College of Pharmacy	**الكلية**
Pharmaceutical Chemistry	**القسم**
Pharmaceutical Organic Chemistry II	**المادة باللغة الانجليزية**
الكيمياء العضوية الصيدلانية	**المادة باللغة العربية**
Fourth grade	**المرحلة الدراسية**
Assistant Lecturer : Amal Anwar Mohammed	**اسم التدريسي**
Phenol Synthesis Part I	**عنوان المحاضرة باللغة الانجليزية**
تحضير الفينول	**عنوان المحاضرة باللغة العربية**
10	**رقم المحاضرة**
	المصادر والمراجع

محتوى المحاضرة

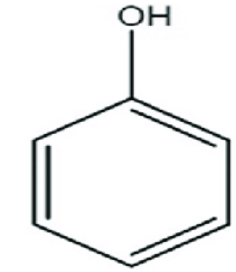
Phenol Synthesis Part I

Phenols are compounds having a hydroxyl group attached directly to an aromatic ring .

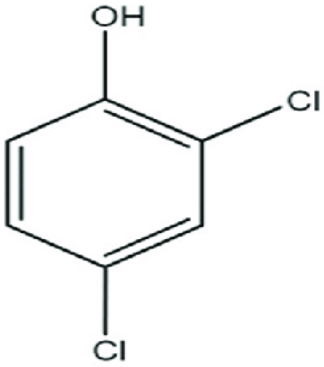
Their general formula is Ar-OH, where Ar- is phenyl, substituted phenyl, or some other aryl group (e.g. naphthyl,etc.).

They are usually named as derivatives of the simplest member of the family, phenol.

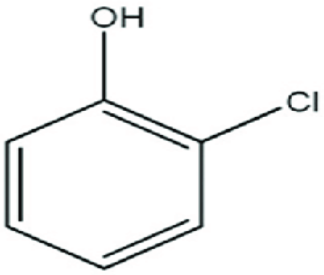
The -OH gr. is named as a substituent if it occurs in the same molecule with the carboxylic acid, aldehyde or ketone functionalities , which have priority in naming.



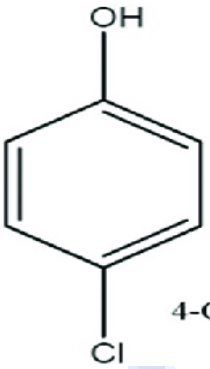
Phenol



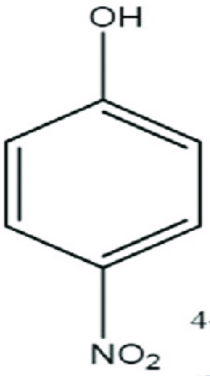
2,4-Dichlorophenol



2-Chlorophenol



4-Chlorophenol



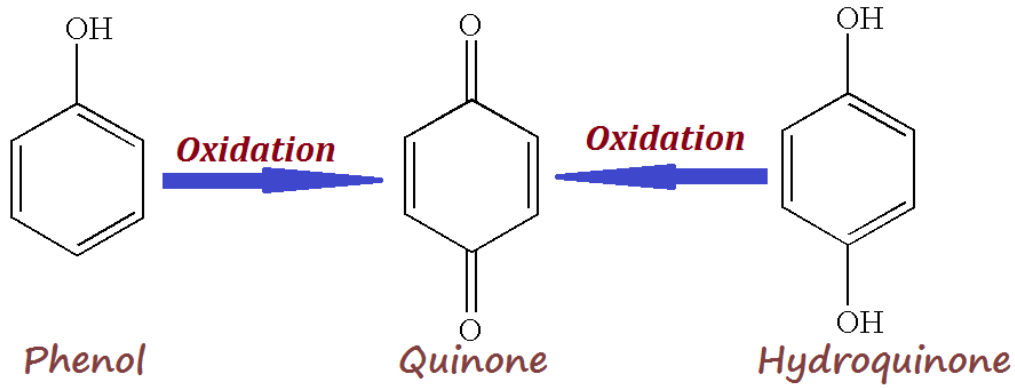
4-Nitrophenol

Physical properties of Phenols:

The simplest phenols are liquids or low-melting solids. They have high boiling points. (Because of hydrogen bonding)

Most phenols are essentially insoluble in water.

Phenols themselves are colorless, although they are pink to red by oxidation products



1)Colorless-pink needle-like crystals.

2)Freely soluble in organic solvents.

3)Has high B.P. (180 - 183 0C) , because of the intermolecular hydrogen bonding between phenol molecules .

4)High m.p. = 42 0C , (intermolecular H- bonding of phenol molecules) .

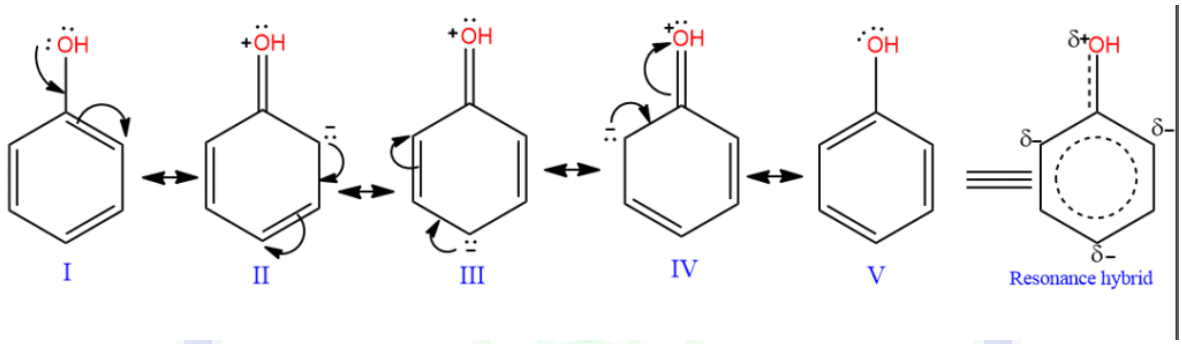
5)Slightly soluble in water (9 g /100 ml) , because of the intermolecular H – bonding between phenol & water molecules.

6)It has a characteristic aromatic odor.

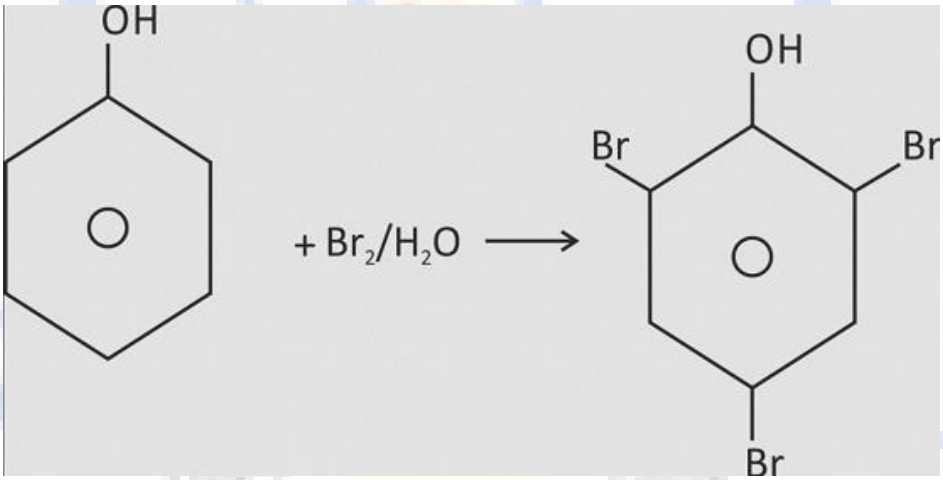
7) Phenol is a weak acid, more acidic than alcohol * & water but weaker than carboxylic acids.

*** Because the corresponding phenoxide ions are stabilized by resonance.**

The negative charge of an alkoxide ion is concentrated on the oxygen atom, but the negative charge on a phenoxide ion can be delocalized to the orth & para ring positions through resonance.



8) Phenol reacts with bromine water to give 2,4,6 – Tribromophenol, (white precipitate)



Uses of Phenol:

Phenol is one of the oldest antiseptics . It has bactericidal and bacterostatic properties besides it's caustic & slight anesthetic activities.

It denatures proteins while in high concentrations it precipitates them.

It is used in 0.1 – 1 % in lotions & ointments.

Preparation of Phenol:

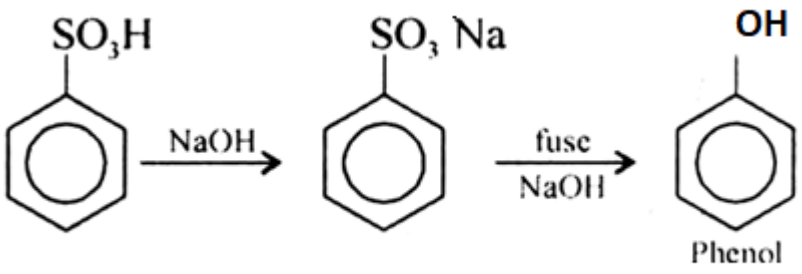
In the early of 19th century, phenol was obtained from coal tar in low yield by extraction with alkali,

Now phenol is commercially produced synthetically.

In the laboratory, Phenol is generally prepared by one of the three methods.

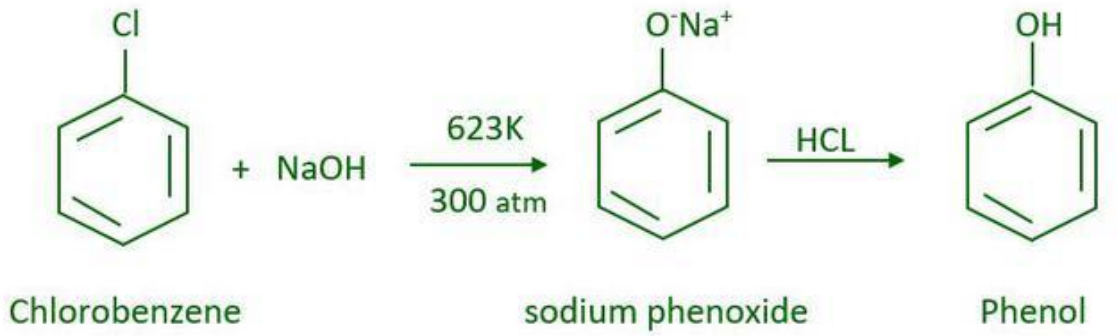
1- From aryl sulfonic acids :

An aryl sulfonic acid yields the corresponding phenol on heating it with molten NaOH (fusion).

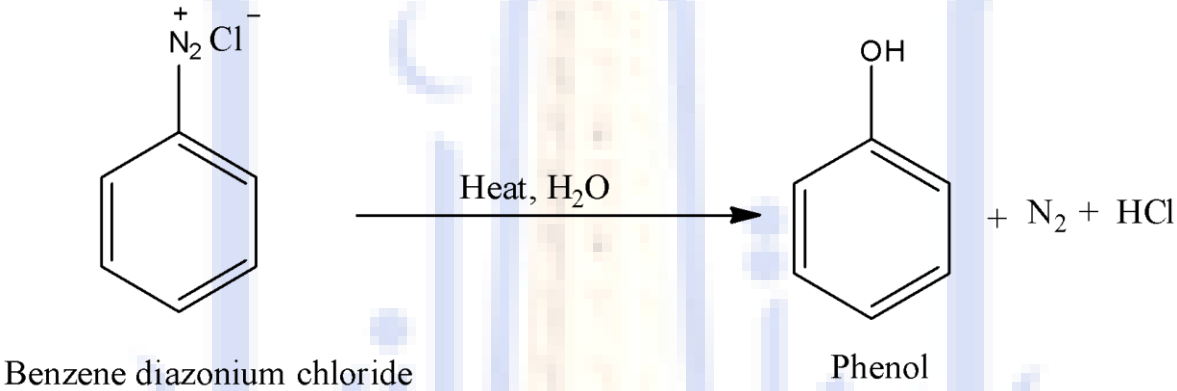


2- From haloarenes (Aryl halides) :

An aryl halide is hydrolyzed by treating it with 10% NaOH sol. at high temp. in the presence of a catalyst.



3- From hydrolysis of diazonium salts :



In our laboratory today , for synthesis of phenol we shall use the last procedure , namely that of the diazotization of aniline & subsequent hydrolysis both because of it's simplicity and because of it typifies a close reaction.

Both phenol (99% purity) & liquefied phenol (phenol 800 g and sufficient water to make 1000 g) are official in the pharmacopia

Preparation of phenol

1 .In a beaker containing 50 mL of distilled water, add 7.5 mL of sulfuric acid, then add 7.5 mL of aniline and stir the mixture.

2 .Cool the solution to 0°C in an ice bath (5 min) stirring.

3 .In another beaker, dissolve 5.5 g of $NaNO_2$ in 25 mL of distilled water. Place the mixture in a burette and slowly add it to the mixture from step 1 (5 min) while keeping it in an ice bath.

4 .Transfer the mixture to a reflax and heat it for 15 to 20 min at 60°C.

5. Then, transfer it to a beaker and place it in an ice bath.