

Ester Chemistry Questions with Solutions

Q1. Which of the following acts as a catalyst for the esterification of alcohol and carboxylic acid?

- (a) Nitrous acid
- (b) Nitric acid
- (c) Sulphuric acid
- d) None of the above

Answer: (c) Sulphuric acid acts as a catalyst for the esterification of alcohol and carboxylic acid.

Q2. Hydrolysis of ester leads to the formation of which of the following products in an acidic medium?

- (a) Alcohol and carboxylic acid
- (b) Alcohol and sodium carboxylate
- (c) Alcohol and ether
- (d) None of the above

Answer: (a) Hydrolysis of ester leads to the formation of alcohol and carboxylic acid in an acidic medium.

Q3. What is the characteristic odour of an ester?

- (a) Alcoholic odour
- (b) Fruity like odour
- (c) Rotten egg odour
- (d) None of the above

Answer: (b) Ester has a characteristic odour of fruits.

Q4. Hydrolysis of ester leads to the formation of which of the following products in an alkaline medium?

- (a) Alcohol and carboxylic acid
- (b) Alcohol and sodium carboxylate
- (c) Alcohol and ether
- (d) None of the above

Answer: (b) Hydrolysis of ester leads to the formation of alcohol and sodium carboxylate in an alkaline medium.

Q5. Alkaline hydrolysis of the ester is commonly known as

- (a) Neutralisation reaction
- (b) Saponification reaction
- (c) Hydrolysis reaction
- (d) None of the above

Answer: (b) Alkaline hydrolysis of the ester is commonly known as saponification reaction.

Q6. What is an ester?

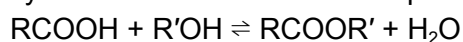
Answer: Ester is a class of organic compounds formed by the reaction of a carboxylic acid, acyl chloride or acid anhydride with alcohol. In it, the hydroxy (-OH) group of the carboxylic acid, acyl chloride or acid anhydride is replaced by the alkoxy (-OR) group of the alcohol.

Q7. What is the general formula of an ester?

Answer: Esters have a general formula of RCOOR' .

Q8. What is an esterification reaction?

Answer: An esterification is a reaction between a carboxylic acid and an alcohol. It is used to synthesise ester. The reaction proceeds in the presence of dilute sulphuric acid.



Q9. What is ester hydrolysis?

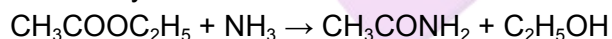
Answer: The addition of water to an ester to yield alcohol and carboxylic acid or carboxylate salt in an acid or a base is known as ester hydrolysis. It is also known as a desertification reaction.

Q10. Is ester soluble in water?

Answer: Ester is relatively soluble in water. Ester consists of an oxygen atom which forms hydrogen bonding with water making it slightly soluble in water. However, esters of high molar mass are insoluble in water.

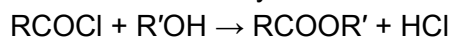
Q11. What is the ammonolysis of an ester?

Answer: The reaction of an ester with ammonia to yield the corresponding amide is known as the ammonolysis of an ester.



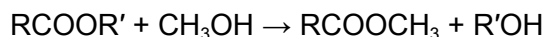
Q12. How can we synthesise an ester?

Answer: We can synthesise ester by reacting acyl chlorides or acid anhydrides with alcohol.



Q13. What is a transesterification reaction?

Answer: The reaction of an ester with alcohol to change one ester into another one in the presence of an acid or a base is known as a transesterification reaction.



Q14. Distinguish between an ester and an ether.

Answer:

S. No.	Ester	Ether
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1.	Ester is a sweet-smelling chemical compound derived from the reaction of a carboxylic acid with an alcohol.	Ether is a chemical compound derived from the dehydration of alcohols.
2.	It has a general formula of RCOOR' .	It has a general formula of ROR' .
3.	They are unsymmetrical due to the presence of a carbonyl group.	They are symmetrical.
4.	Example: Methyl butanoate	Example: Diethyl ether

Q15. Match the following.

Column I	Column II
Ester	$\text{R}(\text{CO})\text{R}$
Aldehyde	RCOOR'
Ketone	RCHO
Carboxylic Acid	ROH
Alcohol	RCOOH

Answer:

Column I	Column II
Ester	RCOOR'
Aldehyde	RCHO
Ketone	$\text{R}(\text{CO})\text{R}$
Carboxylic Acid	RCOOH
Alcohol	ROH

Practise Questions on Ester

Q1. What is reverse esterification?

Reverse esterification is also known as ester hydrolysis or desertification reaction. It is the reaction of an ester with water in an acidic or alkaline medium to yield alcohol and carboxylic acid or carboxylate salt.

Q2. What is saponification reaction?

Answer: A saponification reaction is used to manufacture soap. It is the basic hydrolysis of the ester. In it, an ester is heated under reflux with dilute NaOH to yield carboxylate salt and alcohol.

Q3. What are the applications of an ester?

Answer: There are lots of applications of esters.

1. Ester has a fruity smell and is used in perfumes, food flavourings, and cosmetics.
2. It is used in plastic production.
3. It is used to manufacture detergents and soaps.
4. It is used as an organic solvent.

Q4. What is an acid catalysed ester hydrolysis?

Answer: Acid catalysed ester hydrolysis is the reaction of an ester with water under an acidic medium. In it, an ester is heated under reflux with dilute sulphuric to yield carboxylic acid and alcohol.

Q5. Explain the mechanism of base catalysed ester hydrolysis?

Answer: Base catalysed ester hydrolysis is the reaction of an ester with water under a basic medium. In it, an ester is heated under reflux with dilute NaOH to yield carboxylate salt and alcohol.

Mechanism of Ester Hydrolysis with NaOH

Step 1: Attack of Nucleophile

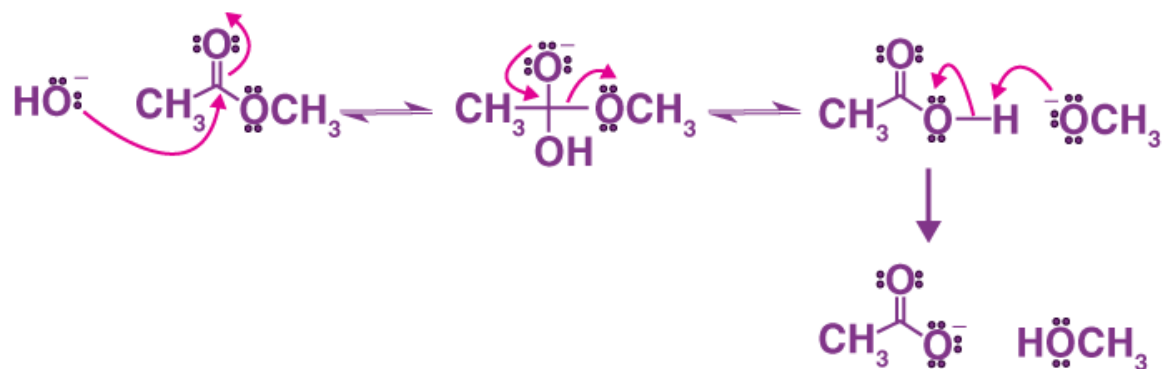
In the first step, the hydroxide ion attacks the electron-deficient carbon centre of the ester. It breaks the C=O π bond of ester and forms a tetrahedral intermediate structure.

Step 2: Elimination of Leaving Group

In the second step, an internal attack of the O⁻ ion takes place, reforming the C=O bond, and leading to the loss of the alkoxide (RO⁻) ion.

Step 3: Deprotonation of Carboxylic Acid

In the third step, an acid-base equilibrium between carboxylic acid and alcohol is set up. The alkoxide (RO⁻) ion works as a base. It deprotonates the carboxylic acid leading to the formation of alcohol and carboxylate ions.



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