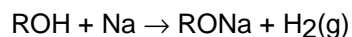


Classification Tests

1. Classification Tests For Alcohols

a) Sodium Metal:

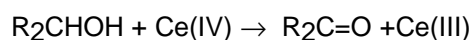


Positive Test: evolution of gas – the rate is highly variable and depends upon the alcohol structure

Other Functional groups that give positive Test:



b) Ceric Ammonium Nitrate Oxidation



Positive Test: Color changes from yellow to red first then to colorless solution. (1 min. to 12 hrs)

Positive for alcohols of 10 or fewer carbons

Very good test for 1°, 2° alcohol

Slow for 3° alcohol

Note: Phenols gives brown or black products.

c) Jones Oxidation (CrO₃)

Good for 1°, and 2° alcohols but not 3° alcohol.

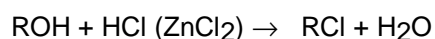
Pos. Test: Orange solution changes to opaque suspension with green to blue color.

Result in 2 sec.

Note: Aldehydes give positive result.

d) Lucas Test (HCl/ZnCl₂)

shows the existence of OH group



Pos. Test: Formation of insoluble layer or emulsion in 5-10 min.

Note: Primary alcohols do not give positive Result.

e) Periodic Acid (HIO₄) Test for detection of Vicinal Diols.

Pos. Test: White ppt upon addition of AgNO₃

(f) Acetyl Chloride (ROH & ArOH)

Pos. Test: Evolution of heat and HCl gas – ester formation in the top layer of the flask.

2. Classification Tests For Aldehydes and Ketones

a) 2,4-Dinitrophenyl Hydrazine

Pos. Test indicate: formation of yellow, orange or red ppt.

b) Phenyl hydrazine and p-Nitrophenylhydrazine.

Pos. Test indicate formation of yellow ppt.

c) Hydroxylamine Hydrochloride

In the presence of orange color indicator =) Orange color changes to red.

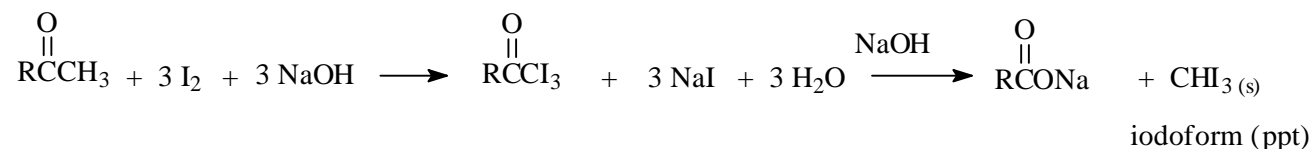
d) Sodium Bisulfite (NaHSO₃)

Pos. Test: formation of ppt

good for aldehydes, all give ppt

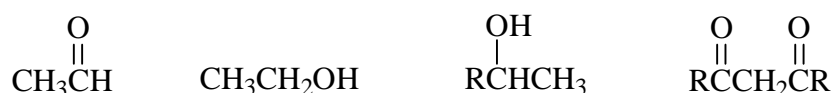
Only some ketones give positive results (ppt)

e) Iodoform Test_ (For methyl Ketones)



Pos. Test: Yellow ppt for methyl ketones

Disadvantages: Some compounds that can be easily oxidized to methyl ketones give also positive results e.g.

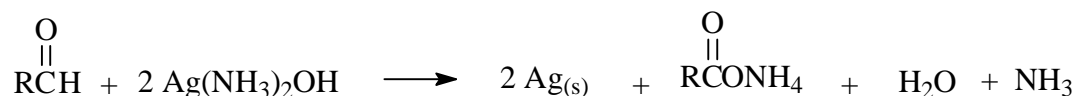


3. Tests that give positive results with aldehydes and negative results with Ketones

(a) CrO₃ (Jones Oxidation)

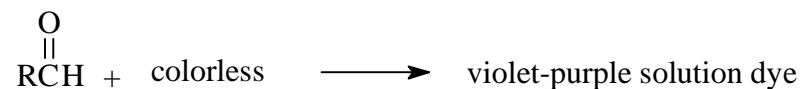
See alcohols part C.

(b) Tollens Reagents (Ag(NH₃)₂ OH)

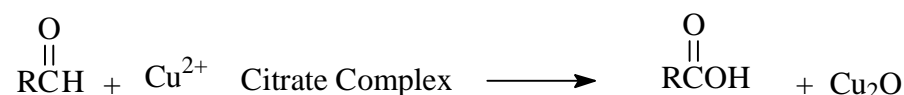


Positive Test. Formation of silver mirror. (ppt)

(c) Fuchsin Reagent:



(d) Benedicts solution



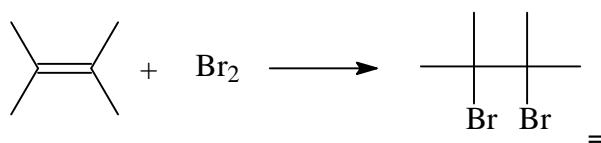
Positive Test ==> yellow or yellowish green ppt.

All aldehydes give positive result except Aromatic aldehydes give negative result. Other compounds that give positive result are



4. Classification Tests for Unsaturation "alkenes & alkynes"

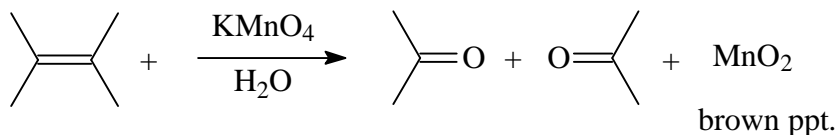
(a) Bromine in CCl₄



Pos. Test: Bromine color discharged without evolution of gas (HBr)
alkenes & alkynes give positive results

If HBr evolved ==> indicates enols & phenols and enolizable compounds

(b) Baeyer Test (KMnO₄ aqueous)



Pos. Test: Purple color discharges. and brown color PPT (MnO₂) appears

Note: Aldehydes and alcohols also give positive result.

5. Tests for Alkyl Halides

(a) Ethanolic Silver Nitrate



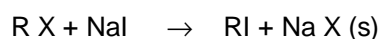
Pos. Test: formation of ppt.

Indicates: 2° and 3° RX

1° RX, Ar-X, and vinyl halides give negative Result.

Note allylic and benzylic RX give Pos. Result

(b) Sodium Iodide in Acetone



X = Cl, Br

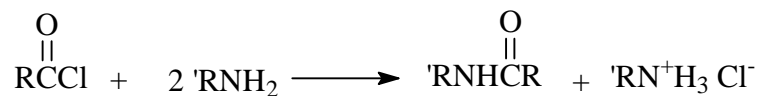
Pos. Test: ppt forms

Indications: 1°, 2° RX, allylic and benzylic halides.

Not good for ArX, vinyl halides, HCCl₃, and 3° RX

6. Tests for amines

(a) Acid chloride

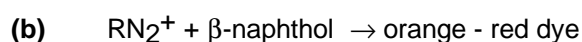


Pos. Test: Heat evolves and formation of ppt when added to H₂O

Indications: 1° & 2° amines give both heat & ppt 3° amines give only heat

Note: ROH give also pos. result (heat).

(b) Nitrous Acid

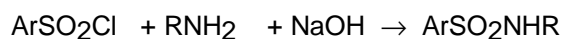


Pos. Test: gas evolution and formation of orange-red dye when reacted with $\beta\text{-naphthol}$.

2. Secondary amines: should give yellow oil or solid



(c) Hinsberg Test



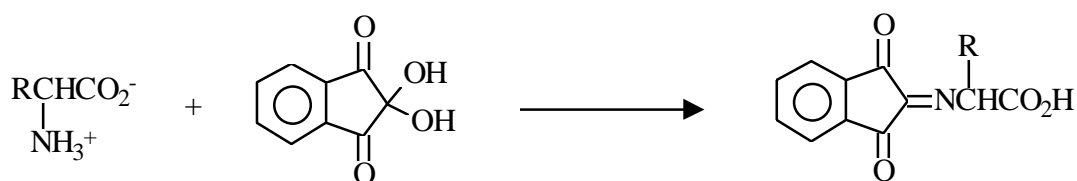
1- Primary amines: give solution that produce ppt after addition of HCl.

2- Secondary amines: give ppt not soluble in NaOH or HCl.

3- Tertiary amines: Give ppt (starting material) soluble in HCl (no reaction).

7. Tests for Amino Acids

Ninhydrin Test:



Pos. Test: blue or blue-violet color for amino acids.

8. Tests for Aromatics

(a) Fuming Sulfuric Acid

This test is good for aromatics with no other functional group present.

Pos. Test: soluble in H₂SO₄ (Fuming)

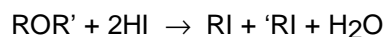
(b) Chloroform and Aluminum Chloride

Aromatics give colored solution or powder.

Pos. Test(Orange, red, blue, purple, green) – dependent upon the functional groups on the aryl ring.
non aromatics give yellow color (Neg.result)

9. Tests for Ethers

(a) Hydroiodic Acid (Zeisel's, Alkoxy method)



Pos. Test: Orange or Orange-red color

Indication: ether with R equal to 3 carbons or less.

Note: Ethyl and methyl esters give also pos. result.

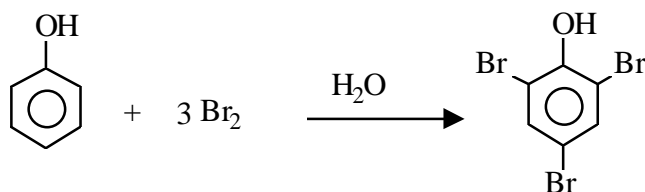
(b) Bromine water

Pos. Test: decolorization of Bromine

Indicates: Aromatic ethers and some aliphatic ethers.

10. Tests for Phenols

(a) Bromine water



Pos. Test: decolorization of bromine.

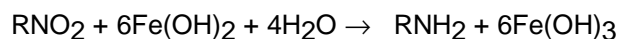
This is good for water soluble phenols

(b) Ferric Chloride/Pyridene

Pos. Test: Production of blue, violet, purple, green, or red-brown colors
good for all types of Ar-OH.

11. Test For Nitro compounds

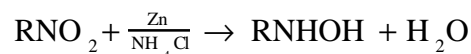
(a) Ferrous Hydroxide Reduction



Pos. Test indicated by formation of red, brown to brown ppt

Note: Nitroso Compounds, quinones, hydroxylamines alkyl nitrates give also pos. results

(b) Zinc and ammonium chloride reduction



Test the solution with Tollens Reagent

Pos. Test → formation of metallic silver