CBSE Class 12 Chemistry Chapter 10 Haloalkanes and Haloarenes Worksheet with Answer – Set 5

Q1. Arrange the following halide in increasing order of their reactivity in alkyl halide.
(a) F > Cl > Br > I
(b) Br > I > Cl > F
(c) I > Br > Cl > F
(d) Cl > F > Br > I

Answer:

(c) The increasing order of the reactivity of halide in alkyl halide is as I > Br > Cl > F.

Q2. A yellow precipitate is obtained when aqueous silver nitrate is added to the solution of the compound
(a) CCl_3CHO
(b) CHI_3
(c) $CHCl_3$
(d) None of the above.

Answer:

(b) A yellow precipitate is obtained when aqueous silver nitrate is added to the solution of the CHI_3.

Q3. What is the formula and shape of the chloroform molecule?
(a) $CHCl_3$ and tetrahedral shape
(b) CH_2Cl_2 and pyramidal shape
(c) CH_3Cl and linear shape
(d) CCl_4 and trigonal bipyramidal shape

Answer:

(a) Chloroform has a molecular formula $CHCl_3$ and tetrahedral shape.

Q4. What will happen if iodoform is heated with the silver powder?
(a) Acetylene is formed
(b) Ethylene is formed
(c) Ethane is formed
(d) None of the above

Answer:

(a) If iodoform is heated with the silver powder, acetylene is formed.

Q5. The given reaction is an example of $C_2H_5Br + KCN\ (aq) \rightarrow C_2H_5CN + KBr$
(a) Electrophilic substitution reaction
(b) Nucleophilic substitution reaction
(c) Elimination reaction
(d) None of the above

Answer:

(a) $C_2H_5Br + KCN\ (aq) \rightarrow C_2H_5CN + KBr$ is an example of electrophilic substitution reaction.

Q6. Potassium hydroxide solution is used to hydrolyse the below-mentioned compounds. Which one of them will be hydrolysed readily?
(i) $CH_3CHClCH_2CH_3$
(ii) $CH_3CH_2CH_2CH_2Cl$

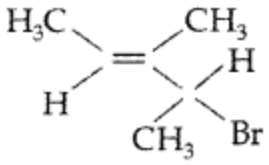
Answer:

The first compound, $CH_3CHClCH_2CH_3$, will be hydrolysed readily. As the potassium hydroxide solution favours the S_N1 mechanism, thus, the more stable carbocation will be preferred. In compound (i), a 2° carbocation is formed, while in (ii), 1° carbocation is formed. As 2° carbocation is more stable. Thus, the (i) compound will be hydrolysed readily.

Q7. Draw the structure of 2-Bromo-3-methyl-pent-3-ene.

Answer:

The structure of 2-Bromo-3-methyl-pent-3-ene is mentioned below.



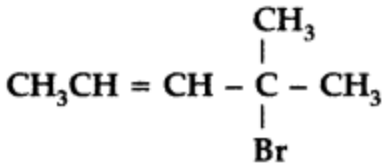
Q8. What will happen if methyl bromide is treated with potassium cyanide?

Answer:

If methyl bromide is treated with potassium cyanide, an electrophilic substitution reaction will take place, leading to the formation of methyl cyanide and potassium bromide.

$CH_3Br + KCN \rightarrow CH_3CN + KBr$

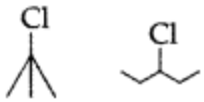
Q9. Write the IUPAC name of the below-mentioned compound.



Answer:

The IUPAC name of the below-mentioned compound is 4-Bromo-4-methyl pent-2-ene.

Q10. Which of the below-mentioned compound will react faster by the S_N^1 mechanism?



Answer:

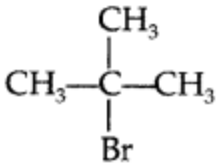

will react faster than the

It is due to the fact that a tertiary carbocation is more stable than the secondary carbocation.

Q11. Draw the structure of an isomer of compound C_4H_9Br, which is most reactive towards the SN_1 mechanism.

Answer:

Since a tertiary carbocation is most stable. Thus, the structure of the compound will be as below.



Q12. Why does a para dichlorobenzene have a higher melting point than ortho and meta dichlorobenzene?

Answer:

A para dichlorobenzene has a higher melting point than ortho and meta dichlorobenzene because para dichlorobenzene is comparatively more symmetrical and fits closely in the crystal lattice. Therefore, it requires a large amount of heat to break the strong force of attraction.
Hence, a para dichlorobenzene has a higher melting point than ortho and meta dichlorobenzene.

Q13. Why is (±) Butan-2-ol optically inactive?

Answer:

(±) Butan-2-ol is optically inactive because one type of rotation is cancelled by another in its racemic mixture.

Q14. Why is chloroform stored in closed dark brown bottles?

Answer:

Chloroform is stored in closed dark brown bottles because it gets oxidised to liberate a poisonous phosgene gas.

$2\ CHCl_3 + O_2 + Light \rightarrow 2\ (CO)\ Cl_2 + 2\ HCl$

Q15. How can you prepare 1-bromobutane from:
(i) 1-Butanol
(ii) But-1-ene

Answer:

(i) We can prepare 1-bromobutane from 1-Butanol by reacting it with PCl_5 via a nucleophilic substitution reaction. The chloride nucleophile displaces the hydroxide group of 1-Butanol to form 1-bromobutane.
Reaction: $CH_3CH_2CH_2CH_2OH + PCl_5 \rightarrow CH_3CH_2CH_2CH_2Br + POCl_3 + H_2O$

(ii) We can prepare 1-bromobutane from But-1-ene by reacting it with hydrobromic acid via an addition reaction in the presence of a peroxide group. An anti markownkov addition mechanism is followed for the formation of 1-bromobutane from But-1-ene.
$CH_3CH_2CH=CH_2 + HBr + H_2O_2 \rightarrow CH_3CH_2CH_2CH_2Br$

Q16. Why does ethyl iodide undergo the SN_2 mechanism faster than ethyl bromide?

Answer:

Ethyl iodide undergoes the SN_2 reaction faster than ethyl bromide because iodide is a better leaving group than the bromide. Thus, it will leave the alkyl halide faster than the bromide, making ease SN_2 reaction in ethyl iodide over ethyl bromide.

Q17. Convert chloroethane to butane.

Answer:

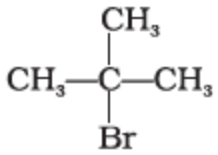
We can convert chloroethane to butane by the Wurtz reaction.
Two moles of chloroethane react with the two moles of the sodium atom in the presence of the dry ether to form butane.

$2\ CH_3CH_2Cl + 2\ Na + \text{Dry Ether} \rightarrow CH_3CH_2CH_3CH_3 + 2\ NaCl$

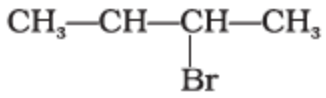
Q18. A has a molecular formula of C_4H_9Br. When it is treated with the aqueous KOH solution, its reaction rate depends on the concentration of compound A. Compound B is the optically active isomer of B. When B is treated with the aqueous KOH solution, its reaction rate depends on the concentration of compound A and the KOH.
(i) Draw the structure of A and B.
(ii) Which of the above will have an inverted configuration product?

Answer:

(i) As the reaction rate depends on the concentration of compound A only. Then it is favoured through the SN_1 mechanism. Thus, it will be a tertiary alkyl halide with the given below structure.



The reaction rate depends on the concentration of compounds B and KOH. Then it is favoured through the SN_2 mechanism. Thus, it will be a primary alkyl halide with the given below structure.



or $CH_3CH_2CH_2CH_2Br$.

(ii) Compound B will have an inversion of configuration.

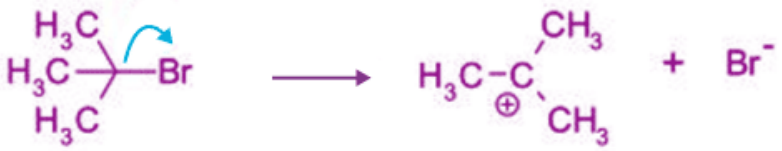
Q19. Explain the mechanism of the SN_1 reaction.

Answer:

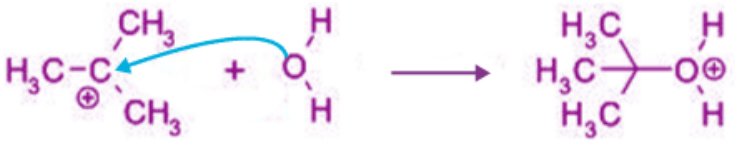
The SN_1 reaction is a unimolecular nucleophilic substitution reaction. It proceeds by the formation of a carbocation. The rate-determining step of the SN_1 reaction depends on the electrophilicity of the leaving group and not on the strength of the nucleophile. The mechanism of the SN_1 reaction is discussed below.

Mechanism of SN_1 reaction:

Step 1: Formation of a carbocation:



Step 2: Attack of Nucleophile:



Step 3: Loss of proton:

Q20. Explain the mechanism of the SN_2 reaction.

Answer:

The SN_2 reaction is a bimolecular nucleophilic substitution reaction. It proceeds by the formation of a transition state. The rate-determining step of the SN_2 reaction depends on the electrophilicity of the leaving group and the strength of the nucleophile. The mechanism of the SN_2 reaction is discussed below.

Mechanism of SN_2 reaction:

The SN_2 reaction mechanism proceeds through a backside attack by the nucleophile on the substrate. The nucleophile approaches the given substrate at an angle of 180^{o}. The formation of the carbon and nucleophile and the breakage of the carbon and leaving group bond take place simultaneously via a transition state.
Leaving group is pushed out of the transition state from the opposite side of the carbon-nucleophile bond. Thus, the product formed is of inverted configuration.

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