

Questions and Answers – Reaction Mechanism of Organic Compounds

1. Why are aryl halides less reactive towards nucleophilic substitution reactions as compared to alkyl halides?

- a) The formation of a less stable carbanion
- b) Longer carbon halogen bond
- c) The inductive effect
- d) Sp²-hybridized carbon attached to the halogen

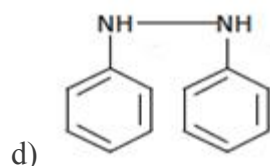
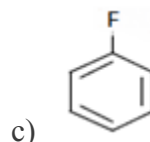
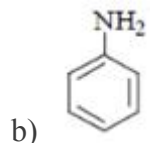
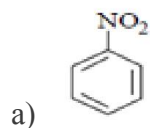
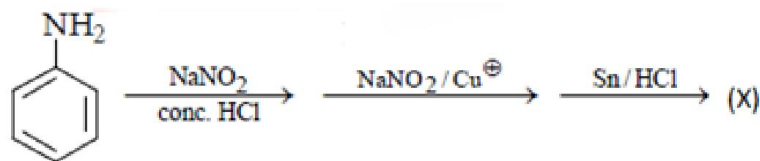
Answer: d

Explanation: Overlapping of sp² orbital of carbon with p-orbital of halogen is one of the reasons.



Due to conjugation double bond character in aryl halide.

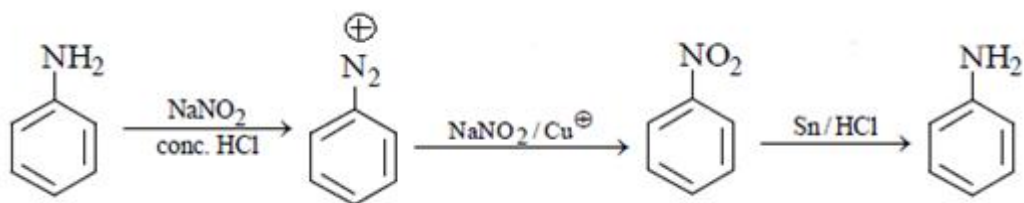
2. What will be the (X) in the below mentioned reaction sequence?



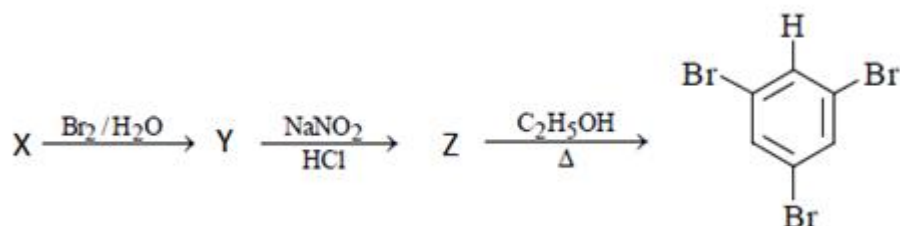
Answer: b

Explanation: As we can see in below reaction, that firstly diazotisation reaction will occur. This is followed by reaction of NaNO₂ with diazonium ion forming nitro benzene, which will

undergo reduction and form aniline.



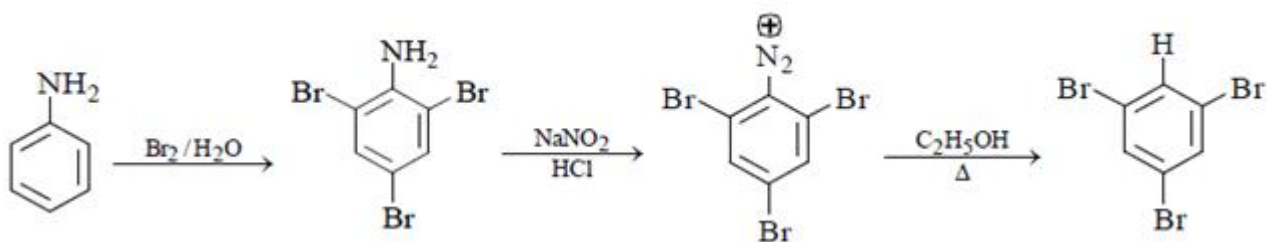
3. In the following reaction sequence, what will be X?



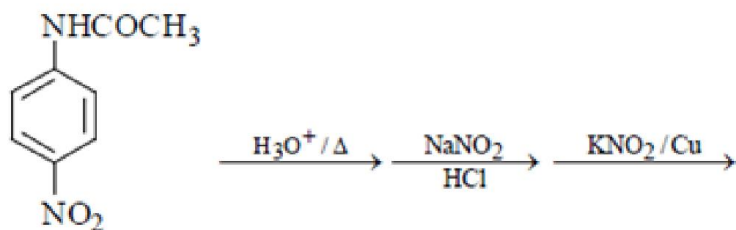
- a) Benzoic acid
- b) Salicylic acid
- c) Phenol
- d) Aniline



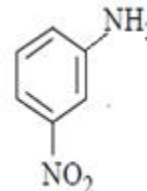
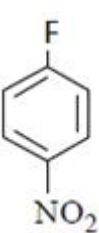
Answer: D

Explanation: Aniline will be X as we can see below reaction. Free bromination will occur, and bromine will get add to ortho and para position followed diazotisation and a rapid reaction will take place between diazonium ion and $\text{C}_2\text{H}_5\text{OH}$ and 1, 3, 5-tribromo benzene will form.



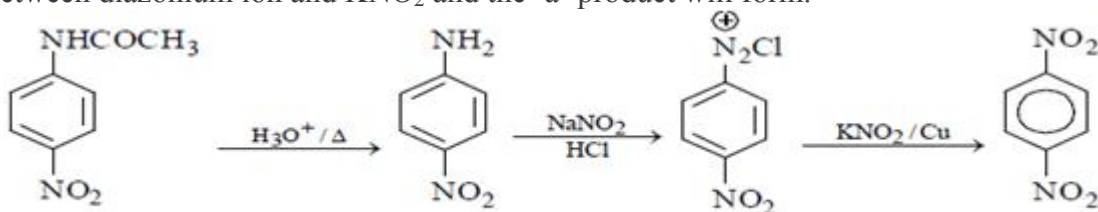
4. What will be the final product in the below reaction?



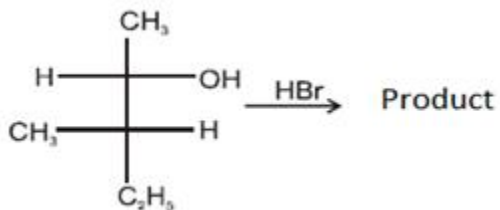
- a) 
- b) 
- c) 
- d) 

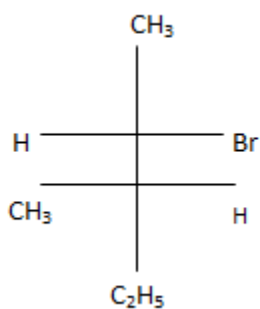
Answer: a

Explanation: As we can see hydrolysis is the first step which will form a amine group containing compound. This amino-compound undergoes diazotisation and a rapid reaction will take place between diazonium ion and KNO_2 and the 'a' product will form.

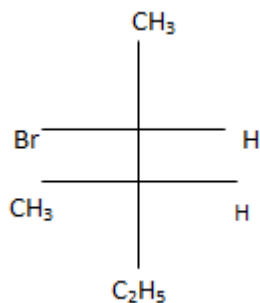


5. Which of the following structures represent the correct major product for the below reaction?

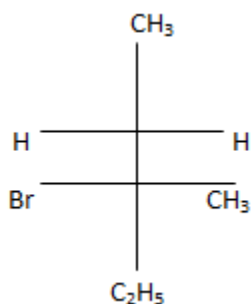




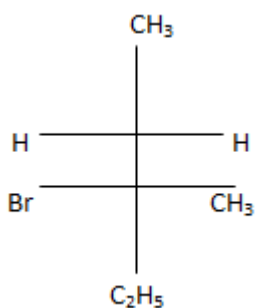
a)



b)



c)

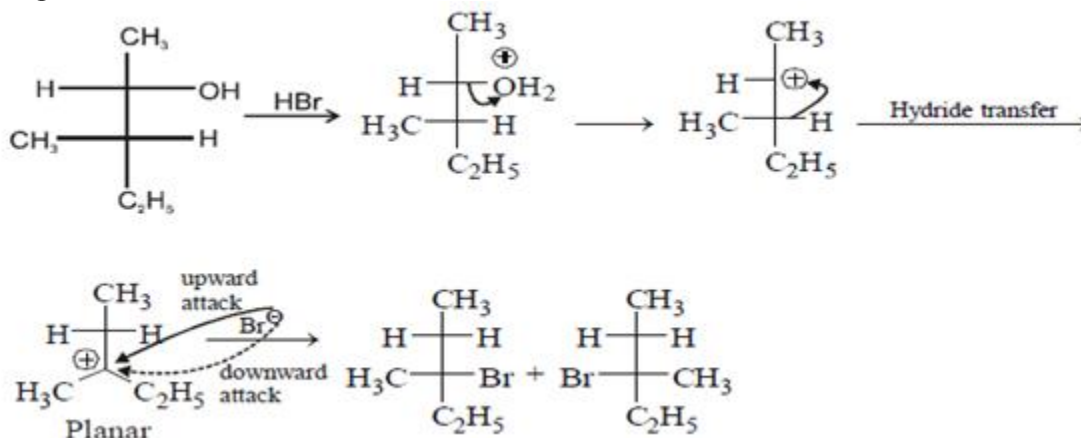


d)

Answer: c

Explanation: According to following mechanism we can say that some are major products. As we can see protonation of hydroxyl group followed by dehydration will lead to hydride shift to the adjacent positively charged carbon for formation of more stable carbocation. This will unleash two possibilities of attack by Br⁻ at the new carbocation from upward and backward and

two products will be formed that are shown below.



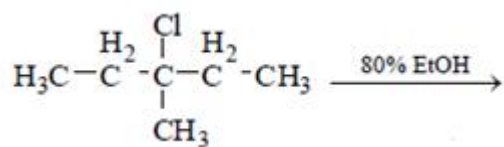
6. Which of the following is not true for SN1 reactions?

- They occur through a single step concerted reaction
- They are favoured by polar solvents
- Tertiary alkyl halides generally react through this mechanism
- Concentration of nucleophile does not affect the rate of such reactions

Answer: a

Explanation: SN1 reaction is a two-step reaction, step one is the leaving group leaves, and the second step is the substrate forms a carbocation intermediate. Formation of carbocation intermediate is the rate determining step. Since for the formation of stable intermediate carbocation, highly polar solvent is required. The bulky substituents prevent the nucleophiles from approaching the carbon, which is attached directly to the halogen. SN1 is also more favorable as the neighboring alkyl groups are electron donating, which helps to stabilize the carbocation. SN1 reaction because the nucleophile is not a part of the rate-determining step.

7. What is not true about below reaction?

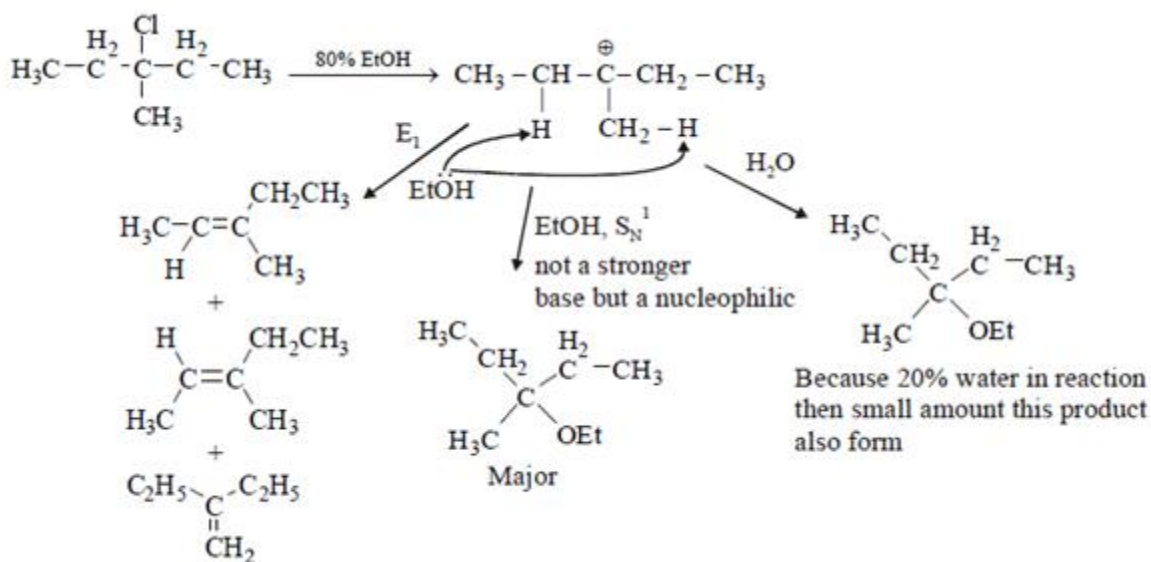


- Major product is given by SN1 reaction
- Through E1 mechanism 3 alkenes are formed
- 3-Methylpentane-3-ol is also formed as one of the product
- Fractional distillation of elimination product will give two fractions

Answer: d

Explanation: As we see below mechanism major product is formed by SN1 mechanism and E1 mechanism forms 3 alkenes. 3-Methylpentane-3-ol is also formed in the reaction. Fractional

distillation of elimination product will give three fractions. Hence statement d is false.

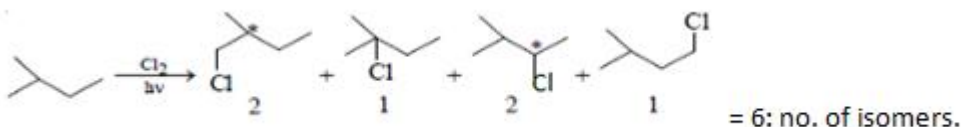


8. What will be the total number of isomers formed when 2-methyl butane is subjected to monochlorination?

- a) 5
- b) 4
- c) 3
- d) 6

Answer: d

Explanation: Monochlorination of 2 methyl butane gives two pairs of enantiomers. 1st pair of enantiomer is 1-chloro-2-methyl butane and 2nd pair of enantiomer is 2-chloro-3-methyl butane. 1-chloro-3-methyl butane and 2-chloro-2-methyl butane products are also formed.



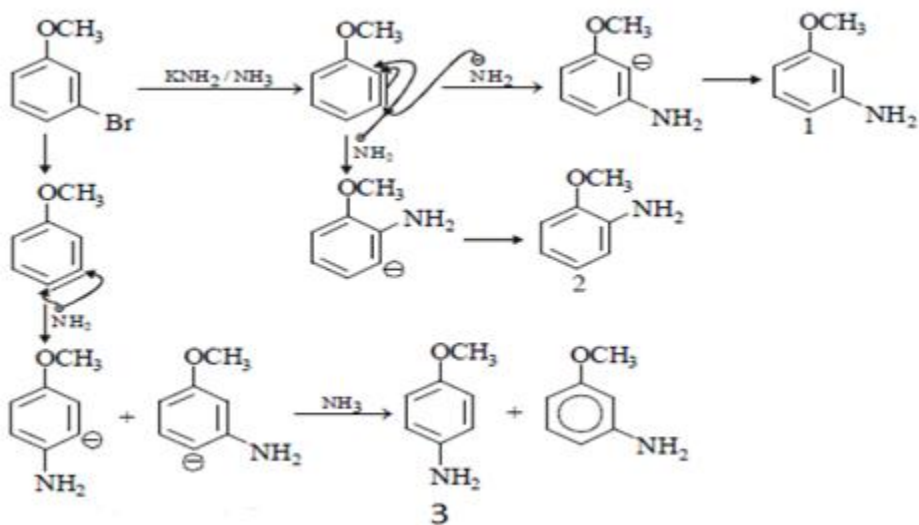
9. The number of substitution products formed when metabromo anisole is treated with KNH_2/NH_3 ?

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

Answer: c

Explanation: Nucleophile ($-\text{NH}_2$) will attack on Br and there will be three possibilities of bond formation and those are ortho, para and meta position as shown in the below structures number 2,

3 and 1 respectively.

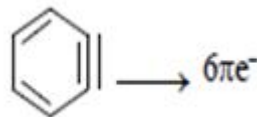


10. How many number of pie e- is present in benzene?

- 6
- 7
- 8
- 9

Answer: b

Explanation: Pie electron are those which show de-localization of the electrons, in same plan or p orbitals and that there aren't alternating double and single bonds. But the electron in one p-p



overlapping is present perpendicular to the plane of ring.

Questions and Answers – Organic Reactions

1. Identify the one which does not come under the organic addition reaction

- Hydration
- Dehydration
- Halogenation
- Hydrohalogenation

Answer: b

Explanation: Dehydration comes under elimination reaction and hence it does not come under addition reaction.

2. Choose the correct one which will react faster in the SN_2 nucleophilic substitution reaction

- $\text{CH}_2\text{-CH=CH}_2\text{-Br}$
- $\text{CH}_2 = \text{CH-CH}_2\text{-Br}$
- $\text{CH}_2 = \text{CH-CH}_2 = \text{Br}$

d) $\text{CH}=\text{CH}_2 - \text{CH}_2 - \text{Br}$

Answer: b

Explanation: The carbocation character in the transition state causes stabilization of the resonance and hence $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{Br}$ (2-bromobutane) is the one which will react faster compared to the others.

3. What will be the reactivity of chlorobenzene in an electrophilic substitution reaction with benzene?

- a) Reacts very slowly than benzene
- b) Reacts in the same way as benzene
- c) Reacts faster than benzene
- d) Does not react with benzene

Answer: a

Explanation: The rate of the reaction depends on the electron density in the ring and here in this case resonance is not favorable and the electronegativity dipole dominates. This slows down the reactivity of chlorobenzene.

4. Alcohol on refluxing with Cr_2O_7 gives:

- a) Ester
- b) Aldehyde
- c) Sugar
- d) Carboxylic acid

Answer: d

Explanation: Alcohol (R-OH), when it is refluxed with Cr_2O_7 , it forms carboxylic acid (R-COOH).

5. Alkene under high temperature and high-pressure forms

- a) Alcohol
- b) Polyalkyne
- c) Polyalkane
- d) Polyalkene

Answer: c

Explanation: Alkenes undergoes polymerization reaction under high temperature and pressure to form poly alkanes $-(\text{C-C})_n$.

6. Identify the one which on reaction with carboxylic acid at high temperature gives Ester

- a) Ketone
- b) Alcohol
- c) Aldehyde
- d) Sugars

Answer: b

Explanation: Alcohols on reaction with carboxylic acid at high temperature, in the presence of sulphuric acid gives Ester.

7. Select the correct statement regarding carboxylic acids
- a) They form acyl chlorides on reaction with PCl_5
 - b) Aldehydes in the presence of $\text{H}^+ / \text{Cr}_2\text{O}_7$ forms carboxylic acids
 - c) They combine with alcohols to form esters
 - d) Upon polymerization, they form polymers

Answer: d

Explanation: Carboxylic acids do not undergo polymerization reaction.

8. Primary alcohols undergo what reaction to form alkenes?
- a) Elimination
 - b) Oxidation
 - c) Reduction
 - d) Hydrolysis

Answer: a

Explanation: Upon elimination or dehydration, the primary alcohols form alkenes.

9. Carbonyl compounds especially ketones undergo reduction to form
- a) Primary alcohols
 - b) Secondary alcohols
 - c) Alkanes
 - d) Alkenes

Answer: b

Explanation: Ketones in the presence of NaBH_4 undergoes reduction to form secondary alcohols.

10. Primary amides get converted into primary amines by:
- a) Addition
 - b) Oxidation
 - c) Reduction
 - d) Acylation

Answer: b

Explanation: Primary amides upon heating in the presence of hydrogen and nickel catalyst, gets reduced to form primary amines.