

Acid Chloride Questions with Solutions

Q1: Formyl chloride is:

- a. CHClO
- b. CH_3Cl
- c. CH_2OCl
- d. None of the above

Answer: (a)

Explanation: The formula of formyl chloride is CHClO .

Q2. Give a few examples of Acid Chlorides.

Answer: Some examples of Acid Chlorides are given below.

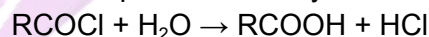
Ethanoyl chloride (CH_3COCl), benzoyl chloride ($\text{C}_7\text{H}_5\text{ClO}$) and propanoyl Chloride ($\text{C}_2\text{H}_5\text{COCl}$).

Q3. Give an application of Acid Chlorides.

Answer: Acid Chlorides are used to prepare acid anhydrides, amides and esters. This can be done by bringing out the reaction of Acid Chlorides with a carboxylic acid salt, an amine and alcohol, respectively.

Q4. What is the hydrolysis product of Acid Chlorides?

Answer: The Acid Chlorides release the respective carboxylic acid on hydrolysis.

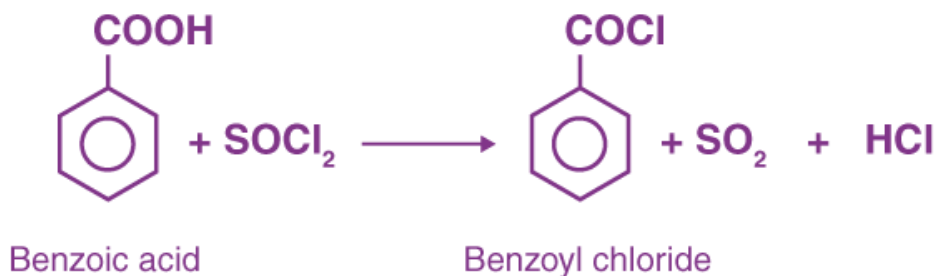


Q5. Benzoyl chloride can be prepared from benzoic acid by:

- a. Chlorine, $h\nu$
- b. SO_2 , Chlorine
- c. SOCl_2
- d. Chlorine, water

Answer: (c)

Explanation: On reaction with SOCl_2 , benzoic acid forms benzoyl chloride, along with the formation of SO_2 and HCl .



Q6. What is meant by Acid Chlorides?

Answer: Acid Chlorides are a class of organic compounds that are formed when the hydroxyl group (-OH) of the (-COOH) group of the carboxylic acid is replaced by a chlorine atom. However, the acid can be restored by the hydrolysis of the Acid Chloride.

Q7. What is the reason behind the high reactivity of the Acid Chlorides?

Answer: Acid Chlorides are the most reactive derivatives of the carboxylic acid functional groups. This is because the chlorine atom attached to the CO group is highly electronegative and pulls the shared pair of electrons in the C-Cl bond towards itself. This makes the C=O carbon even more electrophilic. As a result, the ease of nucleophilic attack increases on the carbonyl carbon. The chlorine atom is a good leaving group, so it leaves quickly as the reaction takes place.

Q8. The reaction of formic acid with PCl_5 forms:

- Acetyl chloride
- Formyl chloride
- Methyl chloride
- Propanoyl chloride

Answer: (b)

Explanation: Formyl chloride is formed by the reaction of formic acid and PCl_5 .

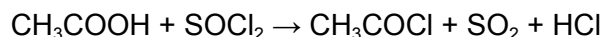


Q9. Acetyl chloride can be prepared in the laboratory by:

- The reaction of acetic acid with thionyl chloride (SOCl_2)
- The reaction of acetic acid with phosphorus trichloride (PCl_3)
- The reaction of sodium acetate with phosphorus trichloride (PCl_3)
- None of the above

Answer: (a)

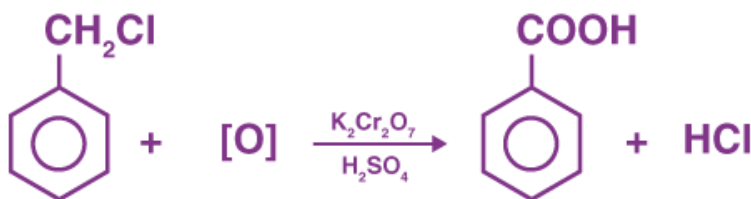
Explanation: Acetyl chloride is formed by the reaction of acetic acid (CH_3COOH) and thionyl chloride (SOCl_2).



Q10. Benzyl chloride on _____ gives benzoic acid.

Answer: Oxidation

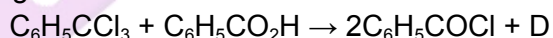
Explanation: Benzoic acid is formed by the oxidation of benzyl chloride.



Q11. Why are Acid Chlorides acidic in nature?

Answer: In the anhydrous form, the Acid Chlorides remain neutral due to the unavailability of the H^+ ions. In an aqueous solution, the Acid Chlorides dissociate to form carboxylic acid and HCl . Now that HCl is a strong acid, it dissociates completely in the solution to give H^+ ions. These H^+ ions are the characteristic of the acidity of the solution. Thus, Acid Chlorides have an acidic nature.

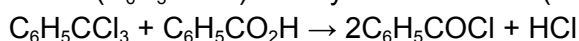
Q12. What is 'D' in the following reaction?



- Chlorine (Cl_2)
- Water (H_2O)
- Hydrochloric acid (HCl)
- Hydrogen gas (H_2)

Answer: (c)

Explanation: The reaction of benzotrichloride ($\text{C}_6\text{H}_5\text{CCl}_3$), either with water (H_2O) or with benzoic acid ($\text{C}_6\text{H}_5\text{CO}_2\text{H}$), forms benzoyl chloride ($\text{C}_6\text{H}_5\text{COCl}$) and hydrochloric acid (HCl).

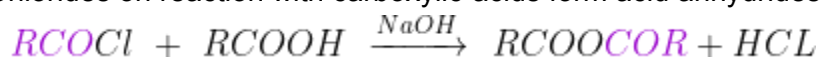


Q13. How are the Acid Chlorides named?

Answer: The basic rule of naming the Acid Chlorides is just like naming any other organic compound. The longest carbon chain is selected and numbered beginning from the Acid Chloride group carbon. To the parent carbon chain name, the suffix 'oyl chloride' is added. For example, $\text{CH}_3\text{CH}_2\text{COCl}$ is named Propanoyl chloride.

Q14. What Acid Chlorides form on reacting with the carboxylic acids?

Answer: The Acid Chlorides on reaction with carboxylic acids form acid anhydrides.



Q15. What is 'A' in the following reaction?



- a. Chlorophenol ($\text{C}_6\text{H}_5\text{ClO}$)
- b. Chlorotoluene ($\text{C}_7\text{H}_7\text{Cl}$)
- c. Chlorobenzene ($\text{C}_6\text{H}_5\text{Cl}$)
- d. Benzoyl Peroxide ($\text{C}_{14}\text{H}_{10}\text{O}_4$)

Answer: (d)

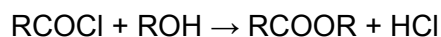
Explanation: The reaction of benzoyl chloride with hydrogen peroxide and sodium hydroxide is the industrial preparation method for Benzoyl Peroxide. The complete reaction for the same is as follows:



Practice Questions on Acid Chloride

Q1. What happens when Acid Chlorides react with alcohol?

Answer: When Acid Chlorides react with alcohols, they produce esters. The general reaction of the Acid Chlorides with alcohols is given below.



Q2. Acid Chlorides are:

- a. Highly reactive
- b. Highly unreactive
- c. Highly stable
- d. None of the above

Answer: (a)

Explanation: Due to the presence of highly electronegative chlorine atoms, the Acid Chlorides are highly reactive.

Q3. Why should Acid Chlorides not be mixed with water?

Answer: This is because Acid Chlorides, on reaction with water, undergo hydrolysis and form respective carboxylic acids, along with the fumes of the hydrochloric acid. The reaction produces a tremendous amount of heat. Thus, the reaction is extremely vigorous even at room temperature. So, the Acid Chlorides should not be mixed with water.

Q4. Which is more polar- carboxylic acids or Acid Chlorides?

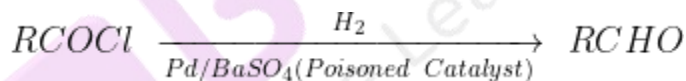
Answer: The carboxylic acids are more polar than the Acid Chlorides. This can be explained by the properties of carboxylic acids. The carboxylic acids can undergo extensive hydrogen bonding, and they have two highly electronegative atoms. Also, they have a high dipole moment.

Q5. How can aldehydes be formed from Acid Chlorides?

Answer: Aldehydes can be formed either by the catalytic hydrogenation of the Acid Chlorides or by the reaction of Acid Chloride with a metal hydride. Both of these reactions are given below. The reactions are conducted in the limiting conditions of temperature and pressure and also in the limiting amount of the reagent to avoid the further reduction of the aldehydes formed.

The reactions for the formation of aldehydes are:

1. Catalytic hydrogenation of Acid Chlorides



2. The reaction of Acid Chlorides with metal hydrides

