Identification of alcohols

- Methanol (H₃C–OH)
- Ethanol (H₂C–OH)
- Glycerol (glycerin) (HO–CH₂–CH₂–OH)
- Isopropyl alcohol (H₃C–CH–CH₃)
- Benzyl alcohol (H₂C=C–OH)
Pharmaceutical application of alcohols

1- Methanol, ethanol are very important organic solvents in organic synthesis reactions and crystalization.
2- Ethanol is used externally as antiseptic for wounds at concentration 70%, in wine preparation, perfumes.
3- Benzyl alcohol is used as preservatives in pharmaceutical preparations.
4- Glycerol is used as wax softener for ears, viscosity modifier & sweetening agent in syrups and levigation of hydrophobic powder in preparation of suspension.
Identification of alcohols

A- Physical Properties:
1- **State:** liquid
2- **color:** colorless
3- **odour:** ethanol, methanol (alcoholic odour)
   isopropyl alcohol, benzyl alc. (characteristic odor)
   glycerol (odourless)

4- **Miscibility** miscible with water except benzyl alcohol
   which is immiscible and heavier than water
5- **Action on litmus paper:** neutral
### B-chemical properties

<table>
<thead>
<tr>
<th>Test</th>
<th>Observation</th>
<th>Result</th>
</tr>
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<tbody>
<tr>
<td><strong>1- Acidity test:</strong></td>
<td>No eff.</td>
<td>so it is not acidic compound</td>
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</table>
| **2- Dry ignition:**  | a) inflammable with non smoky flame (with all except benzyl alcohol)  
                         OR  
                         b) inflammable with smoky flame | so it is an aliphatic compound  
                         so it is an aromatic compound |
<p>| <strong>3-Schif’s test:</strong>   | No immediate magenta color                       | so it is not aldehyde                       |
| <strong>4- Fehling Test:</strong>  | No change in color                               | so it is not aldehyde                       |</p>
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<td>5- Sodium nitroprusside test</td>
<td>No Blood red color</td>
<td>so it is not methyl ketone</td>
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<tr>
<td>6- Oxidation test with potassium dichromate:</td>
<td>Orange color turns to Green color</td>
<td>so it is an aliphatic alcohol</td>
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For aliphatic alcohol only

1 ml unk. + 1 ml K₂Cr₂O₇ + 1 ml dil H₂SO₄
And heat in BWB for 3 min

Orange color turns to Green color
then
a) Add solid sod carbonate
if Eff. Occur, so it may be formic acid
If no eff
b) add Schiff’s reagent
If immediate magenta color, so it may be ethanol
If –ve, so it may be glycerol
Identification of Alcohols

7) Iodoform test

1 ml unk. + 2 ml I₂ solution (brown) + add dropwise NaoH 10% with continuous rubbing & shaking till brown color just disappear

+ve

Fine pale yellow crystals

, so it may be ethanol

-ve (yellow clear solution)

no fine pale yellow crystals

, so it is not ethanol it may methanol or glycerol

1 ml unk. +

a) 0.5 ml acetic acid  OR
b) 1 spatula salicylic acid

+ 4 drops Conc. sulfuric

a) Fruity odor
b) Oil of winter green like odor
If 7) iodoform –ve (methanol or glycerol)

Esterification a) or b) same steps as in ethanol

-ve

+ve

a) Fruity odor
b) Oil of winter greel like odor

,so it is Methanol

a) no Fruity odor
b) no Oil of winter greel like odor

,so it is not methanol it may be glycerol

CT. Borax test

a) 0.2 g borax + 5 ml water, dissolve + add 2-3 dps ph.ph (pink color)
b) add 0.2 ml glycerol, shake

pink color disappear & reappear on warming

,so it is glycerol
Identification of Oxidation products of alcohols

1ry alcohol                              aldehyde                      carboxylic acid
Methanol                                formaldehyde             formic acid

, so formic acid is the oxidation product of methanol and it can be identified by adding solid sodium carbonate to the test tube containing green solution after pot.dichromate test and it will make effervescence

1ry alcohol                              aldehyde                      carboxylic acid
Ethanol                                           acetaldehyde               acetic acid

oxidation product of ethanol is acetaldehyde and can be identified by schiff’s test forming immediate magenta color
**2ry alcohol**
- Isopropyl alcohol

**ketone**
- Acetone
  - Identified by forming sod. nitroprusside test
  - Forming blood red color

**3ry alcohol**
- Tert-butyl alcohol
  - Ve no reaction, no oxidation as there is no replaceable hydrogen on their carbon carrying hydroxyl group
Iodoform test

- It is base catalysed halogenation for carbonyl compounds, this test to occur it needs **α methyl group to carbonyl**

  \[
  \begin{align*}
  \text{R} & \quad + \quad 3 \ \text{I}_2 \quad + \quad 4 \ \text{NaOH} \quad \rightarrow \\
  \text{R} & \quad \text{C} \quad \text{O} \quad \text{Na} \quad + \quad \text{CH}_3 \quad + \quad 3 \ \text{NaI} \quad + \quad 3 \ \text{H}_2\text{O}
  \end{align*}
  \]

- Used in identification of some organic compounds
- **Examples of compounds gives +ve iodoform**
  a) Any methyl ketone (acetone, acetophenone)
  b) Acetaldehyde is the only aldehyde gives +ve iodoform
  c) Alcohols containing **α methyl group like ethanol?? HOW?**
  d) Lactic acid. How??