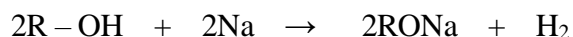


Qualitative Analysis of Functional Groups

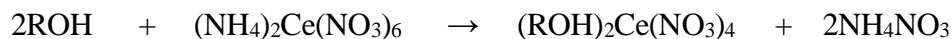
1) Alcoholic –OH group

We can detect the alcoholic group by the following tests:

- **Sodium Metal Test:** We conduct this test on the basis of the appearance of effervescence due to the liberation of hydrogen gas in reactions of sodium with alcohol.

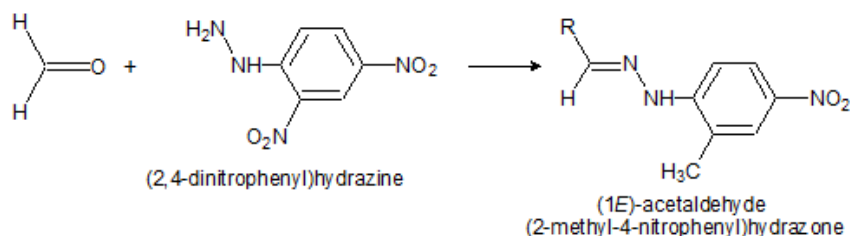


- **Acetyl Chloride Test:** Acetyl chloride reacts vigorously with primary and secondary alcohols with the evolution of hydrogen chloride. The hydrogen chloride gives white fumes of ammonium chloride with ammonium hydroxide.
- **Ceric Ammonium Test:** To the sample, we add a few drops of ceric ammonium nitrate and shake well. The appearance of pink or red colour indicates the presence of an alcoholic group.



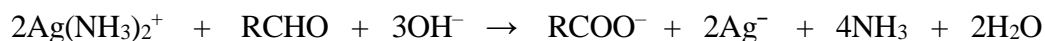
2) Carbonyls (Aldehydes and Ketones)

- **2,4-dinitrophenyl hydrazine test:** We add a small amount (2 drops or 0.05 – 0.1g) of the substance to 3 ml of 2,4-dinitrophenyl hydrazine reagent and shake well. A crystalline precipitate indicates the presence of a carbonyl compound. Occasionally the precipitate is oily at first but this becomes crystalline upon standing.



3) Aldehydes

- **Schiff's Test:** We dissolve the given compound in alcohol and then add 1-2ml of Schiff's reagent. The appearance of pink, red or magenta colour confirms the presence of aldehyde group.
- **Tollen's Test (Silver Mirror Test):** We add 3-4 drops of the liquid to the Tollen's reagent. We heat the container. A shining mirror precipitate confirms the presence of the aldehyde.



4) Carboxyl Group

We can identify Carboxylic acid by the following tests:

- **Sodium Bicarbonate test:** We add Sodium bicarbonate (NaHCO_3) to the 1 ml of the sample. A pinch of effervescence indicates the presence of a carboxylic group.



- **Ester Test:** We warm a small amount of the acid with two parts of absolute ethanol and one part of concentrated sulphuric acid. We cool the solution and pour it continuously into aqueous Na_2CO_3 solution. A sweet, fruity smell of an ester confirms the presence of ester.

5) Amino Group

The most important basic nitrogen compounds are the primary, secondary and tertiary amines and they dissolve in mineral acids and change red litmus to blue.

- **Chemical classification of the amine function:** The classification of primary, secondary or tertiary amines is done by means of the reaction with nitrous acid.

- **Nitrous Acid Test:** We add 2g of the substance to 5 ml of 2 M HCl acid. Then, we cool it and add 2 ml of ice-cold 10% aqueous NaNO₂ solution slowly by means of a dropper. If we obtain a clear solution, with a continuous evolution of nitrogen gas, the substance is a primary amine.

