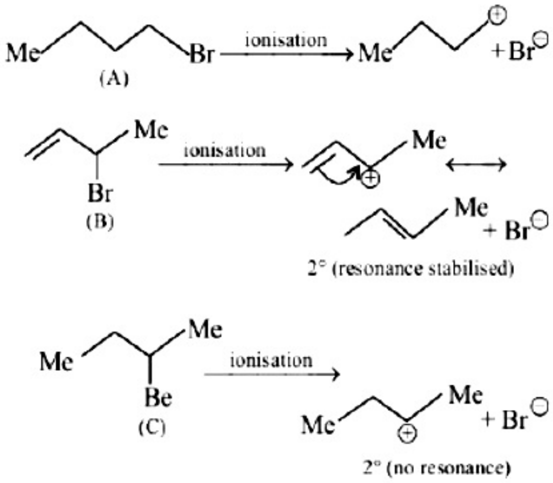
B. B > A > C

C. C > B > A

D. A > B > C

Answer: A

Solution:



Since S_N1 reactions involve the formation of carbocation as intermediate in the rate determining step, more is the stability of carbocation higher will be reactivity of alkyl halides towards S_N1 route. Now we know that stability of carbocations follows the order : $3^\circ > 2^\circ > 1^\circ$, so$S_N1$ reactivity should also follow the same order.
$3^\circ > 2^\circ > 1^\circ > \text{ Methyl } (S_N1 \text{ reactivity})$

Question107

The organic chloro compound, which shows complete sterochemical inversion during a S_N2 reaction, is
[2008]

Options:

A. $(C_2H_5)_2CHCl$

B. $(CH_3)_3CCl$

C. $(CH_3)_2CHCl$

D. CH_3Cl

Answer: D

Solution:

S_N2 reaction is favoured by small groups on the carbon atom attached to halogen. So, the order of reactivity is
$CH_3Cl > (CH_3)_2CHCl > (CH_3)_3CCl > (C_2H_5)_2CHCl$

Question108

Which of the following is the correct order of decreasing S_N2 reactivity?
[2007]

Options:

A. $R_2CHX > R_3CX > RCH_2X$

B. $RCH_2X > R_3CX > R_2CHX$

C. $RCH_2X > R_2CHX > R_3CX$

D. $R_3CX > R_2CHX > RCH_2X$ (X is a halogen)

Answer: C

Solution:

Solution:
In S_N2 mechanism transition state is pentavelent. For bulky alkyl group it will havesterical hinderance and smaller alkyl group will favour the S_N2 mechanism. So the decreasing order of reactivity of alkyl halide towards S_N2 mechanism is
$RCH_2X > R_2CHX > R_3CX$

Question109

Reaction of trans 2 -phenyl-1-bromocyclopentane on reaction with alcoholic KOH produces
[2006]

Options:

A. 1-phenylcyclopentene

B. 3-phenylcyclopentene

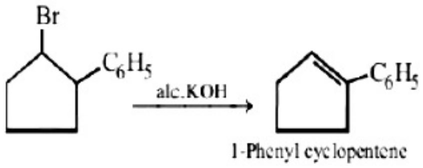
C. 2 -phenyleyclopentene

D. 4 -phenylcyclopentene

Answer: A

Solution:

Solution:
The reaction is dehydrohalogenation



Question110

Fluorobenzene (C_6H_5F) can be synthesized in the laboratory
[2006]

Options:

A. by direct fluorination of benzene with F_2 gas

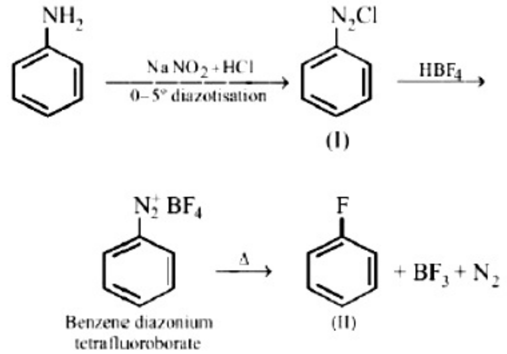
B. by reacting bromobenzene with NaF solution

C. by heating phenol with HF and KF

D. from aniline by diazotisation followed by heating the diazonium salt with HBF_4

Answer: D

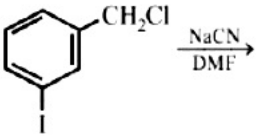
Solution:



Conversion of (I) to (II) is known as Balz-schilmann reaction.

Question111

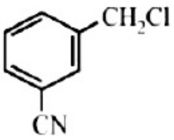
The structure of the major product formed in the following reaction is



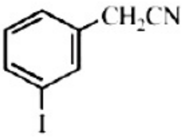
[2006]

Options:

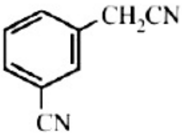
A.



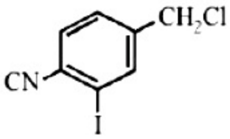
B.



C.

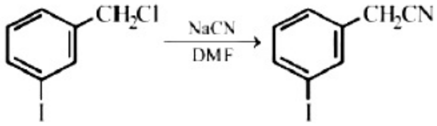


D.



Answer: B

Solution:



Nuclear substitution will not take place.

Question112

Tertiary alkyl halides are practically inert to substitution by S_N2 mechanism because of
[2005]

Options:

A. steric hindrance

B. inductive effect

C. instability

D. insolubility

Answer: A

Solution:

Due to steric hindrance tertiary alkyl halides do not react by S_N2 mechanism, they react by S_N1 mechanism. S_N2 mechanism is followed in case of primary and secondary alkyl halides.
