

QUALITATIVE TESTS FOR CARBOXYLIC ACIDS

Carboxylic acids are versatile organic compounds. It has excellent physical and chemical properties. The chemical structure of carboxylic acid contains a carbonyl functional group and hydroxyl group. They interact easily with polar compounds and contribute to many important chemical reactions.

Carboxylic acids have a tendency to donate protons and act as acids. It is this property which is helpful in the identification of a -COOH group.

1. Litmus test
2. Sodium bicarbonate test (or) Sodium hydrogen carbonate test
3. Ester test
4. Fluorescein test
5. Sodalime test

1. Litmus test:

- Add a drop of given organic compound on blue litmus paper.
- Observe the color change in blue litmus paper.
- If the color of blue litmus changes to red the presence of carboxylic acid.

Note: Blue litmus solution is also used in the place of blue litmus paper.

The carboxylic acid turns blue litmus red. Because the hydroxyl group present in -COOH is far more acidic than in alcohol.

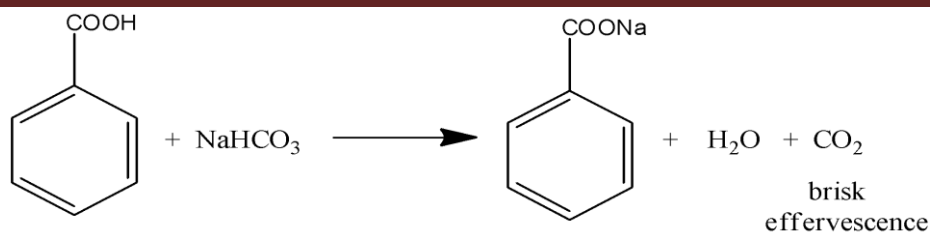
Note: If the color of the blue litmus paper changes to red, then a carboxylic group is present. Phenol also gives this test.

2. Sodium bicarbonate test (NaHCO₃):

- Prepare a saturated solution of sodium bicarbonate by dissolving sodium bicarbonate in 1ml of water.
- Add the given organic compound to the saturated solution of sodium bicarbonate solution.
- Shake the solution well.
- If there is an evolution of brisk effervescence then it indicates the presence of carboxylic acid.

Note: Use acid free alcohol for the test.

When carboxylic acid reacts with sodium bicarbonate solution carbon dioxide is evolved with a *brisk effervescence* along with sodium acetate is formed.



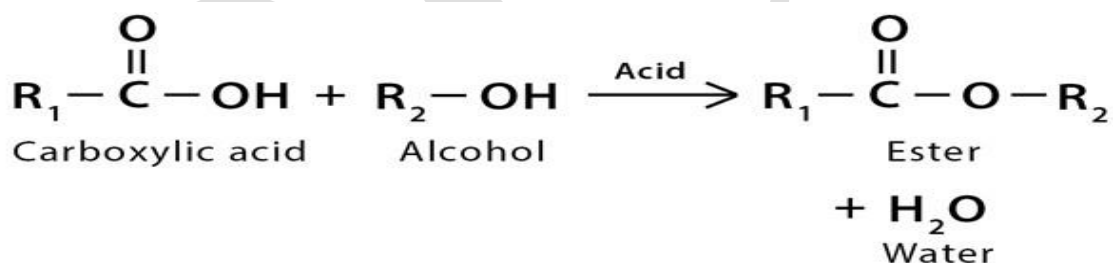
Note: This test is used to distinguish between carboxylic acid from phenol. Phenol does not give this test.

3. Esterification test:

- Mix the given compound with ethyl alcohol and concentrated sulphuric acid.
- Heat the mixture in a dry test tube in a water bath.
- Pour the reaction mixture into a beaker carefully containing water.
- Neutralize the excess sulphuric acid.
- If a sweet smelling substance is sensed then it indicates the presence of acid.

Carboxylic acid reacts with alcohol in the presence of concentrated sulphuric acid and forms a pleasant smelling ester. This reaction is known as esterification.

Note: Formation of a sweet smelling compound indicates the presence of carboxylic group in the given organic compound.



4. Fluorescein Test:

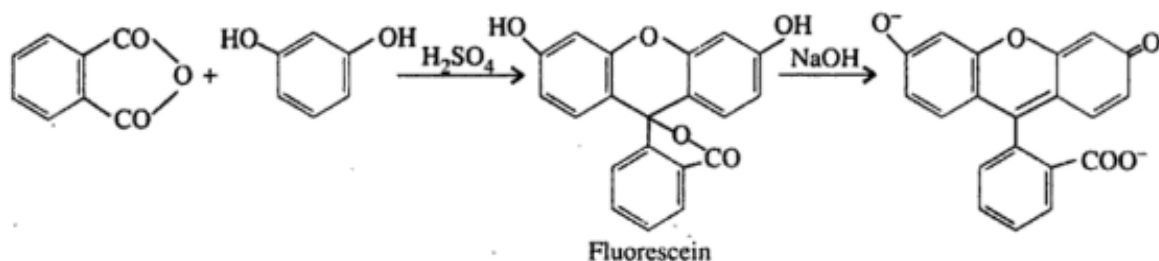
- Take the given organic compound to be tested in a test tube.
- Mix with 100mg of resorcinol and 0.5ml of concentrated sulphuric acid.
- Heat the test tube gently on a bunsen burner.
- Pour the mixture into a beaker containing dilute sodium hydroxide solution.
- Appearance of green color fluorescent solution indicates the presence of carboxylic acid group.

Note: The resultant solution should be alkaline

This test is given by dicarboxylic acid.

Dicarboxylic acid on heating gives acid anhydride. When this anhydride is treated with resorcinol in the presence of concentrated sulphuric acid a fluorescent dye is formed and so this reaction is called fluorescein test.

Fluorescein Test



Note: This test should be performed only if the compound gives positive results in litmus test and sodium bicarbonate test.

5. Sodalime test:

Soda lime is a fused mixture of NaOH and CaO

Carboxylic acids on heating with sodalime give corresponding hydrocarbon and its derivative.

It can absorb carbon dioxide from a given compound. When soda lime reacts with carboxylic acid the carbon dioxide is released and we get the corresponding hydrocarbon compound. So soda lime can be used to test the compounds whether they contain carboxylic acid as the functional group.

