Experiment 9. By:- Rofida Awwad

~ Some Reactions of Hydrocarbons ~

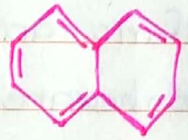
~ Hydrocarbons ~

- aliphatic HC
  - Saturated Hc
    - [alkane, cycloalkanes]
      - have single Bond.
      - unreactive.
  - unsaturated Hc
    - alkene → double Bond
      - cycloalkene
    - alkyne → triple Bond.
- aromatic Hc
  - Benzene

  - toluene

  - m-xylene

  - Naphthalene



① Baeyers test [alkenes + Potassium permanganate].

~ potassium permanganate

KMnO4 ⇒ Oxidizing agent

purple color

[addition, oxidation] reaction

~ alkenes + KMnO4 $\xrightarrow{H_2O}$ produces MnO_2 Brown ppt.

(unsaturated aliphatic HC) تؤكد الراسب دليل حدث هنا التفاعل

~ [alkanes or aromatic Hc] + $KMnO_2$ ⟶ no reaction + no color change.

② Reactions of alkenes with Bromine (Br_2)

~ Br_2 ⇒ Brownish-red / orange / yellow color

~ alkenes + Br_2 $\xrightarrow{CCl_4}$ produces [alkyl Bromide or dibromo alkene]

Brownish-red / yellow / orange

Colorless.

~ [alkanes or aromatic Hc] + Br_2 (or CCl_4) $\xrightarrow{\text{heat or light}}$ no reaction.

③ Reaction of aromatic HC with chloroform

anhydrous aluminum chloride

Aromatic + $CHCl_3$ $\xrightarrow{AlCl_3}$ produce Ar_3CH $\xrightarrow{AlCl_3/Ar_2CHCl}$ highly colored cation.

$CHCl_3$: chloroform; $AlCl_3$: Lewis acid catalist; Ar_3CH: triarylmethanes

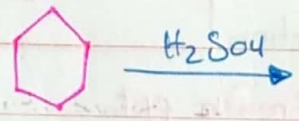
note* the color depends on the number of rings in the aromatic Hc.

- Benzene and its derivatives give ⇒ orange-red color
- Naphthalene and its derivatives give ⇒ Blue-purple color.

* Reaction of hydrocarbons with sulfuric acid.

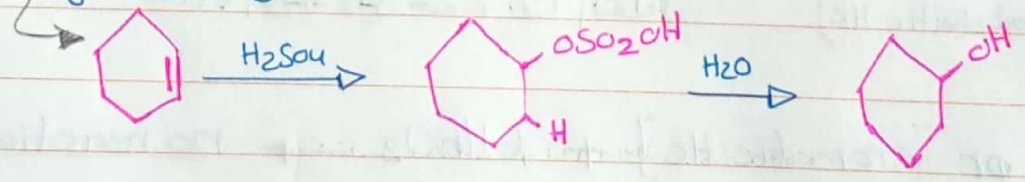
- Sulfuric acid ⇒ H_2SO_4

cyclohexane

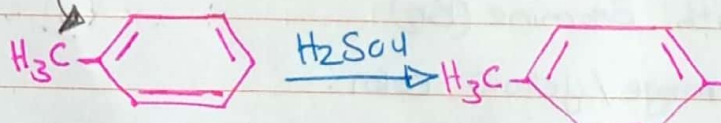


no reaction

cyclohexene



toluene



إذا كانت سبة H أعلى ما يكون بالـ energy أعلى ما يكون والعكس صحيح.

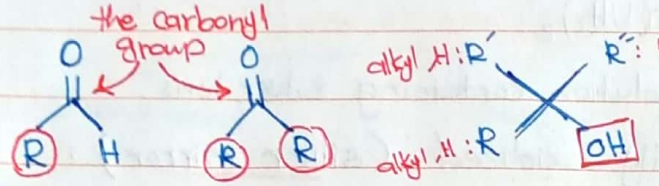
* Combustion of Hc in presence of O_2

~ Saturated burn cleanly ~ unsaturated tend to produce soot

Experiment 10

· By :- Rofida Awwad

~ Aldehydes , ketones , and Alcohols ~



aldehyde ketone alcohol

R: alkyl, aryl.

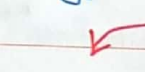
* Carbon of the carbonyl group is Sp^2 hybridized.

. C=O bond is polar

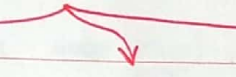
~ Alcohol : hydroxy group bonded saturated carbon.

~ Types of alcohol

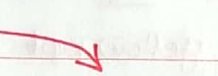
Primary 1°

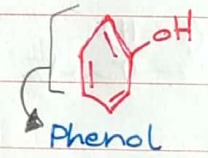


Secondary 2°



Tertiary 3°





~ Reactions of Aldehydes and ketones ~

① (2,4- DNP) ⇒ 2,4- Dinitrophenyl hydrazine

aldehydes and ketones + [2,4- DNP] (in H_2SO_4) → [2,4 - DNP] (solid) (immediate ppt)

[2,4- DNP] : orange- red

[2,4 - DNP] : yellow to deep red

② fehling's test ketones & aldehydes التمييز بين

~ fehling's (Cu^{2}) Copper (II) ⇒ Oxidizing agent ⇒ oxidize aldehydes

~ Red ppt ⇒ Cu_2O ← دليل حدوث التفاعل

[ex:- glucose مثال]

~ with ketones ⇒ no Reaction $R-\overset{O}{\overset{\|}{C}}-R$

③ Tollen's test [silver-mirror test].

~ Tollen's reagent :- $Ag(NH_3)_2^+$

· colorless · Basic · aqueous solution containing silver ions.

~ aldehydes ⇒ readily oxidized. (silver mirror).

~ ketones ⇒ not oxidized / no Reaction.

④ Iodo form test

~ to check the presence of carbonyl compounds with the structure $R-CO-\underset{\text{methyl}}{CH_3}$ or alcohol with structure $R-CH(OH)-\underset{\text{methyl}}{CH_3}$ to give yellow ppt (CHI_3).

↳ Iodoform or triiodomethane

(NaOH)

← هذا التفاعل يتم بوجود [oxidizing agent] و وسط قاعدي = I_2

⑤ Sodium Bisulfite test

~ Sodium Bisulfite : $NaHSO_2$

~ [aldehydes, methyl ketones] + $NaHSO_2$ $\xrightarrow{\text{(addition)}}$ Crystalline (solid)

[unsaturated $\xrightarrow{\text{addition}}$ saturated].

⑥ Lucas test [categorize primary, secondary, tertiary alcohols]

~ Lucas reagent ⇒ $ZnCl_2$

primary alcohol: $RCH_2OH + HCl \xrightarrow{ZnCl_2}$ no reaction / slow reaction ← the layers don't separate.

secondary alcohol: $R_2CHOH + HCl \xrightarrow{ZnCl_2} R_2CHCl + H_2O$ ← the layers separate within 1-5 minutes.

Tertiary alcohol: $R_3COH + HCl \xrightarrow{ZnCl_2} R_3CCl + H_2O$ ← the layers separate immediately.

⑦ chromic Anhydride - Oxidation of alcohols.

(H_2CrO_4) ⇒ chromic acid. oxidizing agent.

Strong acid

reagent for oxidizing alcohol to ketones and carboxylic acid.

- chromic acid → oxidized primary alcohol to aldehyde and then to carboxylic acid. ① ②

- Secondary alcohols $\xrightarrow[H_2CrO_4]{\text{oxidized}}$ Ketones

- Teritary alcohols ⇒ not readily oxidized.