

Haloalkanes and Haloarenes

Question1

Identify ' A ' in the following reaction.



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Options:

A.

Benzene

B.

Chlorobenzene

C.

Toluene

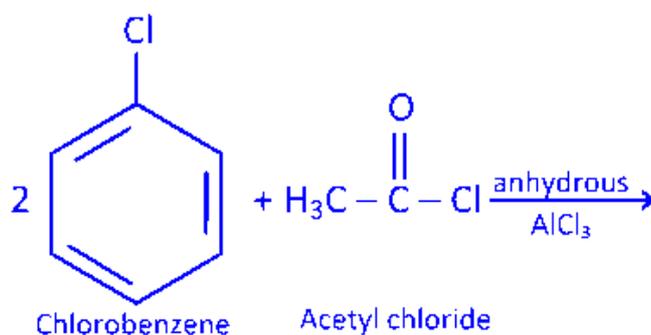
D.

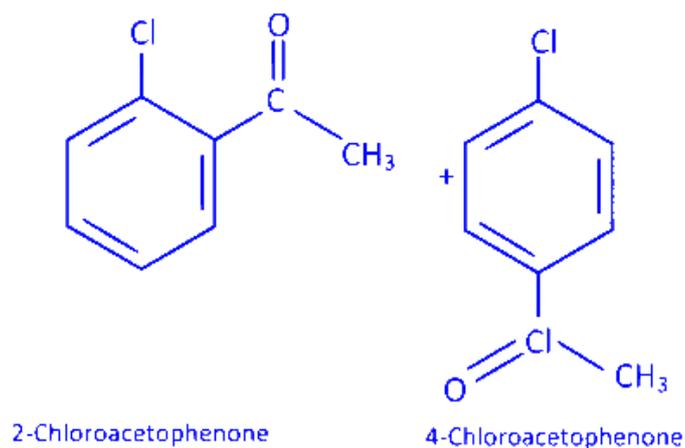
Phenol

Answer: B

Solution:

Given reaction is an example of Friedel-Crafts acylation reaction.





Question2

Which of the following reagents is used in the preparation of nitroalkane from haloalkane?

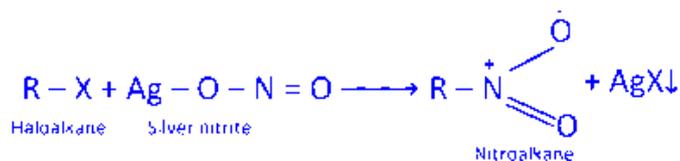
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Options:

- A.
Potassium cyanide
- B.
Sodium nitrite
- C.
Potassium nitrite
- D.
Silver nitrite

Answer: D

Solution:



Question3

What is the order of reactivity of alkyl halides with ammonia?

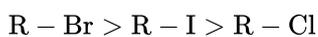
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Options:

A.



B.



C.



D.



Answer: C

Solution:

In the presence of an incoming nucleophile, I^- will be released at a faster rate because of its large size. Therefore, order of reactivity of alkyl halide with ammonia is $R - I > R - Br > R - Cl$.

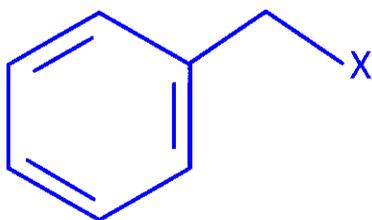
Question4

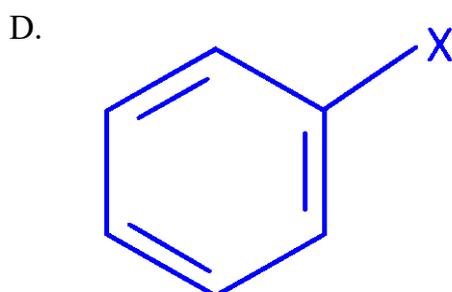
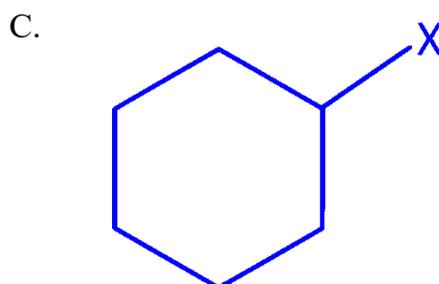
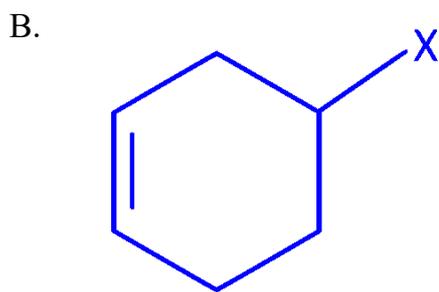
Which among the following is haloarene?

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Options:

A.





Answer: D

Solution:

In haloarenes, halogen atom is directly bonded to the sp^2 hybridized carbon atom of aromatic ring.

Question5

Which from following is the most commonly used refrigerant Freon-12?

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Options:

A.

Chlorofluoromethane

B.

Dichlorodifluoromethane

C.

Chlorodifluoromethane

D.

Dichlorofluoromethane

Answer: B

Solution:

The most commonly used refrigerant **Freon-12** is:

Option B: Dichlorodifluoromethane

Explanation:

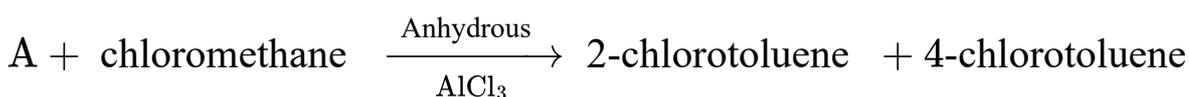
- Freon-12 has the chemical formula CCl_2F_2 , which is **dichlorodifluoromethane**.
- It was widely used in refrigerators, air conditioners, and aerosol propellants until its use was restricted due to ozone depletion concerns.

Final Answer:

B) Dichlorodifluoromethane

Question6

Identify ' A ' in the following reaction.



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Options:

A.

Benzene

B.

Chlorobenzene

C.

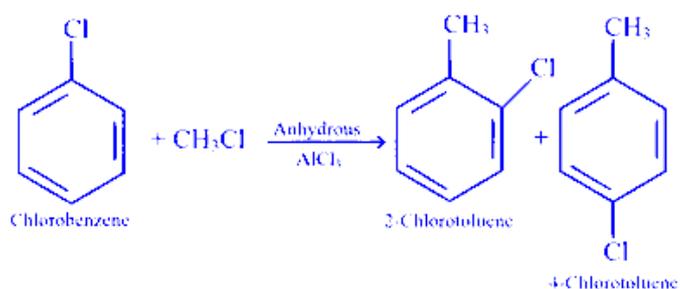
Toluene

D.

Phenol

Answer: B

Solution:



Question 7

Identify the product 'A' formed in the following reaction.



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Options:

A. 2,3-dibromopentane

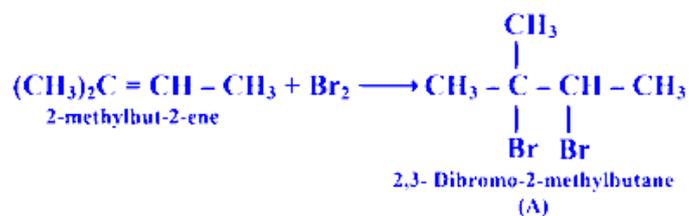
B. 2-Bromo-3-methylbutane

C. 3-Bromo-2-methylbutane

D. 2,3-dibromo-2-methylbutane

Answer: D

Solution:



Question 8

Identify the product when chlorobenzene is heated with nitrating mixture.

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Options:

A.

Only 1-chloro-4-nitrobenzene

B.

Only 1-chloro-2-nitrobenzene

C.

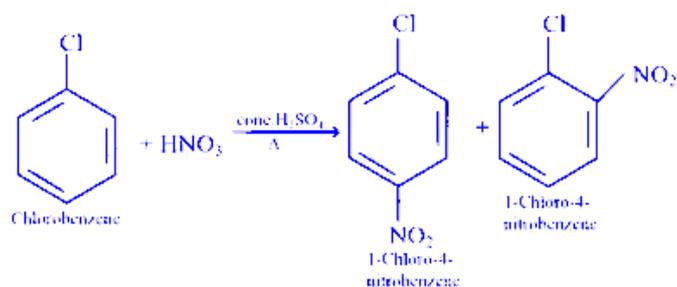
Mixture of 1-chloro-2-nitrobenzene and 1-chloro-4-nitrobenzene

D.

2,4,6-trinitrochlorobenzene

Answer: C

Solution:



Question9

Identify the product formed when 2-Bromobutane is heated with aqueous solution of sodium hydroxide.

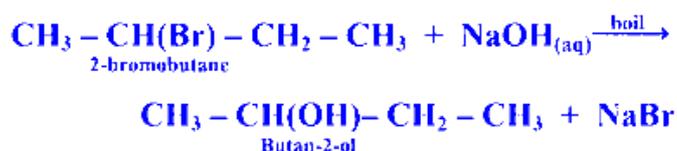
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Options:

- A. But-1-ene
- B. But-2-ene
- C. Butan-1-ol
- D. Butan-2-ol

Answer: D

Solution:



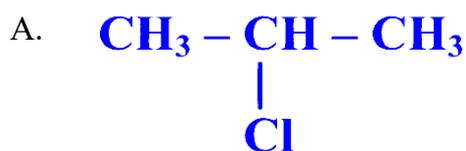
Note that, if NaOH was alcoholic instead of aqueous, elimination reaction would be favoured.

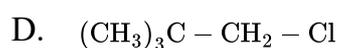
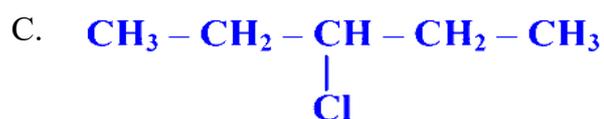
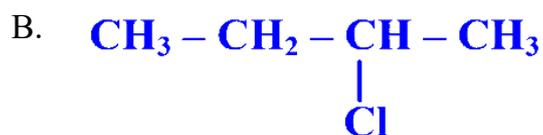
Question10

Which of the following is likely to undergo racemization during alkaline hydrolysis by S_N1 mechanism?

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Options:

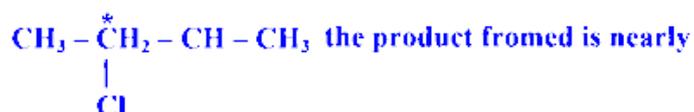




Answer: B

Solution:

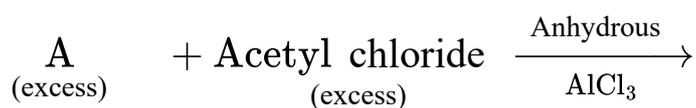
When S_N1 reaction is carried out at chiral carbon in an optically active substrate like



racemic. This indicates that S_N1 reaction proceeds mainly with racemization. Therefore, all other options are optically inactive.

Question11

Identify ' A ' in the following reaction.



2-Chloroacetophenone + 4-Chloroacetophenone

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Options:

A. Benzene

B. Chlorobenzene

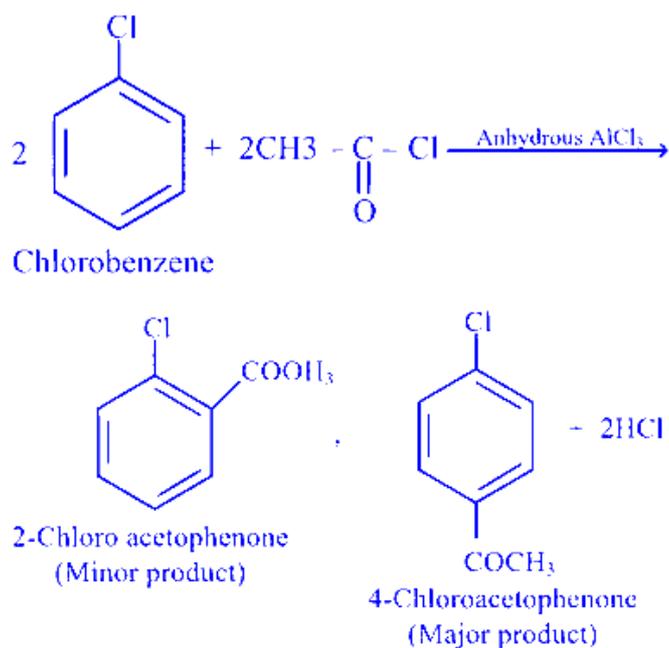


C. Toluene

D. Phenol

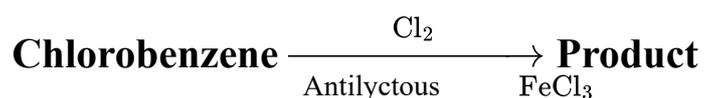
Answer: B

Solution:



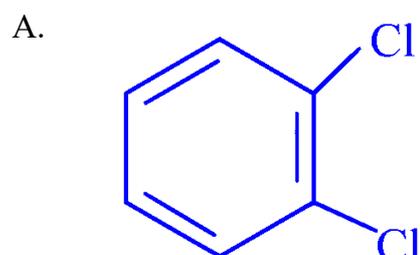
Question12

Identify the major product formed in the following reaction.

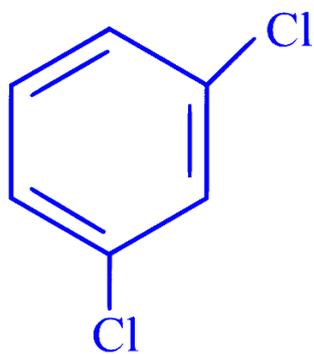


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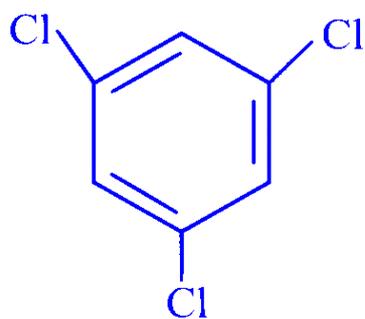
Options:



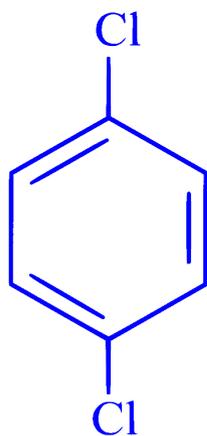
B.



C.

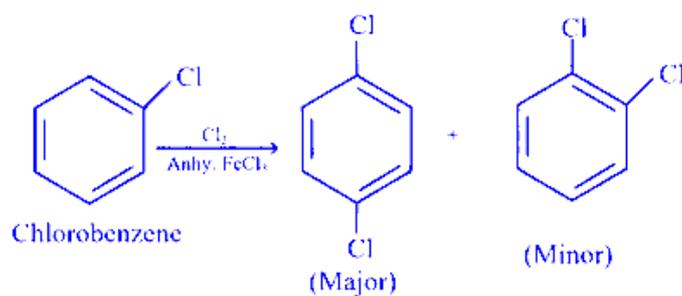


D.



Answer: D

Solution:



Question13

Which of the following compounds has difficulty in breaking of C – X bond?

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Options:

- A. o-Nitrochlorobenzene
- B. m-Nitrochlorobenzene
- C. p-Nitrochlorobenzene
- D. 2, 4, 6-trinitrochlorobenzene

Answer: B

Solution:

Greater the number of electron withdrawing groups at o/p position, greater is the reactivity towards nucleophilic substitution reaction. Electron withdrawing group at meta position has practically no effect on reactivity.

Hence, among the given, m-nitrochlorobenzene has difficulty in breaking of C – X bond during nucleophilic substitution.

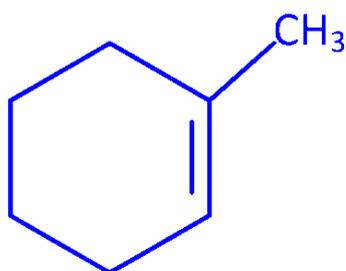
Question14

Which of the following compounds forms 1-bromo-1-methylcyclohexane when treated with HBr ?

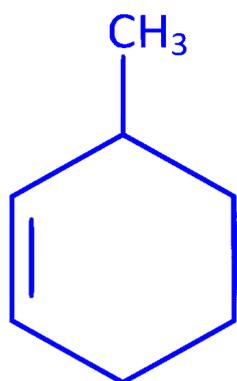
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Options:

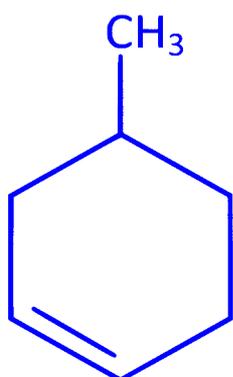
A.



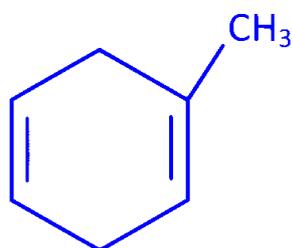
B.



C.

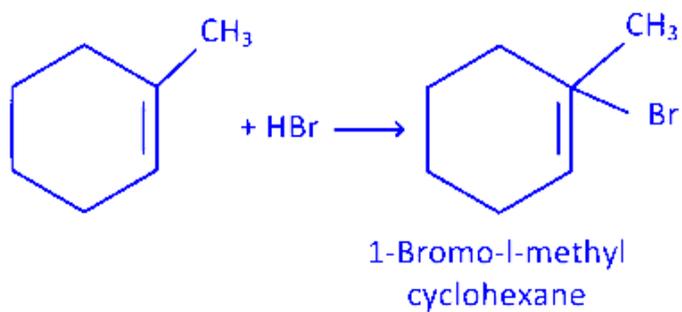


D.



Answer: A

Solution:



This reaction follows Markownikoff's rule.



Question15

Which of the following has highest reactivity towards nucleophilic substitution reaction involving cleavage of C – Cl bond?

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Options:

- A. Chlorobenzene
- B. p-Nitrochlorobenzene
- C. 2,4-Dinitrochlorobenzene
- D. 2,4,6-Trinitrochlorobenzene

Answer: D

Solution:

Greater the number of electron withdrawing groups (NO_2) at o/p position, greater is the reactivity. Hence, 2, 4, 6-trinitrochlorobenzene has the highest reactivity towards nucleophilic substitution reaction.

Question16

Which among the following statements is true for haloalkyne?

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Options:

- A. Halogen atom is bonded to 'sp' hybridised carbon atom.
- B. Halogen atom is bonded to 'sp²', hybridised carbon atom of aliphatic chain.
- C. Halogen atom is bonded to 'sp³', hybridised carbon atom next to a carbon-carbon double bond.
- D. Halogen atom is bonded to 'sp²' hybridised carbon atom of aromatic ring.

Answer: A



Solution:

Step 1: Recall definition of haloalkyne

A **haloalkyne** is a compound in which a halogen atom is directly attached to a carbon of an **alkyne** group ($-\text{C}\equiv\text{C}-$).

In an alkyne, each carbon involved in the triple bond is **sp-hybridized**.

So, in a haloalkyne, the halogen is bonded to an **sp-hybridized carbon atom**.

Step 2: Analyze options

- **Option A:** *Halogen atom is bonded to sp hybridised carbon atom.*
 This matches the definition of haloalkyne. Correct.
- **Option B:** *Halogen atom is bonded to sp^2 hybridized carbon atom of aliphatic chain.*
 That describes **vinyl halides** (haloalkenes), not haloalkynes.
- **Option C:** *Halogen atom is bonded to sp^3 hybridized carbon atom next to a carbon-carbon double bond.*
 This describes **allylic halides**, not haloalkynes.
- **Option D:** *Halogen atom is bonded to sp^2 hybridized carbon atom of aromatic ring.*
 This describes **aryl halides**, not haloalkynes.

Correct Answer: Option A

Halogen atom is bonded to sp hybridized carbon atom.

Question17

Which among the following is NOT Allylic halide?

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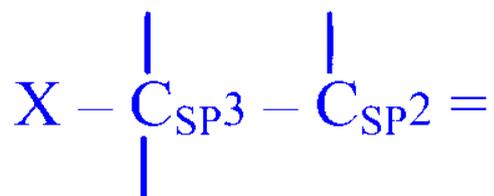
Options:

- A. $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{X}$
- B. $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_2 - \text{X}$
- C. $\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH} - \text{CH}_2 - \text{X}$
- D. $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_2 - \text{CH}_2 - \text{X}$

Answer: D

Solution:

In allylic halides, halogen atom is bonded to a sp^3 hybridized carbon atom next to a carbon-carbon double bond.



Question18

Which of the following has highest reactivity for S_N1 reactions?

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Options:

- A. n-Butyl iodide
- B. sec-butyl iodide
- C. Isobutyl iodide
- D. tert-Butyl iodide

Answer: D

Solution:

Step 1: Recall nature of S_N1 mechanism

- S_N1 reaction rate depends on stability of the carbocation formed (rate-determining step is ionization).
- Carbocation stability order:
 $3^\circ > 2^\circ > 1^\circ > \text{methyl}$

Step 2: Analyze each option

1. n-Butyl iodide:

- On ionization \rightarrow primary carbocation (n-butyl cation).
- Very unstable. Least favorable.

1. sec-Butyl iodide:



- On ionization → secondary carbocation (2°).
 - Moderately stable.
1. **Isobutyl iodide** (Isobutyl = $\text{CH}_2\text{-CH}(\text{CH}_3)_2$):
- On ionization → carbocation at the **primary carbon** bonded to iodide.
 - That gives a primary carbocation, but resonance/hyperconjugation from beta-branches can stabilize somewhat. Still essentially a **primary cation**, less stable than 2° .

1. **tert-Butyl iodide:**

- On ionization → tertiary carbocation (3°).
- Very stabilized. Best for SN1 .

Step 3: Compare and conclude

- **tert-Butyl iodide** produces the most stable carbocation (3°).
- Therefore, **tert-Butyl iodide** undergoes SN1 reaction fastest.

✔ Answer: Option D – tert-Butyl iodide

Question19

Which of the following is NOT obtained when a mixture of chloroethane and 1-chloropropane is treated with sodium metal in dry ether?

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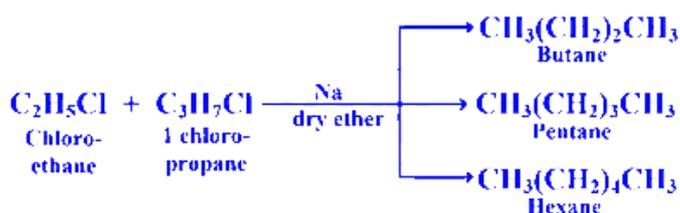
Options:

- A. Propane
- B. Butane
- C. Pentane
- D. Hexane

Answer: A

Solution:

Chloroethane and 1-chloropropane undergo Wurtz reaction with metallic sodium in dry ether.



Question20

What type of arenes are obtained when arene diazonium chloride is treated with fluoroboric acid and then heated further?

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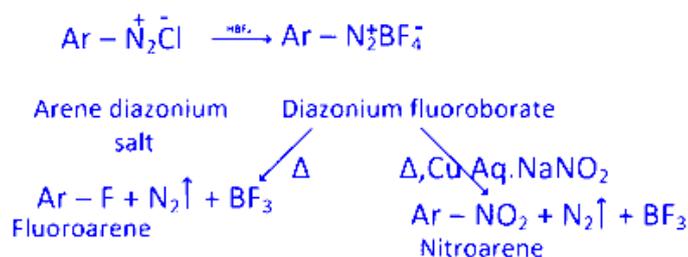
Options:

- A. Ar – NO₂
- B. Ar – F
- C. Ar – Cl
- D. Ar – H

Answer: B

Solution:

Arene diazonium salt on reaction with fluoroboric acid (HBF₄) gives precipitate of diazonium fluoroborate which on heating decomposes to yield fluoroarene. On the other hand, when heated with aqueous sodium nitrite in presence of copper it gives nitroarene.



Question21

Which among the following is vinylic halide?

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Options:

- A. Haloalkane
- B. Haloalkene



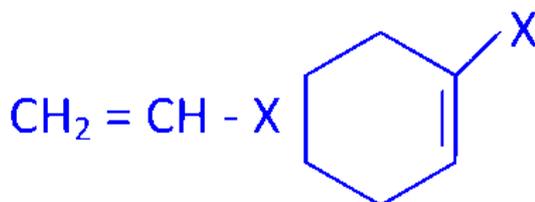
C. Haloalkyne

D. Haloarene

Answer: B

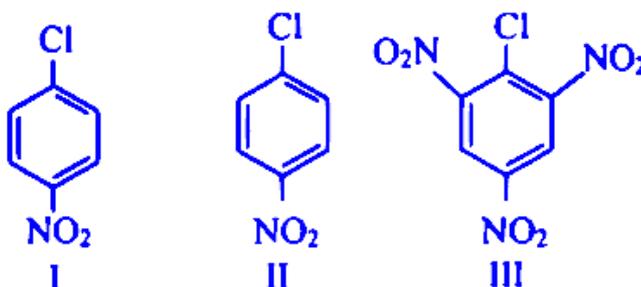
Solution:

In vinylic halides, halogen atom is bonded to a sp^2 hybridized carbon atom of aliphatic chain and is called as haloalkene. It can be represented as follows:



Question22

The correct order of reactivity for reaction involving cleavage of C-X bond in following compounds is



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Options:

A. I > II > III

B. II > III > I

C. III > I > II

D. III > II > I

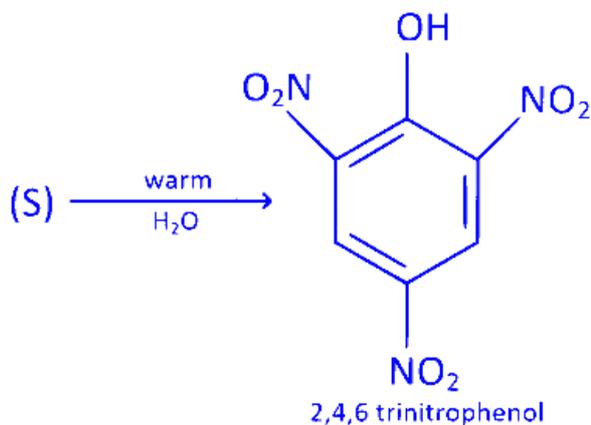
Answer: D

Solution:

Greater the number of electron withdrawing groups (e.g. $-NO_2$) at -O and -p position, greater is the reactivity of haloarenes involving breaking of C - X bond.

Question23

Identify the substrate ' S ' in the following reaction,



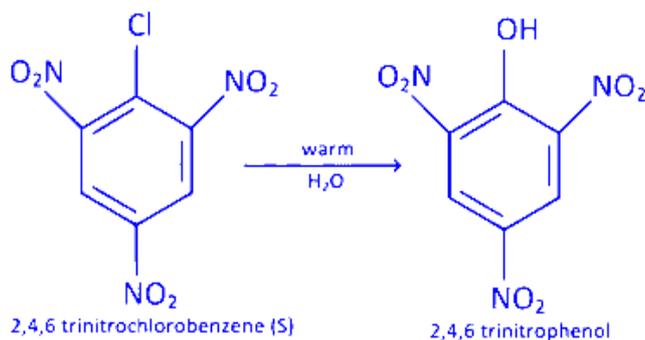
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Options:

- A. p-Nitrochlorobenzene
- B. o-Nitrochlorobenzene
- C. 2,4-dinitrochlorobenzene
- D. 2,4,6-trinitrochlorobenzene

Answer: D

Solution:



Question24

Which of the following pair of compounds on heating gives butanenitrile?

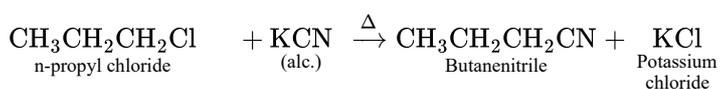
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Options:

- A. Propanol and alcoholic KCN
- B. Butanol and alcoholic KCN
- C. n -Butylchloride and alcoholic KCN
- D. n -Propylchloride and alcoholic KCN

Answer: D

Solution:



Question25

Identify the reagent involved in Sandmeyer reaction.

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Options:

- A. CuCN/KCN
- B. Cu (Powder) /HBr
- C. H₃PO₃
- D. CH₃CH₂OH

Answer: A

Solution:

The correct answer is:

Option A

CuCN/KCN

Explanation:

- Sandmeyer reaction involves the substitution of an aryl diazonium salt group ($\text{ArN}_2^+ \text{X}^-$) by a halide or cyano group using a copper(I) salt as a catalyst.
- For example:

$$\text{C}_6\text{H}_5\text{N}_2^+ \text{Cl}^- + \text{CuCN} \longrightarrow \text{C}_6\text{H}_5\text{CN} + \text{N}_2 + \text{CuCl}$$
- Copper(I) salts like CuCl , CuBr , and CuCN are specifically used in Sandmeyer reactions.

Hence, the reagent involved in the Sandmeyer reaction is CuCN/KCN (Option A).

Question26

Identify the product 'X' formed in the following reaction,



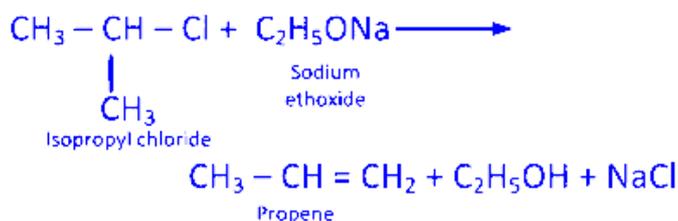
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Options:

- A. 1-Ethoxypropane
- B. 2-Ethoxypropane
- C. Propene
- D. Propane

Answer: C

Solution:



Question27

Which among the following is NOT benzylic halide?

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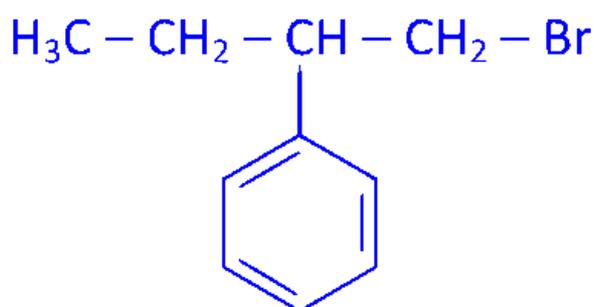
Options:

- A. Bromophenylmethane
- B. 1-Bromo-1-phenylethane
- C. 2-Bromo-2-phenylpropane
- D. 1-Bromo-2-phenylbutane

Answer: D

Solution:

1-Bromo-2-phenylbutane is 1° alkyl halide.



Question28

Which among the following is an allylic halide?

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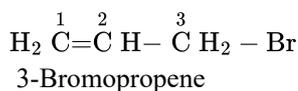
Options:

- A. 1-Bromopropene
- B. 2-Bromopropene
- C. 3-Bromopropene
- D. 4-Bromobut-1-ene

Answer: C

Solution:

In allylic halides, halogen atom is bonded to a sp^3 hybridized carbon atom next to a carbon-carbon double bond.



Question29

When tert butyl bromide is heated with silver fluoride the major product obtained is

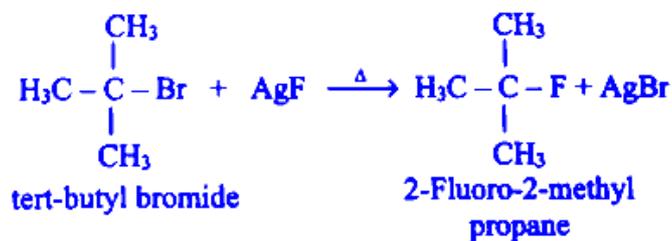
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Options:

- A. 1-Fluoro-2-methylpropane
- B. 2-Fluoro-2-methylpropane
- C. 1-Fluorobutane
- D. 2-Fluorobutane

Answer: B

Solution:



This is Swartz reaction.

Question30

Which among the following is benzylic halide?

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Options:

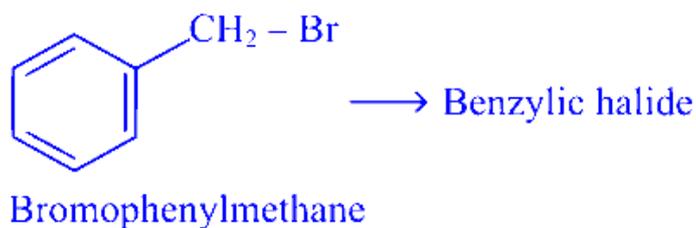
- A. Bromophenylmethane
- B. 4-Bromotoluene

C. 1-Bromo-2-phenylethane

D. Bromobenzene

Answer: A

Solution:



Question31

Identify the product formed from chlorobenzene on heating with conc. HNO_3 in presence of conc. H_2SO_4 .

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Options:

A. Only 1-chloro-4-nitrobenzene

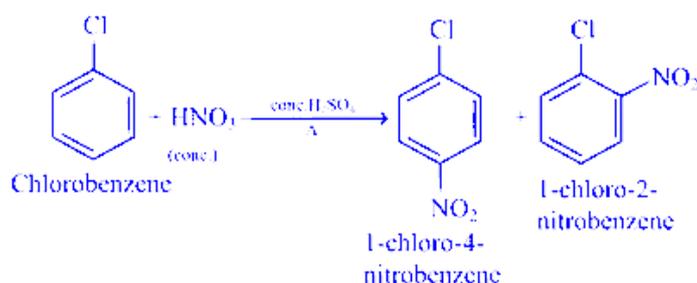
B. 1-chloro-2-nitrobenzene

C. Mixture of 1-chloro-4-nitrobenzene and 1-chloro-2-nitrobenzene

D. 2,4,6-trinitrochlorobenzene

Answer: C

Solution:



Question32



Which of the following alkenes is most easily formed by dehydrohalogenation of alkyl halides?

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Options:

- A. $R_2C = CH_2$
- B. $RCH = CHR$
- C. $R_2C = CHR$
- D. $R_2C = CR_2$

Answer: D

Solution:

According to the **Saytzeff's Rule (Zaitsev's Rule)**, during dehydrohalogenation of alkyl halides, the more substituted alkene is formed more easily and predominates as the major product.

- The order of alkene stability is:

Tetra-substituted > Tri-substituted > Di-substituted > Mono-substituted

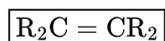
Where "substituted" refers to the number of alkyl groups attached to the doubly bonded carbons in the alkene.

Now, let's analyze each option:

- **Option A:** $R_2C = CH_2$
(Di-substituted alkene; 2 alkyl groups, 2 hydrogens attached to the double-bonded carbons)
- **Option B:** $RCH = CHR$
(Di-substituted alkene; 2 alkyl groups)
- **Option C:** $R_2C = CHR$
(Tri-substituted alkene; 3 alkyl groups)
- **Option D:** $R_2C = CR_2$
(Tetra-substituted alkene; 4 alkyl groups)

Most easily formed alkene will be the most substituted one (**tetra-substituted**).

Correct Answer: Option D



Question33

Which of the following compounds is obtained by using Finkelstein reaction?



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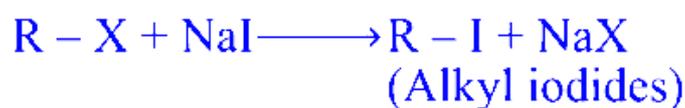
Options:

- A. Alkyl fluorides
- B. Alkyl chlorides
- C. Alkyl bromides
- D. Alkyl iodides

Answer: D

Solution:

Finkelstein Reaction:



Question34

Identify the reactivity order for halogens towards alkanes.

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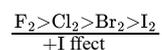
Options:

- A. $I_2 > Br_2 > Cl_2 > F_2$
- B. $Br_2 > Cl_2 > F_2 > I_2$
- C. $F_2 > Cl_2 > Br_2 > I_2$
- D. $Cl_2 > F_2 > Br_2 > I_2$

Answer: C

Solution:

Due to electronegativity difference, the reactivity order for halogens towards alkanes is :



Question35

What is the major product obtained when tert-butyl bromide is heated with silver fluoride?

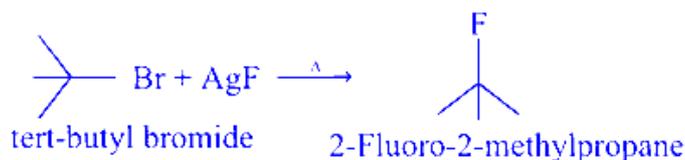
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Options:

- A. 1-Fluoro-2-methylpropane
- B. 2-Fluoro-2-methylpropane
- C. 1-Fluorobutane
- D. 2-Fluorobutane

Answer: B

Solution:



Question36

Identify the product ' B ' in the following sequence of reactions.



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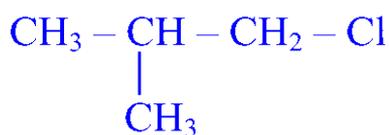
Options:

- A. Methyl cyanide
- B. Methyl amine
- C. Ethyl amine
- D. Ethyl cyanide

Answer: C

Solution:





C. $\text{C}_6\text{H}_5\text{Cl}$

D. $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{Cl}$

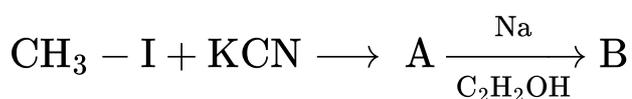
Answer: C

Solution:

Aryl halides do not give Williamson's synthesis.

Question39

Identify product ' B ' in following reaction.



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Options:

A. CH_3OH

B. CH_3ONa

C. CH_3NO_2

D. $\text{CH}_3\text{CH}_2\text{NH}_2$

Answer: D

Solution:



Question40

Which of the following is vinylic halide?

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Options:

- A. Haloalkane
- B. Haloalkene
- C. Haloalkyne
- D. Haloarene

Answer: B

Solution:

In vinylic halides, halogen atom is bonded to a sp^2 hybridized carbon atom of aliphatic chain. Thus, vinylic halide is a haloalkene.

Question41

Identify the product obtained in the following reaction.



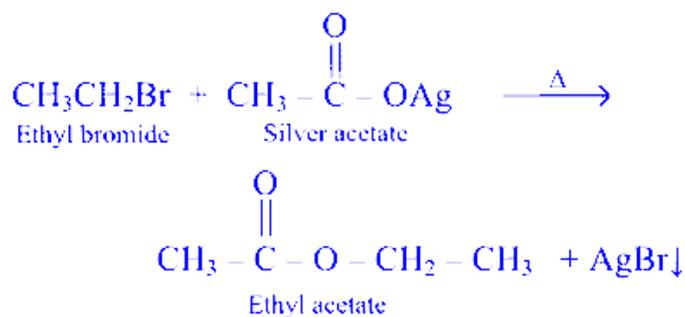
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Options:

- A. $\text{CH}_3\text{CH}_2\text{COOCH}_3$
- B. $\text{CH}_3\text{COOCH}_2\text{CH}_3$
- C. $\text{CH}_3\text{COOCH}_3$
- D. $\text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}_3$

Answer: B

Solution:



Question42

Which among the following is benzylic halide?

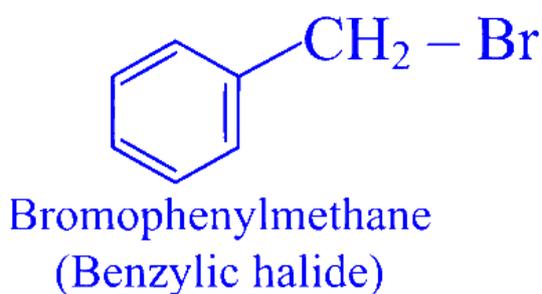
MHT CET 2024 11th May Evening Shift

Options:

- A. Bromobenzene
- B. Bromophenyl methane
- C. 4-Bromotoluene
- D. 1-Bromo-2-phenylethane

Answer: B

Solution:



Question43

Which alkyl halide has highest bond enthalpy of C – X bond?

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Options:

- A. $\text{CH}_3 - \text{Cl}$
- B. $\text{CH}_3 - \text{F}$
- C. $\text{CH}_3 - \text{Br}$
- D. $\text{CH}_3 - \text{I}$

Answer: B

Solution:

As the size of halogen increases from F to I, C – X bond length increases and C – X bond strength decreases. With decrease in bond strength, it becomes easier to break the bond by applying minimum energy. C – F bond length is the shortest, so C – F bond strength is highest and CH_3F has the highest bond enthalpy.

Question44

Which among the following has lowest boiling point?

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Options:

- A. Chloromethane
- B. Bromomethane
- C. Dibromomethane
- D. Tribromomethane

Answer: A

Solution:

The boiling point of a compound generally increases with an increase in molecular mass due to stronger London dispersion forces. Let's analyze the given options:

Chloromethane (CH_3Cl): With chlorine as the halogen, this compound has the lowest molecular mass among the options.

Bromomethane (CH_3Br): This compound has a higher molecular mass than chloromethane due to the presence of bromine, which is heavier than chlorine.

Dibromomethane (CH_2Br_2): This compound contains two bromine atoms, further increasing the molecular mass compared to bromomethane.

Tribromomethane (CHBr_3): With three bromine atoms, this compound has the highest molecular mass among the options.



Considering the trend in boiling points, **Chloromethane (Option A)**, with the lowest molecular mass among the given compounds, will have the lowest boiling point.

Question45

Which from following compounds is used to prepare a refrigerant R-22?

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Options:

- A. Monochloromethane
- B. Dichloromethane
- C. Trichloromethane
- D. Tetrachloromethane

Answer: C

Solution:

Correct Answer: Option C (Trichloromethane)

Refrigerant R-22, also known as chlorodifluoromethane (CHClF_2), is commonly produced starting from trichloromethane (CHCl_3), also known as chloroform. In the presence of hydrogen fluoride (HF) and appropriate catalysts, chloroform undergoes partial fluorination to yield R-22.

Question46

Which among the following is not haloalkyne?

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Options:

- A. $\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH} - \text{X}$
- B. $\text{CH}_3 - \text{C} \equiv \text{C} - \text{CH}_2 - \text{X}$
- C. $\text{CH} \equiv \text{C} - \text{CH}_2 - \text{CH}_2 - \text{X}$
- D. $\text{CH}_3 - \text{CH}_2 - \text{C} \equiv \text{C} - \text{X}$

Answer: A



Solution:

A haloalkyne is an organic compound containing a carbon-carbon triple bond (alkyne group) with at least one halogen atom attached to the carbon chain. The structure of a haloalkyne typically includes the alkyne functionality, generally represented as $C \equiv C$, and a halogen substituent denoted by X.

Analyzing the given options:

Option A: $CH_3 - CH_2 - CH = CH - X$ does not contain a carbon-carbon triple bond. Instead, it has a double bond, making it a haloalkene.

Option B: $CH_3 - C \equiv C - CH_2 - X$ contains a carbon-carbon triple bond, hence it qualifies as a haloalkyne.

Option C: $CH \equiv C - CH_2 - CH_2 - X$ also contains a carbon-carbon triple bond, indicating it is a haloalkyne.

Option D: $CH_3 - CH_2 - C \equiv C - X$ has a carbon-carbon triple bond, making it a haloalkyne.

The compound that is not a haloalkyne is **Option A**.

Question47

Identify the major product formed in the bromination of 2-Methylpropane.

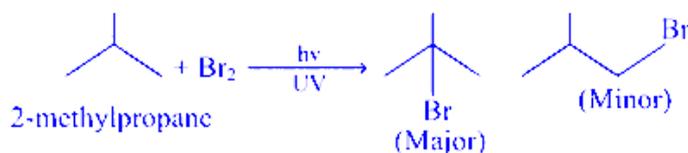
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Options:

- A. 1-Bromopropane
- B. 2-Bromopropane
- C. 1-Bromo-2-methylpropane
- D. 2-Bromo-2-methylpropane

Answer: D

Solution:



This is because the intermediate formed is 3° alkyl radical which is more stable than 1° alkyl radical.

Question48

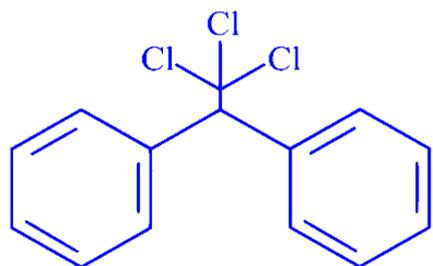
Identify structural formula of DDT.



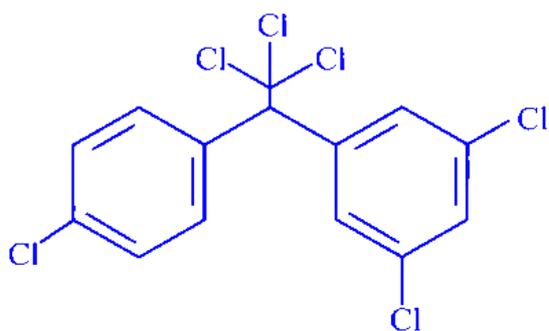
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Options:

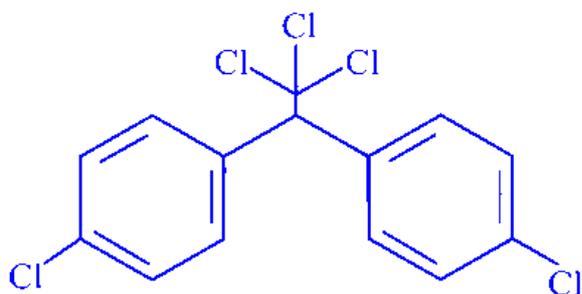
A.



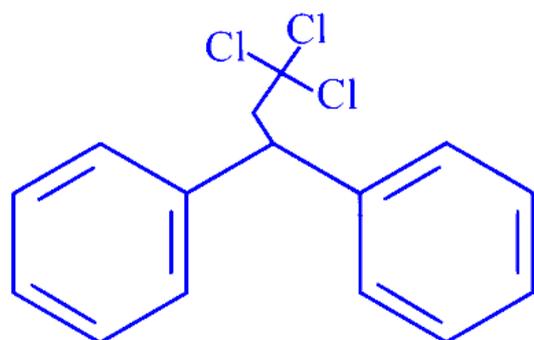
B.



C.



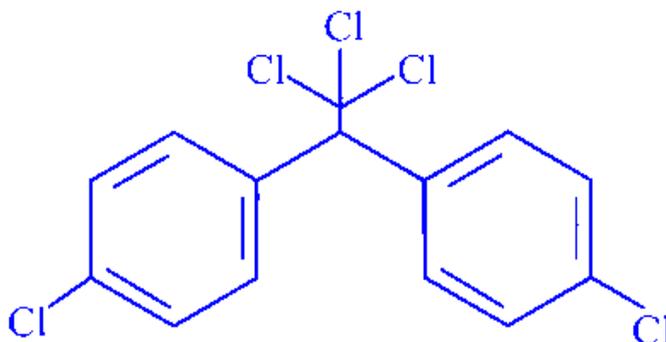
D.



Answer: C



Solution:



Question49

What is the order of ease of dehydrohalogenation of alkyl halides?

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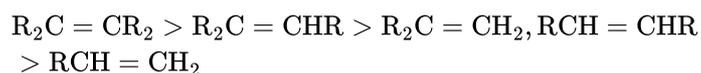
Options:

- A. $3^\circ > 2^\circ > 1^\circ$
- B. $2^\circ > 1^\circ > 3^\circ$
- C. $3^\circ > 1^\circ > 2^\circ$
- D. $1^\circ > 2^\circ > 3^\circ$

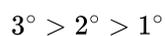
Answer: A

Solution:

According to Saytzeff elimination, the ease of dehydrohalogenation depends on the stability of the alkyl substituted alkenes which is given as,



\therefore The ease of α, β -dehydrohalogenation is:



Question50

Identify the product obtained when chlorobenzene is heated with conc. HNO_3 in presence of conc. H_2SO_4 .

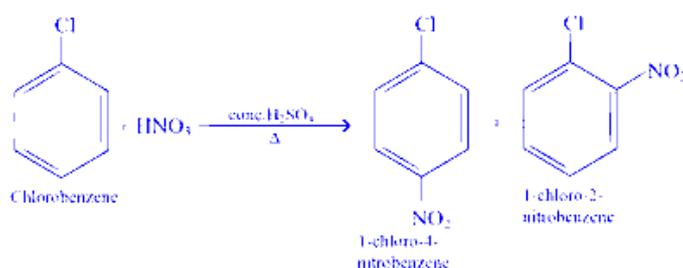
MHT CET 2024 9th May Evening Shift

Options:

- A. Only 1-chloro-4-nitrobenzene
- B. Only 1-chloro-2-nitrobenzene
- C. Mixture of 1-chloro-4-nitrobenzene and 1-chloro-2-nitrobenzene
- D. 2,4,6-trinitrochlorobenzene

Answer: C

Solution:



Question51

Which among the following reactions is used for the preparation of alkyl fluorides?

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Options:

- A. Finkelstein reaction
- B. Swartz reaction

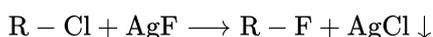
C. Fittig reaction

D. Wurtz reaction

Answer: B

Solution:

Alkyl fluorides are prepared by heating alkyl chlorides or bromides with metal fluorides such as AgF, Hg₂F₂, AsF₃, SbF₃, etc. This reaction is known as Swartz reaction.



Question52

Identify ' B ' in the following conversion.



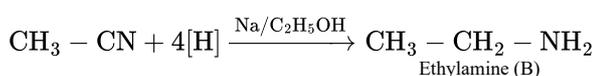
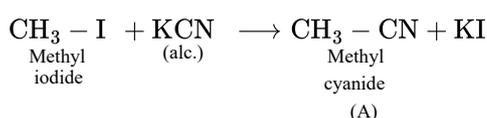
MHT CET 2024 4th May Evening Shift

Options:



Answer: D

Solution:



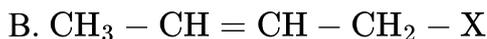
Question53



Which among the following is NOT allylic halide?

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Options:



Answer: D

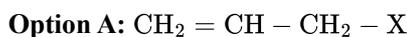
Solution:

Step-by-Step Reasoning:

Definition of an allylic halide:

An allylic halide is a compound in which a halogen atom (X) is attached to a carbon adjacent to a carbon-carbon double bond (C=C). In other words, the halogen-bearing carbon must be one carbon away from the double bond.

Analyze each option:



Double bond between the first and second carbons.

The halogen (X) is attached to the third carbon.

The third carbon is directly next to the second carbon, which is part of the double bond.

Thus, the halogen is on an allylic position.

This is an allylic halide.

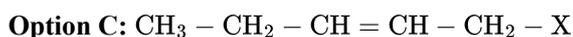


Double bond between the second and third carbons.

The halogen is on the fourth carbon.

The fourth carbon is adjacent to the third carbon, which is involved in the double bond.

This is also an allylic halide.

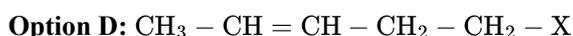


Double bond between the third and fourth carbons.

The halogen is attached to the fifth carbon.

The fifth carbon is directly adjacent to the fourth carbon (part of the double bond).

This is an allylic halide as well.



Double bond between the second and third carbons.

The halogen is on the sixth carbon (if we count from the left: C1 = CH₃, C2 and C3 for double bond, C4 = CH₂, C5 = CH₂, C6 = CH₂-X).

Notice that the halogen is NOT directly next to the double bond. Instead, there's an extra CH₂ group in between.

This halogen is two carbons away from the double bond, not just one.

This is NOT an allylic halide.

Conclusion: The compound in which the halogen is not on a carbon adjacent to a double bond is the one given in Option D.

Final Answer: Option D is NOT an allylic halide.

Question54

The correct order of reactivity for reactions involving cleavage of C – Cl bond in following compounds is



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Options:

- A. I > II > III
- B. II > III > I
- C. III > I > II
- D. III > II > I

Answer: D

Solution:

Greater the number of electron withdrawing groups (–NO₂) at o/p position, greater is the reactivity. Hence, 2,4,6-trinitrochlorobenzene has the highest reactivity.

Question55

Which of the following is correct decreasing order of boiling point of compounds?

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Options:

- A. $\text{CH}_3\text{Cl} > \text{CH}_3\text{Br} > \text{CH}_2\text{Br}_2 > \text{CHBr}_3$
- B. $\text{CH}_3\text{Br} > \text{CH}_2\text{Br}_2 > \text{CHBr}_3 > \text{CH}_3\text{Cl}$
- C. $\text{CHBr}_3 > \text{CH}_2\text{Br}_2 > \text{CH}_3\text{Br} > \text{CH}_3\text{Cl}$
- D. $\text{CH}_3\text{Br} > \text{CH}_3\text{Cl} > \text{CHBr}_3 > \text{CH}_2\text{Br}_2$

Answer: C

Solution:

The comparative boiling points of halogen derivatives are related to van der Waals forces of attraction which depend upon molecular size. The molecular size depends upon the size of halogen and number of halogen atoms. Thus, for the given compounds, boiling point decreases as, $\text{CHBr}_3 > \text{CH}_2\text{Br}_2 > \text{CH}_3\text{Br} > \text{CH}_3\text{Cl}$.

Question 56

Identify the number of moles of ethene obtained when n moles of N, N, N -triethylpropylammonium iodide is treated with moist Ag_2O and then heated.

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Options:

- A. n
- B. $2n$
- C. $3n$
- D. $4n$

Answer: A

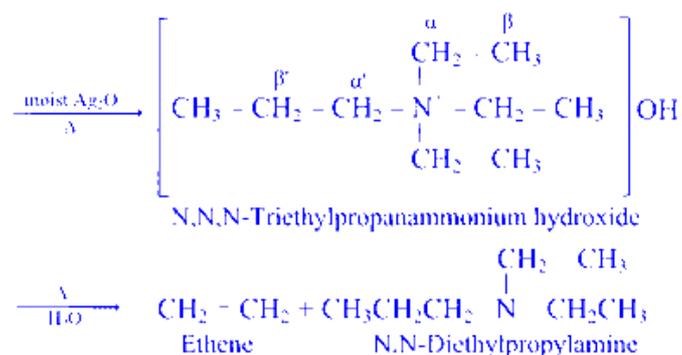
Solution:

1 mole of N, N, N -triethylpropylammonium iodide gives 1 mole of ethane.

Thus, n mole N, N, N -triethylpropylammonium iodide will give n mole of ethane.



N, N, N -Triethylpropylammonium iodide



Question57

Identify compound Q in following reaction.



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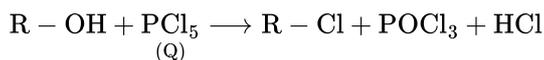
Options:

- A. HCl
- B. PCl₃
- C. PCl₅
- D. SOCl₂

Answer: C

Solution:

Alcohols when treated with phosphorous pentachloride yield alkyl halides.



Question58

Which from following alkyl halides has highest boiling point?

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Options:



- A. CH_3F
- B. CH_3Cl
- C. CH_3Br
- D. CH_3I

Answer: D

Solution:

To determine which alkyl halide has the highest boiling point among the given options, consider the factors affecting the boiling point, such as molecular weight and the strength of intermolecular forces.

In general, as the size and molecular weight of an alkyl halide increase, the boiling point also increases. This is largely due to the increased strength of Van der Waals forces (dispersion forces) in larger molecules. Among halogens, iodine is the heaviest, followed by bromine, chlorine, and then fluorine.

Let's examine each of the compounds:

Option A: CH_3F (methyl fluoride)

Option B: CH_3Cl (methyl chloride)

Option C: CH_3Br (methyl bromide)

Option D: CH_3I (methyl iodide)

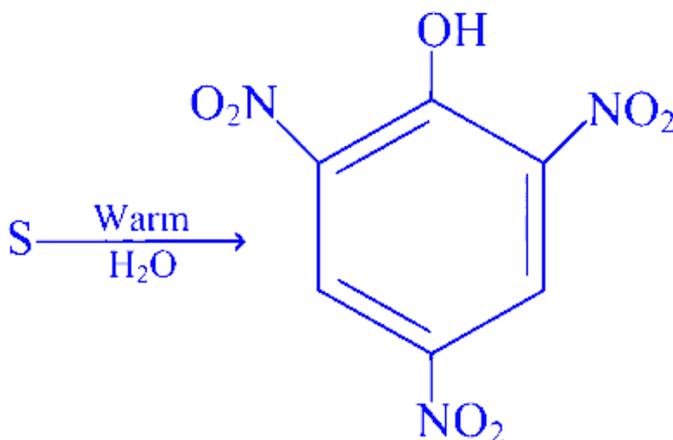
Given the trend that increasing molecular weight and greater intermolecular forces lead to higher boiling points, methyl iodide (CH_3I) would have the highest boiling point among these options, as iodine is the heaviest halogen and contributes to more significant dispersion forces.

Therefore, the alkyl halide with the highest boiling point is:

Option D: CH_3I (methyl iodide).

Question59

Identify the substrate 'S' in the following reaction.



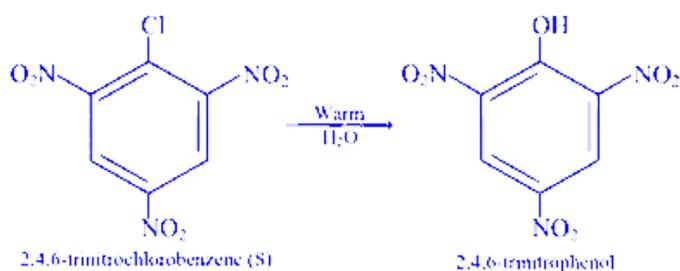
MHT CET 2024 3rd May Morning Shift

Options:

- A. p-Nitrochlorobenzene
- B. o-Nitrochlorobenzene
- C. 2,4,6-trichloronitrobenzene
- D. 2,4,6-trinitrochlorobenzene

Answer: D

Solution:



Question60

Which of the following compounds has difficulty in breaking the $C - Cl$ bond?

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Options:

- A. o-Nitrochlorobenzene
- B. m-Nitrochlorobenzene
- C. p-Nitrochlorobenzene
- D. 2,4,6-trinitrochlorobenzene

Answer: B

Solution:

Nucleophilic aromatic substitution involves the replacement of a leaving group (like Cl) on an aromatic ring by a nucleophile.

The reactivity depends on:

Presence of electron-withdrawing groups (EWGs): Such as nitro groups ($-NO_2$), which stabilize the negative charge in the intermediate.

Position of EWGs relative to the leaving group:

Ortho (o-) and Para (p-) positions: Enhance reactivity due to resonance stabilization.

Meta (m-) position: Less effective in stabilizing the intermediate.

Analyzing Each Compound:

Option A: o-Nitrochlorobenzene

Structure: Chlorine at position 1, nitro group at position 2 (adjacent to Cl).

Effect:

The nitro group is at the **ortho position** relative to Cl.

Strong activating effect for S_NAr due to resonance stabilization.

Conclusion: The C–Cl bond is **easily broken**.

Option B: m-Nitrochlorobenzene

Structure: Chlorine at position 1, nitro group at position 3.

Effect:

The nitro group is at the **meta position** relative to Cl.

Less effective in stabilizing the negative charge on the ring during the transition state.

Conclusion: The C–Cl bond is **difficult to break** compared to ortho and para isomers.

Option C: p-Nitrochlorobenzene

Structure: Chlorine at position 1, nitro group at position 4 (opposite Cl).

Effect:

The nitro group is at the **para position** relative to Cl.

Provides **resonance stabilization** to the intermediate.

Conclusion: The C–Cl bond is **easily broken**.

Option D: 2,4,6-Trinitrochlorobenzene

Structure: Chlorine at position 1, nitro groups at positions 2, 4, and 6.

Effect:

Multiple nitro groups at **ortho and para positions** relative to Cl.

Highly activates the ring towards S_NAr reactions.

Conclusion: The C–Cl bond is **very easily broken**.

Final Answer:

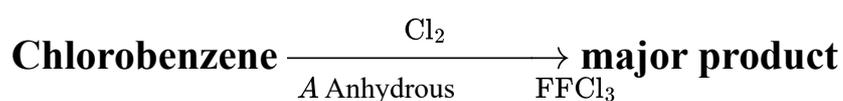
m-Nitrochlorobenzene (Option B) has the **least activation** for nucleophilic aromatic substitution due to the nitro group being at the **meta position**, which does not effectively stabilize the transition state.

Therefore, it has **difficulty in breaking the C–Cl bond** compared to the other options.

Answer: Option B

Question61

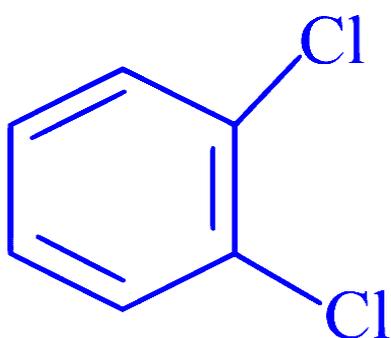
Identify the major product obtained in the following reaction.



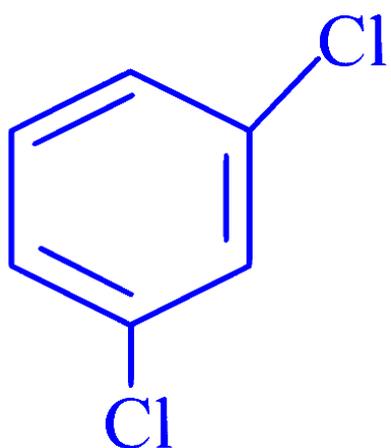
MHT CET 2024 2nd May Evening Shift

Options:

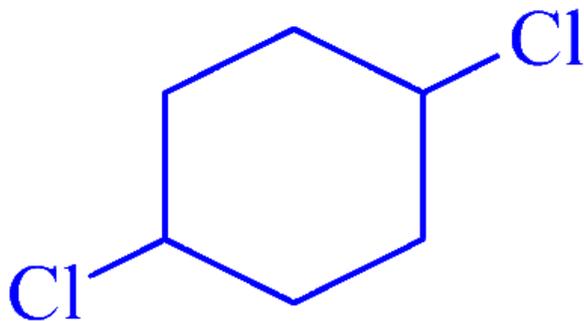
A.



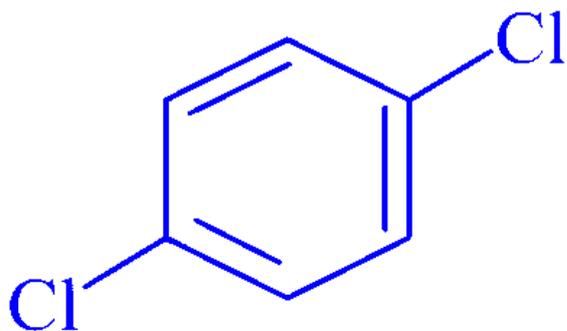
B.



C.

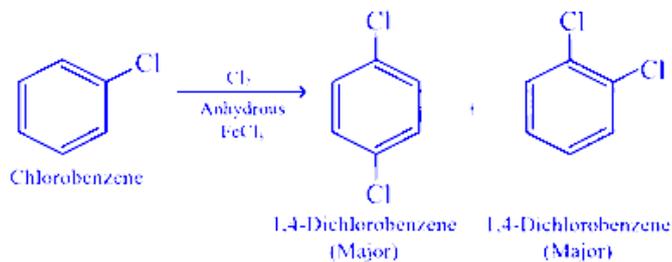


D.



Answer: D

Solution:



Question62

Which of the following compounds is obtained by using Swartz reaction?

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Options:

- A. Alkyl iodides
- B. Alkyl bromides



C. Alkyl chlorides

D. Alkyl fluorides

Answer: D

Solution:

To determine which compounds are obtained using the **Swarts reaction**, we'll first understand what the Swarts reaction entails and then identify the correct option among the given choices.

What is the Swarts Reaction?

The **Swarts reaction** is an important method in organic chemistry used for the preparation of **alkyl fluorides** from other alkyl halides (typically chlorides or bromides). This reaction involves the exchange of halogen atoms (chlorine or bromine) in an alkyl halide with a fluorine atom, using metallic fluorides as fluorinating agents.

Mechanism and Reagents

General Reaction:



Common Fluorinating Agents:

Antimony(III) fluoride (SbF_3)

Mercury(II) fluoride (Hg_2F_2)

Silver fluoride (AgF)

Cobalt(III) fluoride (CoF_3)

Detailed Explanation

Starting Materials:

Alkyl Chlorides (R-Cl) or Alkyl Bromides (R-Br)

Reagents Used:

Metallic Fluorides: Compounds like antimony trifluoride (SbF_3) are used because they can donate fluorine atoms to the organic molecule.

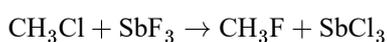
Reaction Process:

The metallic fluoride reacts with the alkyl chloride or bromide.

The **fluorine atom** from the metallic fluoride replaces the **chlorine or bromine atom** in the alkyl halide.

This results in the formation of an **alkyl fluoride (R-F)** and a **metal halide** (e.g., SbCl_3 or SbBr_3).

Example Reaction:



Applications of the Swarts Reaction

Synthesis of Alkyl Fluorides:

Alkyl fluorides are valuable in pharmaceuticals, agrochemicals, and as refrigerants.

The Swarts reaction provides a convenient method to introduce fluorine atoms into organic molecules.

Industrial Importance:

Used in the production of fluorinated compounds like chlorofluorocarbons (CFCs), though their use has declined due to environmental concerns.

Analysis of Given Options

Now, let's match this understanding with the options provided:

Option A: Alkyl Iodides

Not typically formed via the Swarts reaction.

Iodine is a larger halogen and is usually not involved in such halogen exchange reactions for fluorination.

Option B: Alkyl Bromides

Used as starting materials in the Swarts reaction but **not the end product**.

Alkyl bromides are converted **into** alkyl fluorides.

Option C: Alkyl Chlorides

Also used as starting materials in the Swarts reaction.

Alkyl chlorides are transformed **into** alkyl fluorides.

Option D: Alkyl Fluorides

This is the primary product of the Swarts reaction.

Alkyl fluorides are formed by replacing the halogen (Cl or Br) in the starting material with a fluorine atom.

Conclusion

The **Swarts reaction** is specifically used to synthesize **alkyl fluorides** from alkyl chlorides or bromides.

Alkyl fluorides are the compounds obtained through this reaction.

Therefore, the correct answer is:

Answer: Option D

Question63

Identify the product obtained when methyl bromide reacts with sodium tert-butoxide.

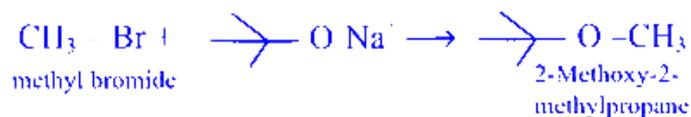
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Options:

- A. Isobutylene and methanol
- B. 1-Methoxybutane
- C. 2-Methoxybutane
- D. 2-Methoxy-2-methylpropane

Answer: D

Solution:

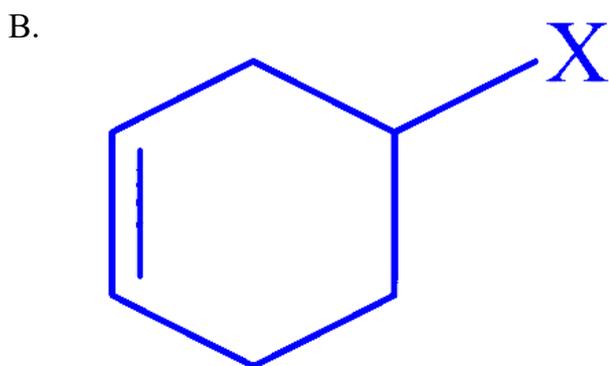
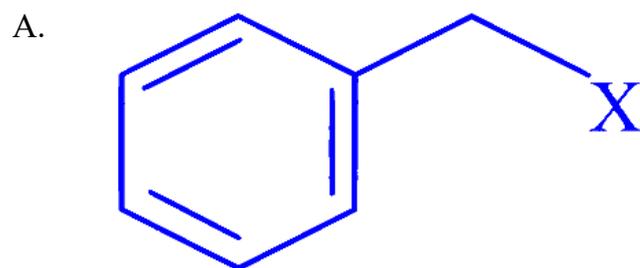


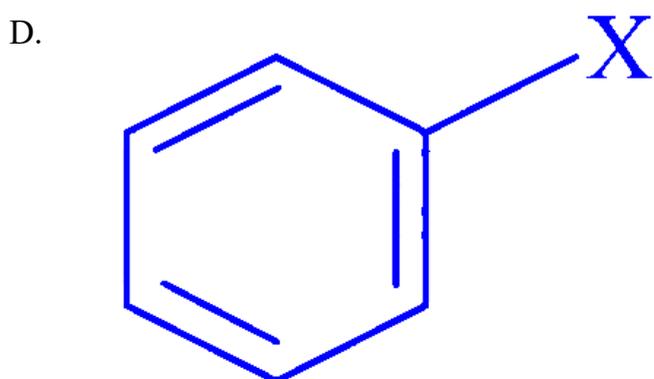
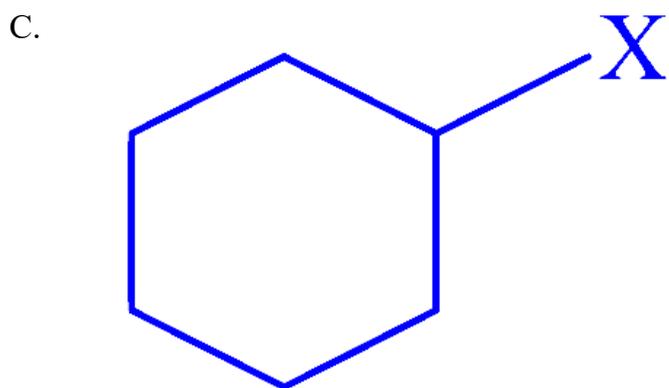
Question64

Which among the following is haloarene?

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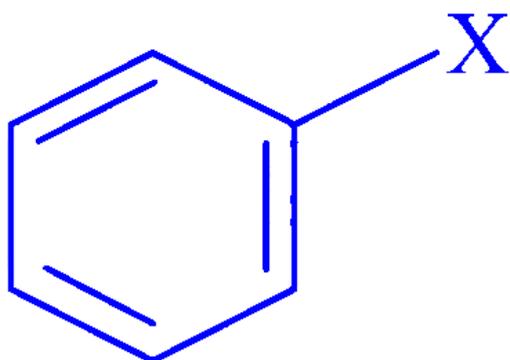
Options:





Answer: D

Solution:



Question65

Which among the following is haloalkyne?

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Options:

- A. Chloroethyne
- B. 3-Chlorobut-1-yne
- C. 1-Chloropent-2-yne
- D. 4-Chloropent-2-yne

Answer: A

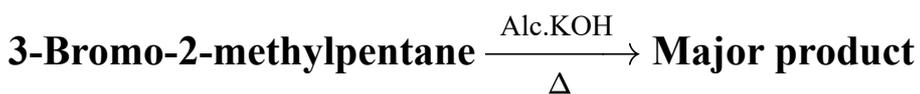
Solution:

<p>Chloroethyne</p> $\text{CH} \equiv \text{C} - \text{Cl}$	<p>3-Chlorobut-1-yne</p> $\begin{array}{c} \text{H} \\ \\ \text{H}_3\text{C} - \text{C} - \text{C} = \text{CH} \\ \\ \text{Cl} \end{array}$
<p>1-Chloropent-2-yne</p> $\begin{array}{c} \text{H} \qquad \qquad \text{H} \\ \qquad \qquad \\ \text{H}_3\text{C} - \text{C} \equiv \text{C} - \text{C} - \text{Cl} \\ \qquad \qquad \\ \text{H} \qquad \qquad \text{H} \end{array}$	<p>4-Chloropent-2-yne</p> $\begin{array}{c} \text{H} \\ \\ \text{H}_3\text{C} - \text{C} - \text{C} \equiv \text{C} - \text{CH}_3 \\ \\ \text{Cl} \end{array}$

In a haloalkyne, halogen atom is bonded to sp hybridized carbon atom. Hence, among the given options, chloroethyne is a haloalkyne.

Question66

Identify major product formed in the following reaction.



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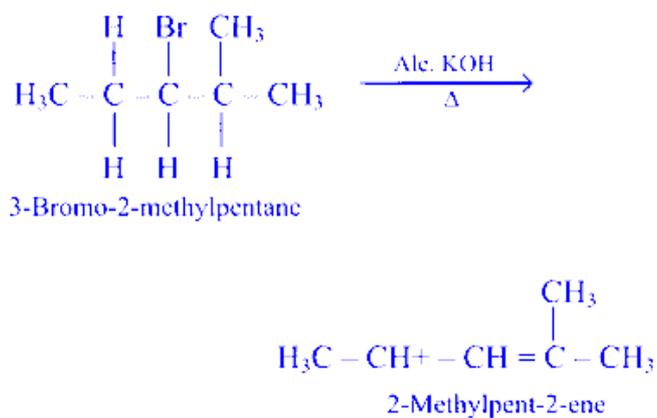
Options:

- A. 2-Methylpentan-3-ol
- B. 2-Methylpent-2-ene
- C. 4-Methylpent-3-ene
- D. 4-Methylpentan-3-ol

Answer: B

Solution:

This is dehydrohalogenation reaction.



Question67

What is the number of moles of ethane obtained from $2n$ moles of bromomethane using $2n$ moles of sodium atoms in dry ether medium?

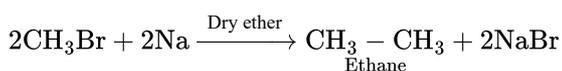
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Options:

- A. $4n$
- B. $3n$
- C. $2n$
- D. n

Answer: D

Solution:



$\therefore 2n$ moles of $\text{CH}_3\text{Br} \equiv n$ moles of ethane

Question68

Which of the following is formed when propene is heated with bromine at high temperature?

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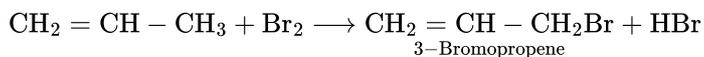
Options:

- A. 1,2-Dibromopropane
- B. 1-Bromopropane
- C. 2-Bromopropene
- D. 3-Bromopropene

Answer: D

Solution:

When alkenes are heated with Br₂ or Cl₂ at high temperature, hydrogen atom of allylic carbon is substituted with halogen atom giving allyl halide.



Question69

Which among the following is benzylic halide?

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Options:

- A. C₆H₅ - CH₂ - X
- B. C₆H₅ - X
- C. C₆H₅ - CH = CH - X
- D. C₆H₅ - CH₂ - CH₂ - X

Answer: A

Solution:

Benzylic halides are the compounds in which the halogen atom is bonded to an sp³-hybridised carbon atom next to an aromatic ring.



Options:

- A. Chloromethane
- B. Fluoromethane
- C. Iodomethane
- D. Bromomethane

Answer: B

Solution:

Generally, boiling points increase with increasing molecular mass due to greater magnitude of van der Waals' force of attraction. Thus, fluoromethane with least molecular mass will have lowest boiling point.

Question72

Which among the following is a feature of S_N1 mechanism?

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Options:

- A. Single step mechanism
- B. Only backside attack of nucleophile
- C. Transition state contains pentacoordinate carbon
- D. Formation of planar carbocation intermediate

Answer: D

Solution:

Answer: **(D) Formation of planar carbocation intermediate.**

The S_N1 (Substitution Nucleophilic Unimolecular) reaction is a two-step process, not a single-step mechanism. The first step involves the slow, rate-determining formation of a carbocation intermediate. This carbocation is sp^2 hybridized and has a trigonal planar geometry. Because of this planar structure, the nucleophile can attack from either the front or the back face with roughly equal probability, leading to a racemic mixture of products (both retention and inversion of configuration). Backside attack only is a feature of the S_N2 mechanism, which also involves a pentacoordinate transition state.

Question73

Which of the following is formed when propene is heated with chlorine at high temperature?

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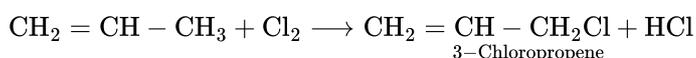
Options:

- A. 1,2-Dichloropropane
- B. 1-Chloropropane
- C. 2-Chloropropane
- D. 3-Chloropropene

Answer: D

Solution:

When an alkene is heated with Cl_2 at high temperature, hydrogen atom of allylic carbon is substituted with halogen atom giving allyl halide.



Alkenes form addition product, vicinal dihalide, with chlorine or bromine usually in inert solvent like CCl_4 at room temperature.

Question74

Which of the following gases is formed during oxidation of trichloromethane?

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Options:

- A. $\text{CO}_{(g)}$
- B. $\text{CO}_{2(g)}$
- C. $\text{COCl}_{2(g)}$
- D. $\text{H}_{2(g)}$

Answer: C

Solution:

Chloroform (trichloromethane) when exposed to air and light forms a poisonous compound phosgene (COCl_2) so it is stored in dark coloured air tight bottles.

Question75

Which of the following compounds has difficulty in breaking of C – X bond during nucleophilic substitution reaction?

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Options:

- A. o-Nitrochlorobenzene
- B. p-Nitrochlorobenzene
- C. m-Nitrochlorobenzene
- D. 2,4,6-Trinitrochlorobenzene

Answer: C

Solution:

Greater the number of electron withdrawing groups at o/p position, greater is the reactivity towards nucleophilic substitution reaction. Electron withdrawing group at meta position has practically no effect on reactivity. Hence, among the given, m-nitrochlorobenzene has difficulty in breaking of C – X bond during nucleophilic substitution.

Question76

Which among the following is haloalkyne?

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Options:

- A. $\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH} - \text{X}$
- B. $\text{CH}_3 - \text{C} = \text{C} - \text{CH}_2 - \text{X}$
- C. $\text{CH} \equiv \text{C} - \text{CH}_2 - \text{CH}_2 - \text{X}$
- D. $\text{CH}_3 - \text{CH}_2 - \text{C} \equiv \text{C} - \text{X}$



Answer: D

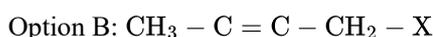
Solution:

Haloalkynes are compounds that contain a halogen atom (such as fluoride, chlorine, bromine, or iodine) directly bonded to a carbon atom that is part of a carbon-carbon triple bond. In other words, for a compound to be classified as a haloalkyne, it must have a functional group that consists of both a carbon-carbon triple bond (alkyne part) and a halogen atom attached to one of the carbon atoms involved in the triple bond.

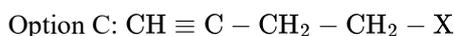
Now, let's examine the provided options:



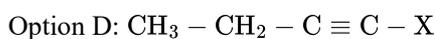
This is not a haloalkyne because it has a carbon-carbon double bond rather than a triple bond, so it would be classified as a haloalkene.



Although this compound contains a carbon-carbon triple bond, the halogen is not attached to one of the carbons participating in that triple bond. Thus, this compound is not a haloalkyne either.



Similar to Option B, this compound has a carbon-carbon triple bond and a halogen, but the halogen is not directly attached to the carbon-carbon triple bond, so this is also not a haloalkyne.



This compound has a carbon-carbon triple bond and a halogen atom directly bonded to one of the carbon atoms of the triple bond, making it a haloalkyne.

Therefore, the correct answer is:



It is the haloalkyne among the given options because it has the halogen atom (X) directly connected to a carbon that is part of an alkyne group.

Question77

Which of the following reactions is used for the conversion of alkyl chloride to alkyl iodide?

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Options:

- A. Fitting reaction
- B. Friedel Crafts reaction
- C. Finkelstein reaction
- D. Swartz reaction

Answer: C

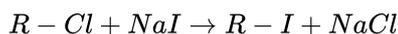


Solution:

The conversion of alkyl chloride to alkyl iodide is typically done through the Finkelstein reaction, which involves the exchange of halide ions. Therefore, the correct answer is:

Option C: Finkelstein reaction

The Finkelstein reaction is an S_N2 nucleophilic substitution reaction where an alkyl halide (usually a chloride or bromide) reacts with a sodium halide salt (usually sodium iodide) in acetone to form an alkyl iodide. The mechanism of the reaction ensures that the iodide ion is a better nucleophile in acetone and displaces the chloride or bromide ion. The reaction can be represented as:



Acetone is used as a solvent because it helps in the swift precipitation of the sodium chloride formed as a byproduct, driving the equilibrium towards the product side due to Le Chatelier's principle.

As for the other options:

Option A: The Fittig reaction is used to couple two aryl or vinyl halides in the presence of a metal, typically sodium.

Option B: The Friedel-Crafts reaction is a type of alkylation or acylation reaction where an alkyl or acyl group is introduced into an aromatic ring with the help of a Lewis acid catalyst like aluminium chloride, $AlCl_3$.

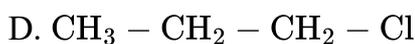
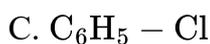
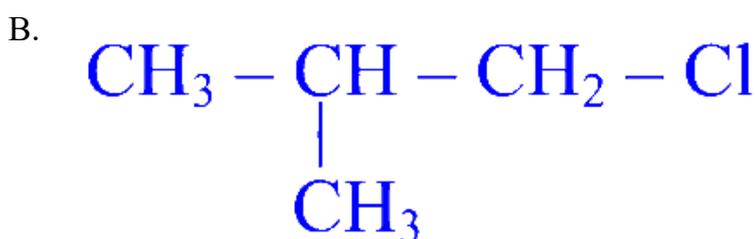
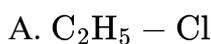
Option D: The Swarts reaction is another halogen exchange reaction primarily used for the conversion of alkyl chlorides or bromides to alkyl fluorides using metal fluoride salts such as AgF , Hg_2F_2 , CoF_3 , or SbF_3 .

Question 78

Which of the following compounds does NOT undergo Williamson's synthesis?

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Options:



Answer: C

Solution:

Aryl halides do not give Williamson's synthesis.

Question79

Identify major product A in following reaction.



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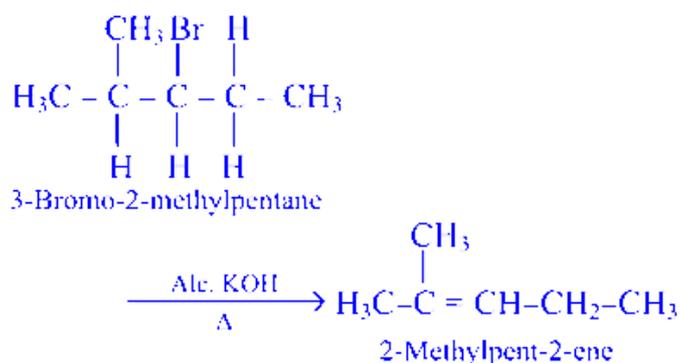
Options:

- A. 2-Methylpentan-3-ol
- B. 2-Methylpent-2-ene
- C. 4-Methylpent-3-ene
- D. 4-Methylpentan-3-ol

Answer: B

Solution:

When alkyl halide having at least one β -hydrogen is boiled with alcoholic solution of potassium hydroxide, it undergoes elimination of hydrogen atom from β -carbon and halogen atom from α -carbon resulting in the formation of an alkene. This reaction is known as dehydrohalogenation reaction or β -elimination. The preferred product is that alkene which has greater number of alkyl groups attached to doubly bonded carbon atoms according to Saytzeff rule.



Question80

The molecular formula of hexachlorobenzene is

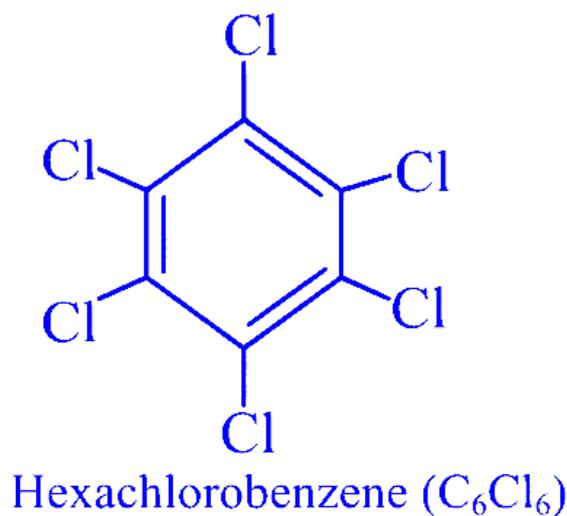
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Options:



Answer: B

Solution:



Question81

Identify the final product formed on ammonolysis of benzyl chloride followed by the reaction with two moles of CH_3I .

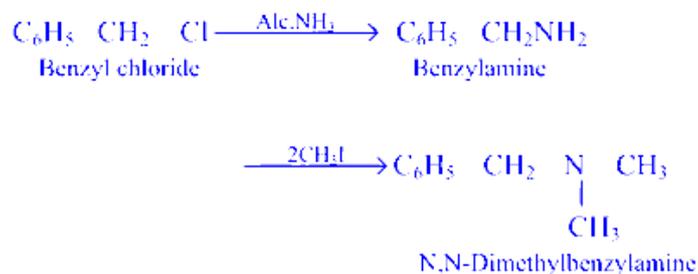
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Options:



Answer: D

Solution:



Question82

When tert-butyl bromide is heated with silver fluoride, the major product obtained is:

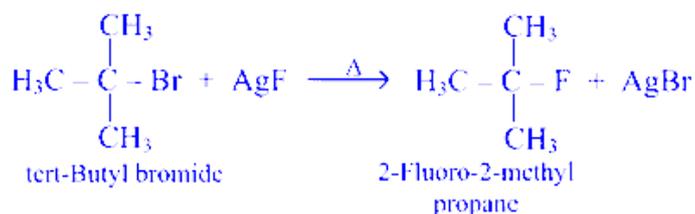
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Options:

- A. 1-Fluoro-2-methylpropane
- B. 2-Fluoro-2-methylpropane
- C. 1-Fluorobutane
- D. 2-Fluorobutane

Answer: B

Solution:



This is Swartz reaction.

Question83

The reaction of aryl halide with alkyl halide and sodium metal in dry ether to form substituted aromatic compounds is known as:

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Options:

- A. Wurtz reaction
- B. Fittig reaction
- C. Wurtz Fittig reaction
- D. Friedel Craft's reaction

Answer: C

Solution:

The reaction of an **aryl halide** with an **alkyl halide** in presence of **sodium metal in dry ether** to form a substituted aromatic compound is called the:

- C) Wurtz–Fittig reaction
-

Question84

Identify 'A' in the following reaction.



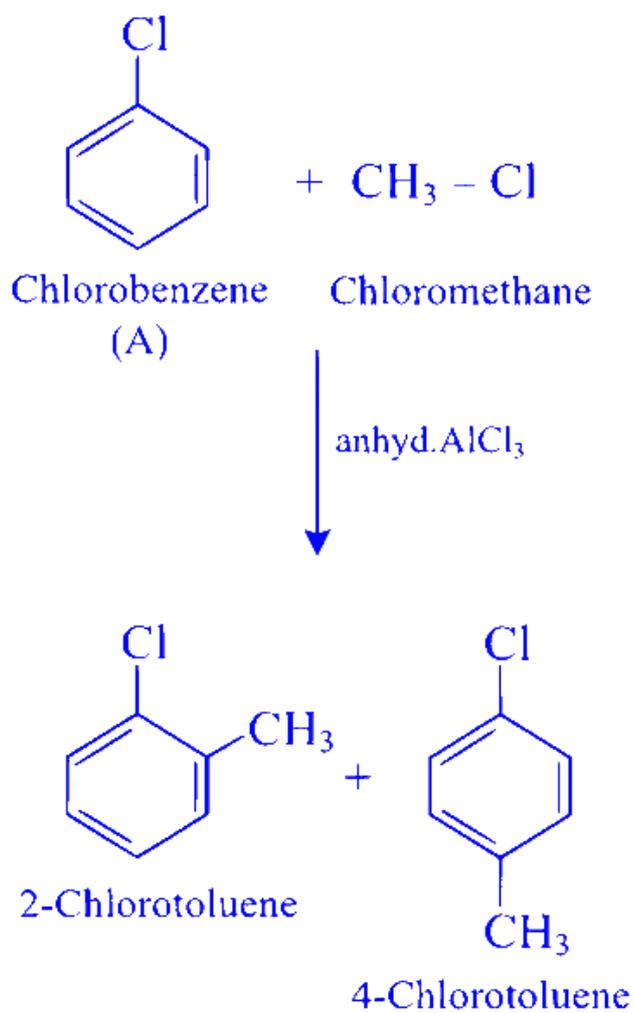
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Options:

- A. Benzene
- B. Chlorobenzene
- C. Toluene
- D. Phenol

Answer: B

Solution:



Question85

Which among the following is vinylic halide?

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Options:

- A. $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{X}$
- B. $\text{CH}_3 - \text{CH} = \text{CH} - \text{X}$
- C. $\text{CH}_3 - \text{C} \equiv \text{C} - \text{X}$
- D. $\text{C}_6\text{H}_5 - \text{CH}_2 - \text{X}$

Answer: B

Solution:

In vinylic halides, halogen atom is bonded to a sp^2 hybridized carbon atom of aliphatic chain. $CH_3 - CH = CH - X$ is a vinylic halide.

Question86

Identify compound Y in the following reaction. $C_2H_5Cl + Y \xrightarrow{\Delta} C_2H_5CN$

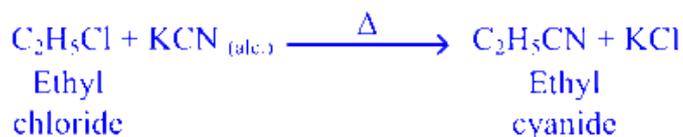
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Options:

- A. NH_3
- B. HNO_3
- C. KCN (alc)
- D. $AgCN$ (alc)

Answer: C

Solution:



Question87

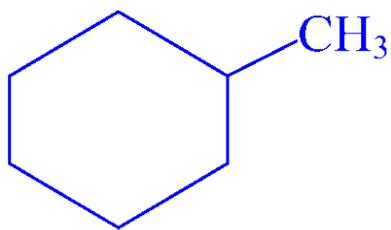
Which of the following compounds reacts with HBr to form 1-Bromo-1-methylcyclohexane?

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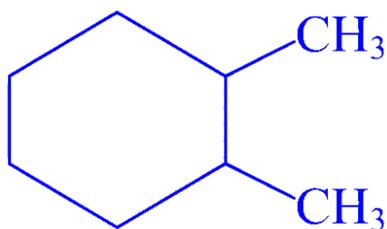
Options:

- A.

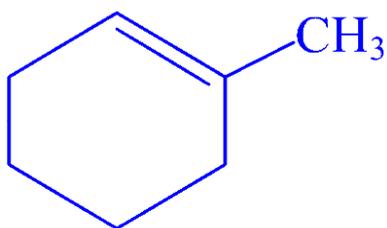




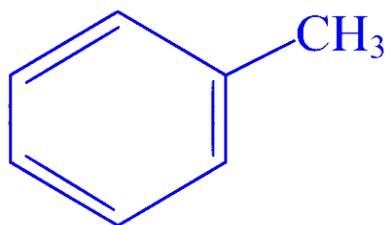
B.



C.

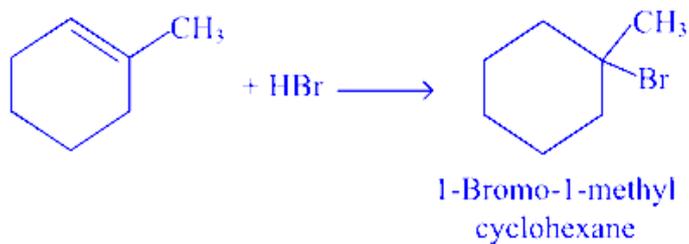


D.



Answer: C

Solution:



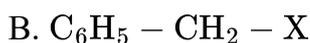
This reaction follows Markownikoff's rule.

Question88

Which among the following is allylic halide?

MHT CET 2023 9th May Evening Shift

Options:



Answer: C

Solution:

In allylic halides, halogen atom is bonded to a sp^3 hybridized carbon atom next to a carbon-carbon double bond ($\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{X}$).

Question 89

Which of the following is NOT obtained when a mixture of methyl chloride and n-propyl chloride is treated with sodium metal in dry ether?

MHT CET 2023 9th May Morning Shift

Options:

A. Ethane

B. Butane

C. Propane

D. Hexane

Answer: C

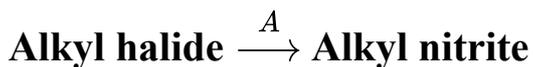
Solution:

When a mixture of methyl chloride and n-propyl chloride is treated with sodium metal in dry ether, three possible alkanes formed are: ethane, butane and hexane.



Question90

Identify the reagent A in the following conversion.



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Options:

- A. KNO_3
- B. NaNO_3
- C. AgNO_2
- D. KNO_2

Answer: D

Solution:

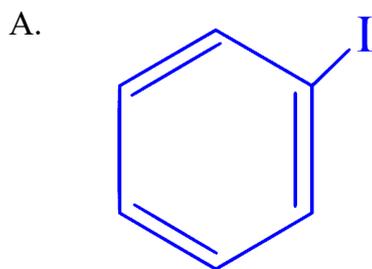
Alkyl halide ($\text{R} - \text{X}$) on treatment with KNO_2 forms alkyl nitrite ($\text{R} - \text{O} - \text{N} = \text{O}$).

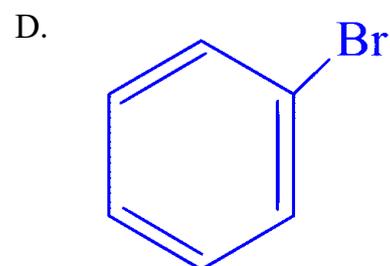
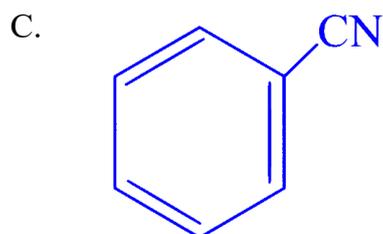
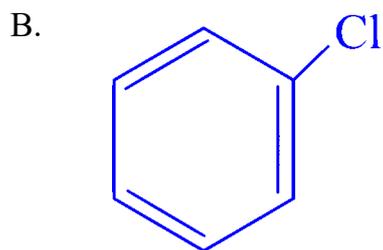
Question91

Which among the following compounds is NOT prepared by Sandmeyer's reaction ?

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Options:

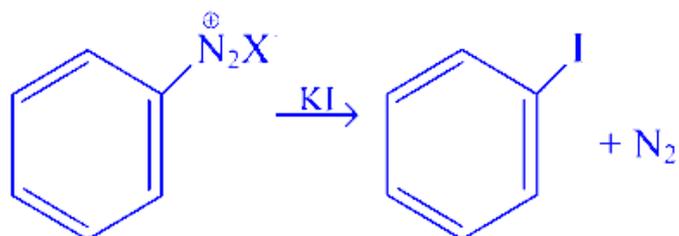




Answer: A

Solution:

It requires only KI

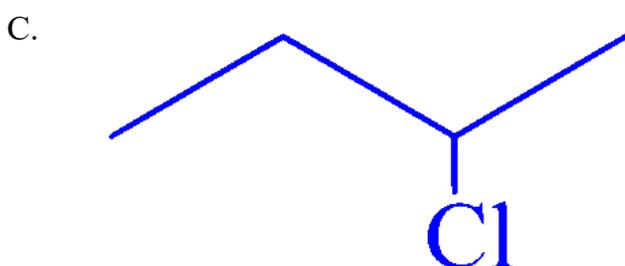
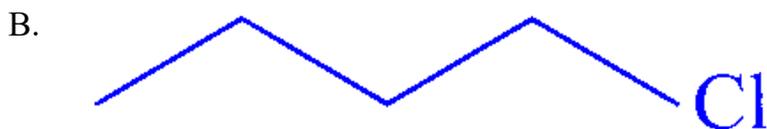


Question92

Which among the following compounds undergoes SN^2 reaction fastly ?

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Options:



Answer: D

Solution:

Primary iodide will undergo S_N2 reaction fast.

Question93

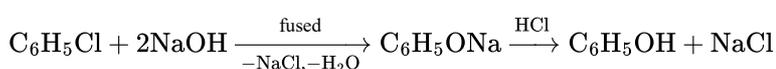
What is the intermediate compound formed when chlorobenzene is treated with fused NaOH under pressure?

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Options:

- A. Phenoxide ion
- B. Sodium phenoxide
- C. Benzene diazonium chloride
- D. Benzene

Answer: B**Solution:**

Question94

Which following statement is true for vinylic halide?

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Options:

- A. Halogen atom is bonded to 'sp' hybridized carbon atom.
- B. Halogen atom is bonded to 'sp²', hybridized carbon atom of aromatic ring.
- C. Halogen atom is bonded to 'sp³' hybridized carbon atom next to carbon- carbon double bond.
- D. Halogen atom is bonded to 'sp²', hybridized carbon atom of aliphatic chain.

Answer: D**Solution:**

The correct statement for a vinylic halide is:

Option D

Halogen atom is bonded to 'sp²' hybridized carbon atom of aliphatic chain.

Explanation:

Vinylic halides are organic compounds where a halogen atom is directly bonded to an sp² hybridized carbon atom, which is part of an aliphatic chain. This can be seen in structures like vinyl chloride (chloroethene) where the halogen (chlorine) is bonded to the carbon-carbon double bond.



Thus, Option D accurately describes a vinylic halide.

Question95

Which among the following is NOT a feature of S_N1 mechanism?

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Options:

- A. Involve only backside attack of nucleophile.
- B. In an optically active substrate the product formed is racemic.
- C. Two step mechanism.
- D. Heterolysis of C – X bond forms carbocation intermediate.

Answer: A

Solution:

The S_N1 mechanism, or unimolecular nucleophilic substitution reaction, has several characteristic features. Let's analyze each option provided to determine which one does NOT describe the S_N1 mechanism:

Option A: Involve only backside attack of nucleophile.

This statement is NOT true for the S_N1 mechanism. The S_N1 mechanism does not involve a specific attack direction (backside or frontside) because the nucleophile attacks the planar carbocation intermediate from either side. This is unlike the S_N2 mechanism, which involves a backside attack by the nucleophile.

Option B: In an optically active substrate the product formed is racemic.

This statement is true for the S_N1 mechanism. Since the carbocation intermediate is planar, the nucleophile can attack from either side, leading to a racemic mixture if the starting material is chiral.

Option C: Two step mechanism.

This statement is true for the S_N1 mechanism. The reaction proceeds via two main steps: the formation of the carbocation intermediate (slow step) and the nucleophilic attack (fast step).

Option D: Heterolysis of C – X bond forms carbocation intermediate.

This statement is true for the S_N1 mechanism. The first step involves the heterolytic cleavage of the C – X bond, resulting in the formation of a carbocation intermediate.

Thus, the correct answer is:

Option A: Involve only backside attack of nucleophile.



Question96

Which among the following is haloalkyne?

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Options:

- A. Halogen atom is bonded to sp^2 hybridized carbon atom of aromatic a ring.
- B. Halogen atom is bonded to sp^3 hybridized carbon atom next to $C = C$ double bond in aliphatic chain.
- C. Halogen atom is bonded to sp hybridized carbon atom in aliphatic chain.
- D. Halogen atom is bonded to sp^2 hybridized carbon atom in aliphatic chain.

Answer: C

Solution:

The correct answer is **Option C**. Here's why:

Let's break down the terms and the options:

Haloalkyne: A haloalkyne is an organic compound that contains a halogen atom (like chlorine, bromine, fluorine, or iodine) bonded to a carbon atom in an alkyne. Alkynes are characterized by having a triple bond between two carbon atoms.

Hybridization: Hybridization refers to the mixing of atomic orbitals to form new hybrid orbitals with different shapes and energies. The hybridization of a carbon atom determines the geometry and properties of the molecule.

Now let's analyze the options:

Option A: This describes a halogenated aromatic compound. Aromatic compounds have a cyclic structure with a special type of bonding, and the carbon atoms in the ring are sp^2 hybridized. This is not an alkyne.

Option B: This describes a halogenated alkene. Alkenes contain a carbon-carbon double bond, and the carbons involved in the double bond are sp^2 hybridized. The carbon next to the double bond is sp^3 hybridized. This is not an alkyne.

Option C: This describes a haloalkyne. Alkynes have a carbon-carbon triple bond, and the carbons involved in the triple bond are sp hybridized. This is the defining characteristic of a haloalkyne.

Option D: This describes a halogenated alkene. The carbon atom involved in the double bond of an alkene is sp^2 hybridized.

In summary: Only Option C correctly describes a haloalkyne, where the halogen is attached to an sp hybridized carbon atom in an aliphatic chain.

Question97

Which among the following is benzylic halide?

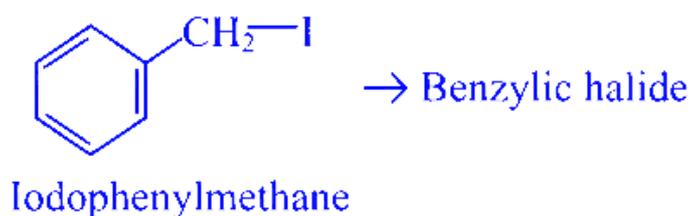
MHT CET 2021 24th September Morning Shift

Options:

- A. 4-Iodotoluene
- B. 1-Iodo-2-phenylethane
- C. Iodobenzene
- D. Iodophenylmethane

Answer: D

Solution:



Question98

Which among the following is NOT benzylic halide?

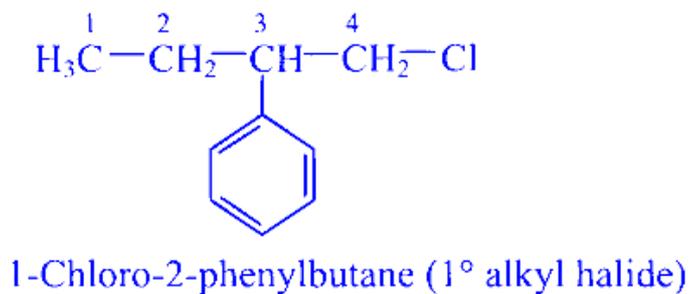
MHT CET 2021 24th September Morning Shift

Options:

- A. 2-Chloro-2-phenylpropane
- B. 1-Chloro-2-Phenylbutane
- C. Chlorophenyl methane
- D. 1-Chloro-1-phenylethane

Answer: B

Solution:



Question99

When 2-Chlorobutane is boiled with concentrated alcoholic solution of KOH, the major product formed is

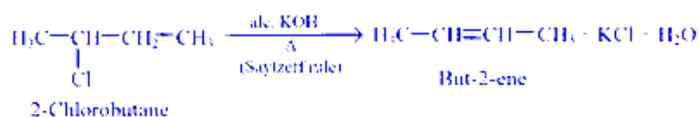
MHT CET 2021 24th September Morning Shift

Options:

- A. But-1-ene
- B. But-2-ene
- C. Butan-2-ol
- D. Butan-1-ol

Answer: B

Solution:



Question100

Which among the followings is an allylic halide?

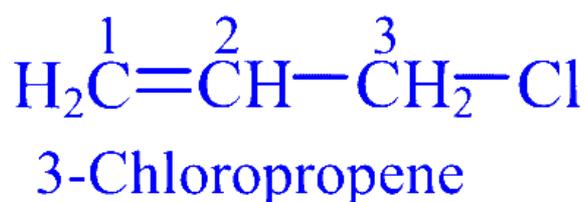
MHT CET 2021 23rd September Evening Shift

Options:

- A. 1-Chloropropene
- B. 2-Chloropropene
- C. 3-Chloropropene
- D. 4-Chlorobut-1-ene

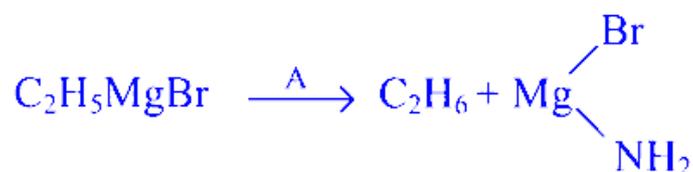
Answer: C

Solution:



Question101

Identify the reagent (A) used in the following reaction.



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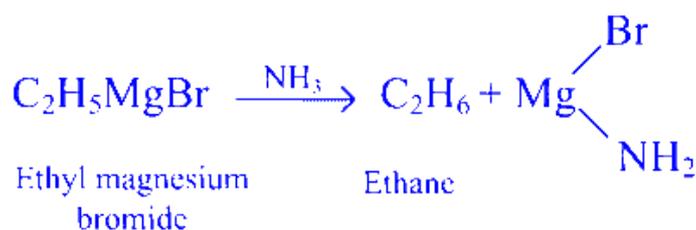
Options:

- A. NH_3
- B. RNH_2
- C. H_2O
- D. CH_3OH

Answer: A

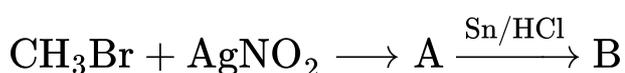


Solution:



Question102

Identify product 'B' in following reaction.



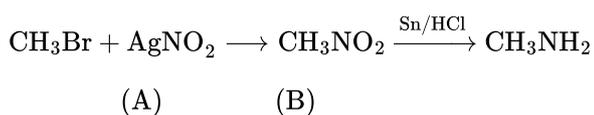
MHT CET 2021 23th September Morning Shift

Options:

- A. CH_3NO_2
- B. CH_3NH_2
- C. CH_3Cl
- D. CH_3OH

Answer: B

Solution:



Question103

The major product obtained in the following reaction is Chlorobenzene + chlorine $\xrightarrow[\text{FeCl}_3]{\text{Anhydrous}}$ product (Major)

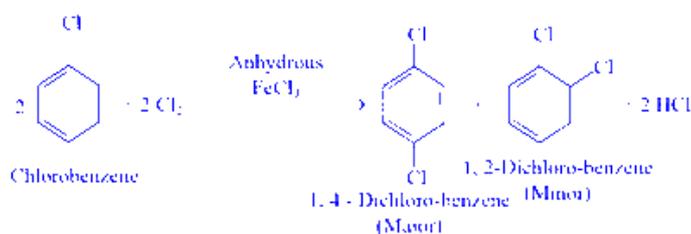
MHT CET 2021 22th September Evening Shift

Options:

- A. 1, 3, 5-trichlorobenzene
- B. 1, 4-dichlorobenzene
- C. 1, 2-dichlorobenzene
- D. 1, 3-dichlorobenzene

Answer: B

Solution:



Question104

The major product obtained in the following reaction is



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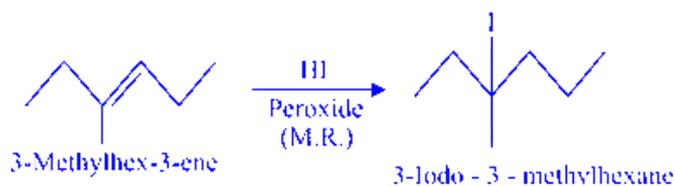
Options:

- A. 4-Iodo-4-methylhexane
- B. 4-Iodo-3-methylhexane
- C. 3-Iodo-3-methylhexane

D. 3-Iodo-4-methylhexane

Answer: C

Solution:



Question105

When tert-butyl bromide is heated with silver fluoride, the major product obtained is

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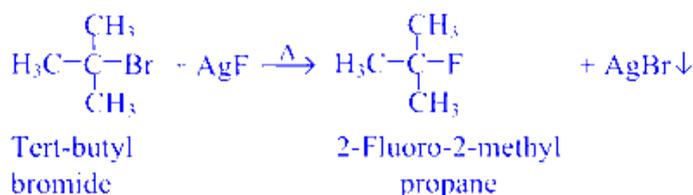
Options:

- A. 1-Fluorobutane
- B. 2-Fluoro-2-methylpropane
- C. 2-Fluoro-2-methylpropene
- D. 2-Fluorobutane

Answer: B

Solution:

Swartz reaction:



Question106

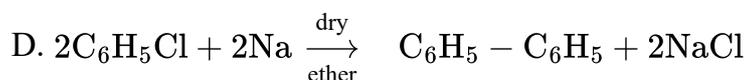
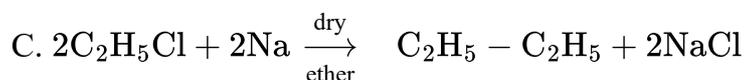
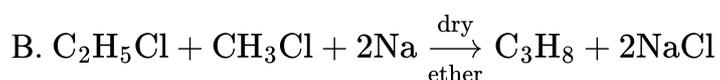
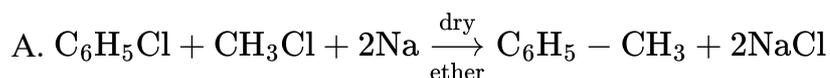
Identify the reagent used in following conversion. Chloroethane $\xrightarrow{\text{A}}$ Nitro ethane

Question108

Which of the following reactions is a Wurtz - Fittig reaction?

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Options:



Answer: A

Solution:

The reaction of aryl halide with alkyl halide and sodium metal in dry ether to give substituted aromatic compounds is known as Wurtz-Fittig reaction.

Question109

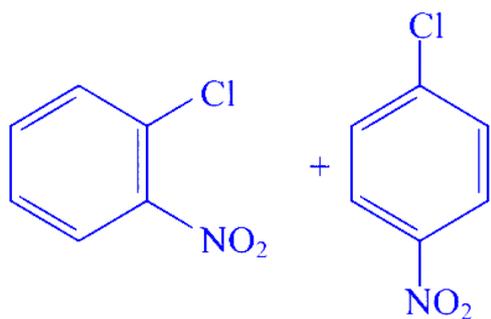
Chlorobenzene on heating with concentrated HNO_3 in presence of concentrated H_2SO_4 gives

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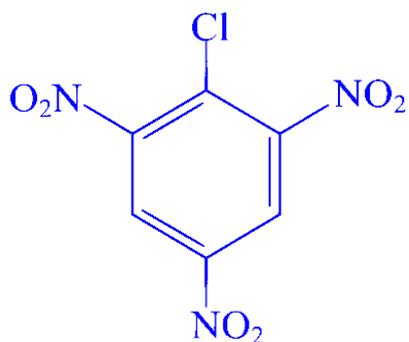
Options:

A.

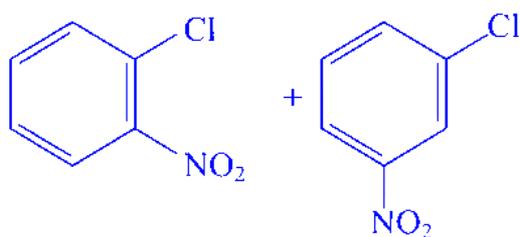




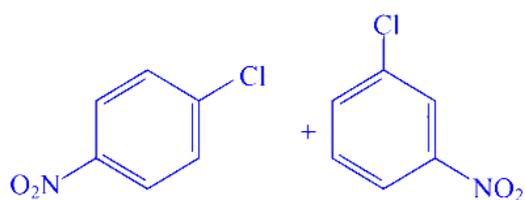
B.



C.

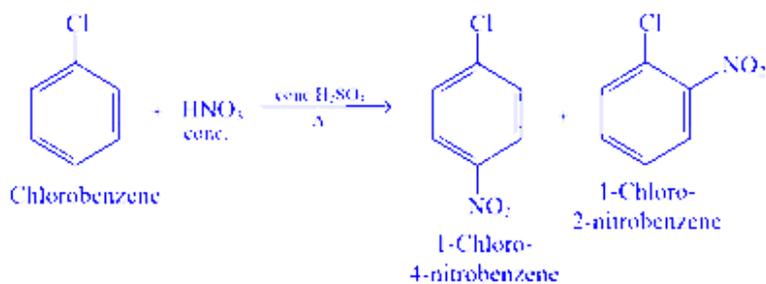


D.



Answer: A

Solution:



Question110

Identify the product formed when tertiary butyl bromide reacts with alcoholic NH_3 solution?

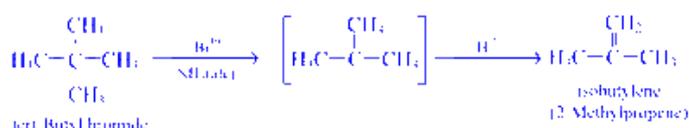
MHT CET 2021 21th September Evening Shift

Options:

- A. 2-Methylpropene
- B. But-2-ene
- C. But-1-ene
- D. 2-Methylpropan-1-ol

Answer: A

Solution:



Question111

Which of the following compounds has lower boiling point?

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Options:

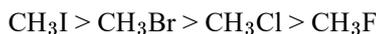
- A. Fluoromethane
- B. Iodomethane
- C. Bromomethane
- D. Chloromethane

Answer: A



Solution:

The boiling point of methyl halides decreases in the order :



(With decrease in atomic mass of halogen)

Question112

Which of the following reactions is used for the conversion of alkyl chloride to alkyl iodide?

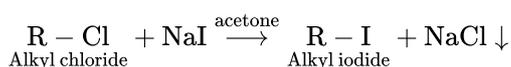
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Options:

- A. Fittig reaction
- B. Finkelstein reaction
- C. Swartz reaction
- D. Friedel Craft's reaction

Answer: B

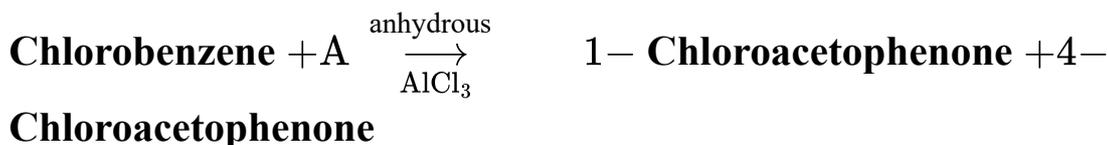
Solution:



This reaction is known as Finkelstein reaction.

Question113

Identify reactant (A) used in the following conversion.



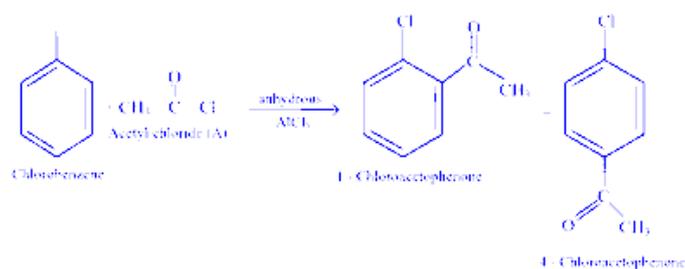
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Options:

- A. Ethyl acetate
- B. Acetophenone
- C. Acetic acid
- D. Acetyl chloride

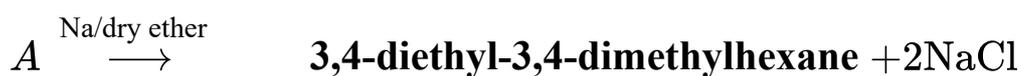
Answer: D

Solution:



Question114

Identify 'A' in the following reaction.



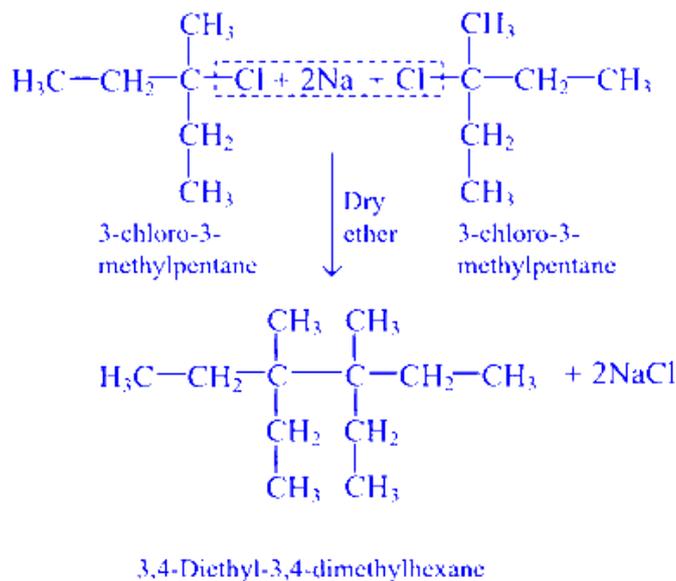
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Options:

- A. 3-Chloro-3-methylpentane
- B. 3-Chloro-2-methylpentane
- C. 2-Chloro-3-methylpentane
- D. 2-Chloro-2-methylpentane

Answer: A

Solution:



Question115

How many molecules of methyl iodide are required to obtain tetramethyl ammonium iodide from dimethyl amine?

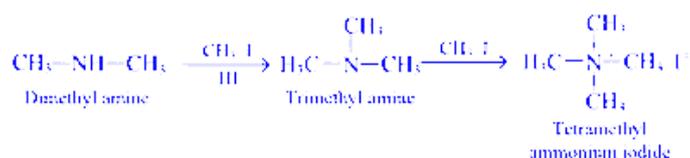
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Options:

- A. 1
- B. 3
- C. 2
- D. 4

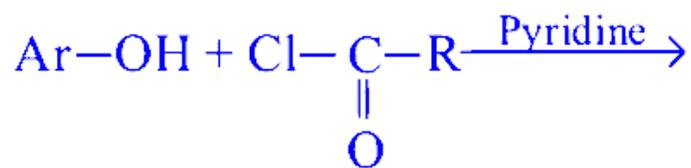
Answer: C

Solution:



Question116

Identify the compound obtained in following reaction?

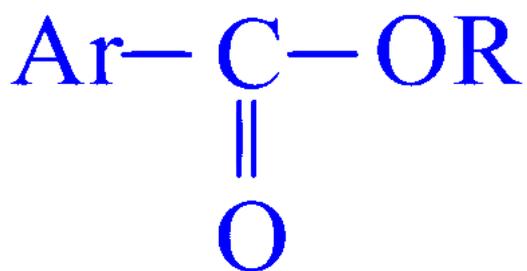


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Options:

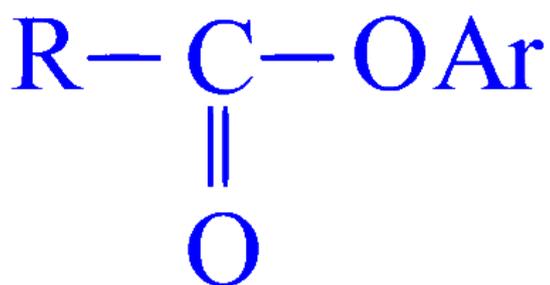
A. Ar-Cl

B.



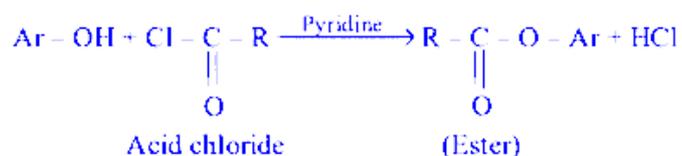
C. Ar-O-R

D.



Answer: D

Solution:



Question117

Which among the following is NOT correct statement about S_N1 reaction?

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Options:

- A. A more powerful nucleophile favours S_N1 mechanism.
- B. S_N1 reaction proceeds via formation of carbocation intermediate.
- C. S_N1 reaction proceeds more rapidly in polar protic solvent.
- D. The rate of S_N1 mechanism is independent of the nature of nucleophile.

Answer: A

Solution:

A more powerful nucleophile attacks the substrate faster and favours S_N2 mechanism.

Question118

Which of the following is least reactive towards S_N1 reactions?

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Options:

- A. $\text{CH}_3 - \text{CH}_2 - \text{Br}$
- B. $\text{CH}_3 - \text{CH}(\text{Br}) - \text{CH}_3$
- C. $(\text{CH}_3)_3\text{C} - \text{Br}$
- D. $\text{CH}_3 - \text{Br}$

Answer: D

Solution:

$\text{CH}_3 - \text{Br}$ is least reactive towards S_N1 reaction. The reaction proceed via the formation of carbocation in case of $\text{CH}_3 - \text{Br}$ the carbocation formed, which is least stable (1° carbocation).



Question119

What is the name of reaction involving replacement of diazonium group by chloride using cuprous (I) salt ?

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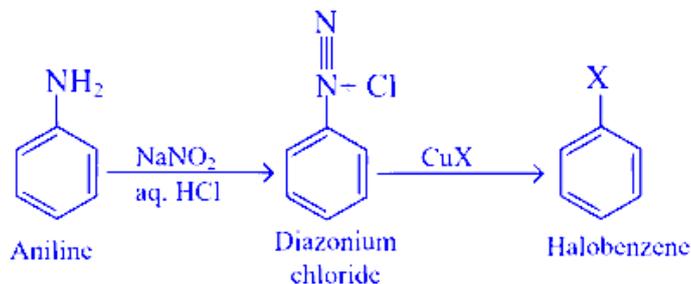
Options:

- A. Wolff -Kishner reduction
- B. Sandmeyer's reaction
- C. Balz Schiemann reaction
- D. Friedel Craft's reaction

Answer: B

Solution:

Sandmeyer's reaction involving replacement of diazonium group by chloride using cuprous (I) salt as reagent or catalyst.



Basically, this reaction used to synthesise aryl halide.

Question120

Which of the following pairs of aryl halides cannot be prepared directly by electrophilic substitution?

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Options:

- A. Aryl chloride and aryl bromide



B. Aryl fluoride and aryl chloride

C. Aryl bromide and aryl iodide

D. Aryl iodide and aryl fluoride

Answer: D

Solution:

Aryl iodide and aryl fluoride cannot be prepared directly by electrophilic substitution because reaction with iodine are reversible in nature and require the presence of an oxidising agent (HNO_3 , HIO_4) to oxidise the HI formed. Fluoro compounds are not prepared by this method due to high reactivity of fluorine.

Aryl iodide + aryl fluoride \longrightarrow no reaction.

Question121

What is correct order of $C - X$ bond strength in $\text{CH}_3 - X$?

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Options:

A. $\text{CH}_3\text{F} > \text{CH}_3\text{Cl} > \text{CH}_3\text{Br} > \text{CH}_3\text{I}$

B. $\text{CH}_3\text{Cl} > \text{CH}_3\text{Br} > \text{CH}_3\text{I} > \text{CH}_3\text{F}$

C. $\text{CH}_3\text{I} > \text{CH}_3\text{Br} > \text{CH}_3\text{Cl} > \text{CH}_3\text{F}$

D. $\text{CH}_3\text{F} > \text{CH}_3\text{Br} > \text{CH}_3\text{Cl} > \text{CH}_3\text{I}$

Answer: A

Solution:

As the size of halogen atom (X) increases, the $C - X$ bond length increases and hence, the $C - X$ bond strength decreases.

Since, the order of size of halogen atom is, $\text{F} < \text{Cl} < \text{Br} < \text{I}$

Thus, the order of $C - X$ bond strength is,
 $C - \text{F} > C - \text{Cl} > C - \text{Br} > C - \text{I}$

The correct order of $C - X$ bond strength in $\text{CH}_3 - X$ is,

$\text{CH}_3 - \text{F} > \text{CH}_3 - \text{Cl} > \text{CH}_3\text{Br} > \text{CH}_3\text{I}$

Question122

The reaction $2\text{R} - \text{Cl} + \text{CoF}_2 \longrightarrow 2\text{R} - \text{F} + \text{CoCl}_2$ is an example of

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Options:

- A. Swarts reaction
- B. Sandmeyer's reaction
- C. Wurtz-fittig reaction
- D. Finkelstein reaction

Answer: A

Solution:

Given reaction is an example of Swart's reaction. It is an halogen exchange reaction associated with alkyl halides. In this reaction, a heavy metal fluoride is used.



When alkyl chloride or alkyl bromide is heated with metallic fluoride (CoF_2) then alkyl fluoride and corresponding metal chloride are produced.

Question123

Which among the following methods is not suitable for the preparation of alkyl chlorides?

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Options:

- A. Addition of HCl to alkene
- B. Treating alcohols with Lucas reagent
- C. By heating alcohols with thionyl chloride
- D. Chlorination of alkanes in presence of sunlight

Answer: D

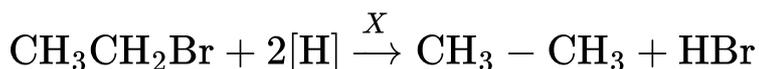
Solution:

Chlorination of alkanes in presence of sunlight is not suitable for the preparation of alkyl chloride because chlorination of alkanes gives a complex mixture of isomeric mono and polyhaloalkanes, which is difficult to separate as pure compounds. Consequently, the yield of any one compound is low.



Question124

Identify the catalyst X used in following reaction.



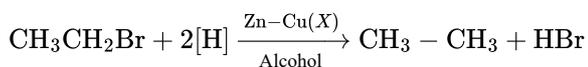
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Options:

- A. $\text{K}_2\text{Cr}_2\text{O}_7$
- B. KMnO_4
- C. CaO, Δ
- D. Zn-Cu couple in alcohol

Answer: D

Solution:



$[X]$ is Zn-Cu couple in alcohol. In the reaction, when ethyl bromide is reacted with Zn – Cu couple and alcohol, ethyl bromide reduced to give ethane. This is more or less a redox reaction. In it, ethyl bromide is reduced to give an ethyl organo metallic and Br^- subsequently, the ethanol protonates the ethyl organo metallic to give ethane.

Question125

What type of hybridisation is present in carbocation formed during the alkaline hydrolysis of 1 - bromo-1-phenyl ethane?

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Options:

- A. sp^2
- B. sp



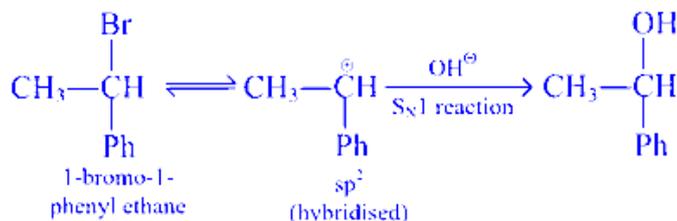
C. $d^2 sp^3$

D. sp^3

Answer: A

Solution:

Alkaline hydrolysis of 1-bromo-1-phenylethane produce 1-phenylethan-1-ol. The reaction proceed via S_N1 reaction. A carbocation is formed in the slow step of an S_N1 reaction. The positively charged carbon of the carbocation intermediate is sp^2 -hybridised and the three bonds connected to an sp^2 -hybridised are in the same plane. Reaction involved is as follows:



Question126

The correct order of boiling points of alkyl halides is

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Options:

A. $RI > RBr > RF > RCl$

B. $RI > RCl > RBr > RF$

C. $RI > RBr > R > RF$

D. $RF > RBr > R > RI$

Answer: C

Solution:

The correct order of boiling point of alkyl halides is $RI > RBr > RCl > RF$. This is because with increase in size and mass of halogen atom, the magnitude of van der Waals' forces increases.

Question127

α -chlorosodium acetate on boiling with aqueous sodium nitrite gives



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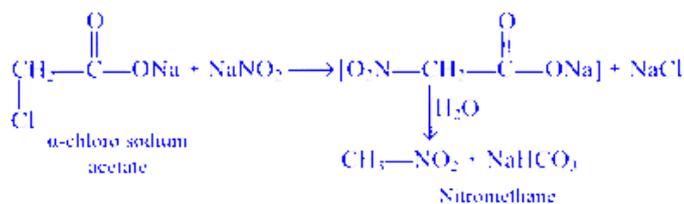
Options:

- A. nitromethane
- B. α -chloronitromethane
- C. nitroethane
- D. acetyl chloride

Answer: A

Solution:

α -chlorosodium acetate on boiling with aqueous sodium nitrite gives nitromethane. The reaction can be written as :



Question128

Which reaction is useful in exchange of halogen in alkyl chloride by iodide?

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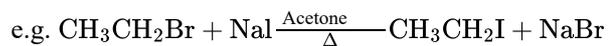
Options:

- A. Wurtz reaction
- B. Finkelstein reaction
- C. Reimer-Tiemann reaction
- D. Williamson synthesis

Answer: B

Solution:

The reaction is useful in exchange of halogen in alkyl chloride by iodide is Finkelstein reaction. This reaction is used in preparation of alkyl iodide by the reaction of alkyl chloride, bromide with NaI in dry acetone.



Question129

Nitroalkanes are obtained in laboratory from primary or secondary alkyl halides by the action of

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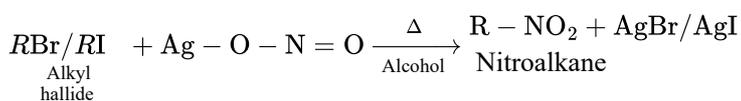
Options:

- A. AgNO_2
- B. NaNO_3
- C. AgNO_3
- D. HNO_3

Answer: A

Solution:

Nitroalkanes are obtained in laboratory from primary or secondary alkyl halides by the action of silver nitrite (AgNO_2). This method of preparation is an example of nucleophilic substitution reaction. The reaction is as follow:



(R can be 1° or 2°)

