

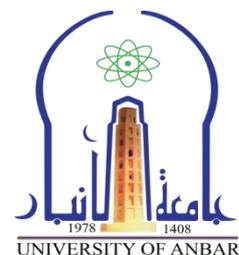


Ministry of Higher Education and Scientific Research

University of Anbar

Science College

Department of Chemistry



ORGANIC DIAGNOSIS PRACTICAL

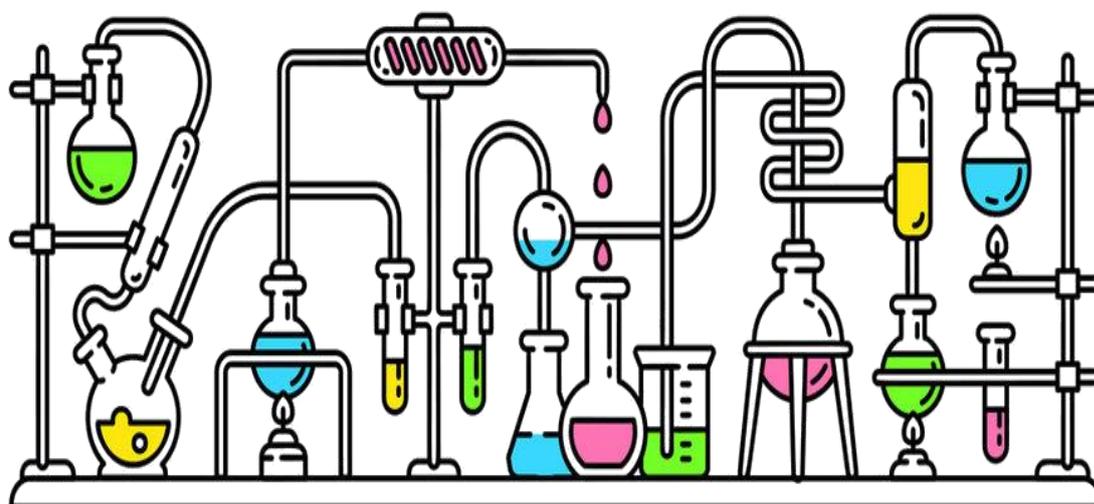
Fourth stage

EXPERIMENT 4

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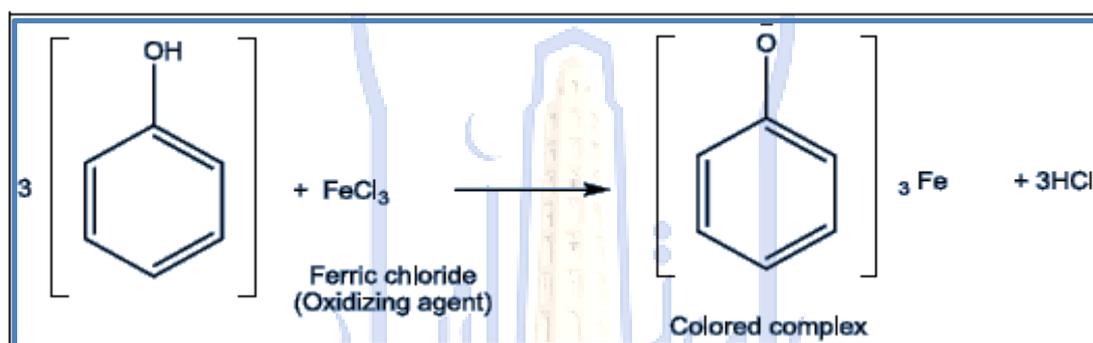
EXP4 :- IDENTIFICATION OF PHENOLS

Phenols are organic compounds with a hydroxyl group attached directly to an aromatic ring. They have the general formula Ar-OH. Examples of them include phenol, hydroquinone, resorcinol, o-cresol, m-cresol, p-cresol, β -naphthol, and catechol.

Chemical Reactions:

1. Ferric chloride test.

Phenols react with ferric chloride to give colored compounds due to the presence of [-C=C-OH] (enol) group. Indeed this reaction is considered as a test for any compound with enol group.

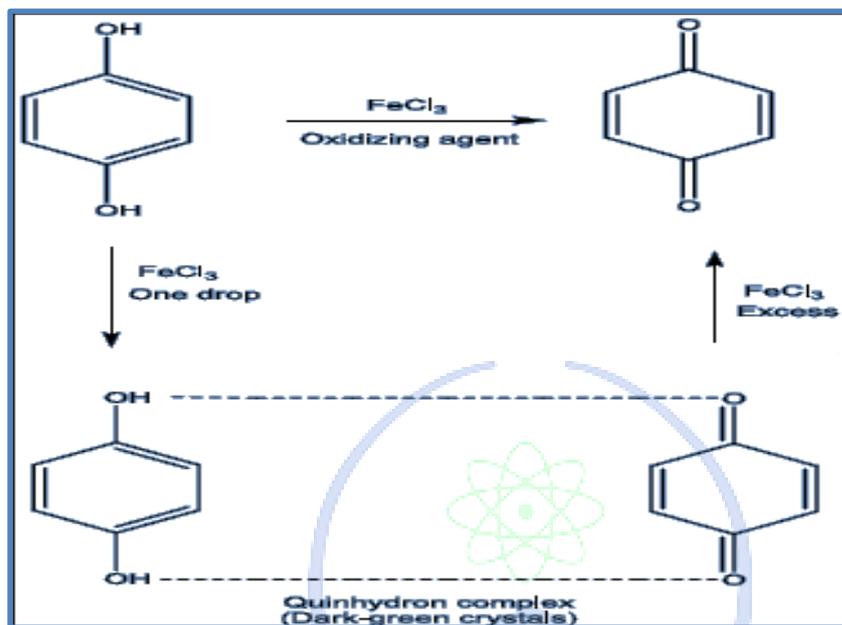


Procedure:

To a very dilute aqueous solution of phenol or to a few crystals of the solid phenol (0.1 gm) dissolved in water add 1 drop of ferric chloride solution and observe the resulting color:

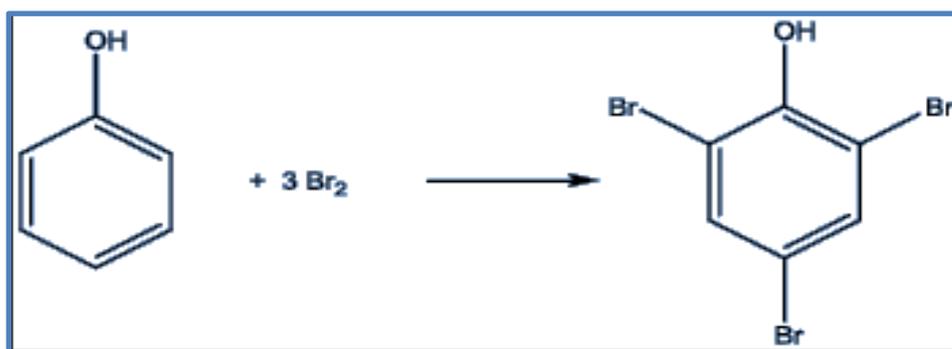
Phenols	Colors
phenol, <i>m</i> -cresol, resorcinol	violet or blue
<i>o</i> - and <i>p</i> -cresol	greenish blue
Hydroquinone	deep green
β -naphthol	no special color

In the reaction of hydroquinone with ferric chloride as crystals may separate, and on further addition of ferric chloride solution a yellow solution of pbenzoquinone is produced:



2. Bromine water test.

Phenols are generally highly reactive towards electrophilic reagents and are readily brominated by bromine water. e.g.

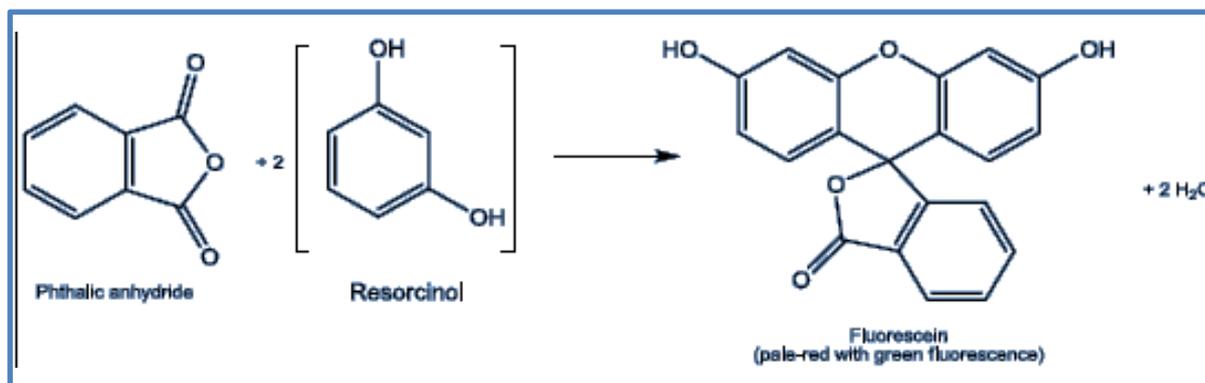


Dissolve or suspend about 0.05 g of the compound in 2 mL of dilute hydrochloric acid and add bromine water drop wise until the bromine color remains. A white precipitate of the bromophenol may form. Solid bromophenol derivatives can be used for the confirmation of the structure of a phenol.

3. Phthalein test.

Many phenols yield Phthalein which give special colors in alkaline solutions when reacting with Phthalic anhydride and a little amount of concentrated sulfuric acid.

An example is the case with resorcinol:



The fluorescence is because of the oxygen linkage between the two phenolic nuclei (in basic medium).

Procedure:

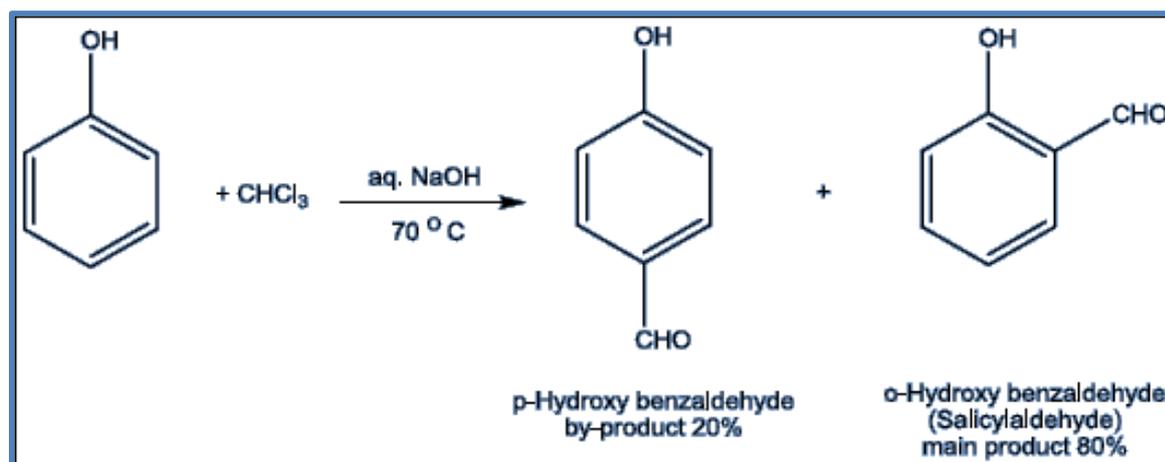
In a dry test tube put about 0.1 gm of the compound and an equal amount of Phthalic anhydride or Phthalic acid, mix well, and add 1-2 drops of conc. H₂SO₄. Heat on a direct flame for 1 minute until the crystals of the mixture melts. Then cool the test tube and add excess of 10% sodium hydroxide solution. Results should be as follows:

Phenols	Colors
<i>β</i> -naphthol	very pale green with slight fluorescence
Phenol	red to pink
<i>o</i> -cresol	red – violet
<i>m</i> -cresol	blue to pink
Resorcinol	pale red color with green fluorescence
Hydroquinone	iodine color

If the resultant color is not so clear you can dilute with water.

4. Riemer - Tiemann reaction.

Treatment of phenol with chloroform and aqueous sodium hydroxide solution introduces an aldehyde group (-CHO) into the aromatic ring at the ortho- or para- positions:



Procedure:

To about 0.2 gm of the phenol add 1 ml of 30% NaOH solution and 1 ml of chloroform, heat on water bath, and observe the color of the aqueous layer:

Phenols	Colors
phenol	yellow or no color
<i>o</i> -cresol	deep orange
resorcinol	red color with a little fluorescence
hydroquinone	deep brown
β -naphthol	deep blue that turns to green
<i>m</i> -cresol	pale orange
<i>p</i> -cresol	yellow