

identification test

Functional Groups	test names	Reactions & Results
• alkane	Combustion test	$C_nH_{2n+2} + O_2 \rightarrow CO_2 + H_2O$ burns with non-sooty flame
• alkene	• Bromine water test	$R-CH=CH-R + Br_2 \rightarrow R-CHBr-CHBr-R$ decolorize reddish brown bromine water
	• Baeyer's test	$R-CH=CH-R + KMnO_4 + H_2O \rightarrow R-CHOH-CHOH-R + MnO_2$ diol is formed & discharging purple color to colorless.
• alkyne	• Ammonical silver nitrate test	$HC \equiv CH + [Ag(NH_3)_2]^+ \rightarrow AgC \equiv CAg + NH_4^+$ white precipitates of silver acetylide formed.
	• Bromine water test	$R-C \equiv C-R + 2Br_2 \rightarrow R-CBr_2-CBr_2-R$ decolorize reddish brown color.
• benzene	• Ignition test	burns with sooty, yellow flame
	• Nitration test	$C_6H_6 + HNO_3 \xrightarrow{H_2SO_4} C_6H_5NO_2 + H_2O$ pale yellow oily product is formed.
• alkyl halide	• Sodium iodide in acetone test	$R-X + NaI \rightarrow R-I + NaX. (Cl/Br)$ Precipitate of NaBr/NaCl is formed.
	• Silver nitrate test	$R-X + H_2O + AgNO_3 \rightarrow R-OH + H^+ + X^- + Ag^+ \rightarrow AgX$ Precipitate are formed.
• amine	• Nitrous acid test	$R-NH_2 + HNO_2 \rightarrow R-OH + N_2 + H_2O$ Nitrogen gas forming effervescence.
• alcohol	• Lucas test	$R-OH + HCl \xrightarrow{ZnCl_2} R-Cl + H_2O$ Time taken to form alkyl halide confirms diff type of alcohol. • 1°-OH = forms oily layer after heating. • 2°-OH = insoluble oil layer formed after 5-10 min. • 3°-OH = forms oily layer immediately.
	• Sodium metal test	$R-OH + Na \rightarrow R-O^-Na^+ + H_2$ H ₂ gas release.
	• Iodoform test	$R-OH + 4I_2 + 6NaOH \rightarrow CHI_3 + R-C(=O)ONa + 5NaI + 5H_2O$ Yellowish ppt forms.

• phenol	• Ferric chloride test	$C_6H_5OH + Fe^{+3} \rightarrow [Fe(C_6H_5O_6)]^{-3}$ violet complex is formed.
	• Bromine water test	$C_6H_5OH + 3Br_2 \rightarrow C_6H_2Br_3OH + 3HBr$ white ppt of tribromophenol is formed.
• ether	• Iodine Pentaoxide test	$R-O-R' + I_2O_5 \rightarrow CO_2 + \text{other product}$ effervescence.
	• Sodium carbonate test	$R-COOH + NaHCO_3 \rightarrow R-COONa + CO_2 + H_2O$ effervescence
• Carboxylic acid	• esterification test	$R-COOH + R'-OH \rightarrow R-COOR' + H_2O$ fishy / fruity smell.
	• Sodium Hydroxide test	$R-COOH + NaOH \rightarrow R-COONa + H_2O$ forms water-soluble salt.
	• Tollen's test	$R-CHO + 2[Ag(NH_3)_2]^+ + 3OH^- \rightarrow R-COOH + 2Ag + 4NH_3 + 2H_2O$ shiny silver lining is formed on wall of tube.
• aldehyde	• Fehling test	$R-CHO + 2Cu^{+2} + 5OH^- \rightarrow R-COO^- + Cu_2O + 3H_2O$ brick red ppt formed.
	• Benedict test	Same as above.
	• Schiff test	aldehyde reacts with Schiff's Reagent (Rosaniline hydrochloride decolorizes with SO_2) to restore its magenta color.
	• 2,4-DNP test	yellow orange/red ppt formed.
• Ketone	• Sodium bisulfite test	white crystalline addition comp.
	• Sodium nitroprusside test	Gives wine red color.