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A New Scientific Base and its Role in Understanding and Assimilating the Similar and Interacting Interactions of Oxygen Organic Compounds

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Abstract

This research dealt with a new scientific base and its role in understanding the similar and overlapping interactions of oxygen organic compounds, through answering the following questions:

-A trial to find a relationship between the similar and interacting interactions of oxygen organic compounds.

- Trying to develop that relationship- if any- in the form of a scientific basis that facilitates the understanding and assimilation of these interactions.

To achieve the goals, the researcher adopted the descriptive analytical methodology, in addition to the inductive, deductive and structural (synthesis) methodologies.

The research consisted of three topics, the first topic dealt with the general framework of the research in terms of: the introduction of the research, a problem, its questions, importance, goals, limits, approaches and structuring, and the second topic dealt with oxygen organic compounds and their similar and overlapping interactions, while the third topic research results reviewed steps to build the discovered scientific base, recommendations and proposals

The research concluded with a new scientific base that facilitates the process of understanding the similar and overlapping interactions of oxygen organic compounds with ease, and effortlessly.

Key words: oxygen organic compounds, new scientific base

THE GENERAL FRAMEWORK OF THE RESEARCH

Introduction

Chemistry is considered one of the most important natural sciences, as it is included in all industries of all kinds. It is divided into two parts: General Chemistry, which deals with the elements and compounds present in nature, such as oxygen, hydrogen, water, minerals, oxides and salts, and the Organic Chemistry, which deals with compounds extracted from plants and animals, whether in their life or after their death, like sugar, fat, vinegar, alcohol, etc., and the science of organic chemistry went through many stages of developments and discoveries, including in the year 1776, the German scientist "Lavois Zee" concluded his analytical experiments that the largest part of any organic matter consists from carbon, hydrogen, and oxygen, other scientists have discovered small amounts of nitrogen, phosphorus, sulfur, and halogens.[1]

In the year 1828 AD, the German scientist Friedrich Wohler made the urea, which is an organic compound of ammonium cyanide, which is an inorganic compound, thus proving that organic compounds can be manufactured, which is what is happening now.[2]

As a result of the fact that the organic compounds constitute the carbon, hydrogen, and oxygen for the largest part of them, their interactions are similar and overlapping, and therefore it is difficult to understand these similar and overlapping interactions of organic compounds and distinguish between them, and it has become a problem that all students suffer from, and hinders their academic achievement.

This problem is what prompted the researcher during his study in the general secondary school to fully devote the subject of organic chemistry with a view to a deep understanding of the material in order to arrive at a solution to this problem, which was done thanks to God and his success, where the student then reached a scientific basis that facilitates the process of understanding the similar and overlapping interactions of organic compounds of oxygen, through

[1] Chemistry book, for Secondary schools, Yemeni Republic, Ministry of Education,2014,P.155
[2] Ibid.

which the student can understand and absorb these similar and overlapping interactions with ease, effortlessly , without much effort.
Here we see the importance of this research, which aims to bring this scientific base to light, benefit from it and include it in the school curricula.

Research Problem

After a lot of time and effort in researching and analyzing organic compounds in general, the research limited the current research problem to oxygen organic compounds, similar and interacting interactions of compounds.

Research Questions

The research problem can be identified in the following main question:

How can similar and interacting interactions of oxygen organic compounds be understood?

From this question, the following sub-questions are branched:

- Is it possible a relationship between similar and interacting interactions of oxygen organic compounds?
- Is it possible to put that relationship if it exists in the form of a scientific basis that facilitates the process of understanding and understanding these interactions?

Research Importance

1-**Scientific importance**: The scientific importance of this research is as follows:

- Provides a distinct scientific addition to the cognitive field in organic chemistry as it reveals a new scientific basis
- Provides a qualitative scientific addition to the curricula that facilitate the process of understanding the similar and overlapping interactions of oxygen organic compounds.

2-**Practical importance**: The practical importance of this research is as follows:

This research will open the door wide for researchers in organic chemistry to discover other scientific laws similar to this law.

The discovered scientific base will facilitate the process of understanding and assimilation of students and researchers to the

similar and overlapping interactions of oxygen organic compounds with ease, effortlessly and effortlessly

Research Aims

The research aims to the following:

1-Trying to find a relationship between the similar and interacting interactions of oxygen organic compounds

2-Trying to develop that relationship, if any, in the form of a scientific basis that facilitates the process of understanding these interactions

Research Limits

1-Objective Limits: The objective limits for research are in oxygen organic compounds (aldehydes, ketones, alcohols, carboxylic acids, esters, and ethers)

2-Time limits: It was determined in the year, in which the research numbers were completed systematically, and the intellectual property of the researcher was registered, that was in the year 2019-2020.

Research Methodologies

The researcher adopted the following research methodologies:

1-Analytical Descriptive methodology: This approach is based on determining the characteristics of the problem, describing its nature, the type of relationship between its variables and its causes and identifying its nature. It also goes beyond merely collecting metadata about the problem to linking and interpreting this data, classifying and measuring it, extracting findings from it and determining the relationship between the variables, and is based The curriculum is based on a number of foundations such as: abstract, generalization, topic analysis, case study and tracking study.[3]

2-Inductive methodology: The inductive approach is based on observing particles, facts, and individual information, which helps to form a framework for a theory that can be generalized, as it contributes to reaching the answer to known traditional questions, what, how, who, where. Examples of this approach include the famous

[3] Mohamed Shalabi: Methods of Political Analysis: Lecture to students of Fourth class-Economics and Political science-In Arabic-Sanna University,1998

apple incident and what Newton's scientist deduced from the results and facts.[4]

3-The deductive methodology: (analogy): This approach is going in a direction opposite to the inductive approach, that is, it is complementary to it and not contrary to it, as it transmits the researcher logically from the laws and scientific axioms to the particles and specific individual conclusions, and arises from the presence of a scientific inquiry that the researcher works to collect Data and information about it and analyzing it to prove the validity or rejection of the inquiry.[5]

4-The synthesis (synthesis) methodology, which aims to synthesize and compose facts that have been discovered through the analytical method, with a view to disseminating and disseminating them.

OXYGEN ORGANIC COMPOUNDS

First: organic compounds

It is important to present a descriptive overview of the organic compounds and their classifications before entering into the research topic. Organic compounds oxygen as follows:

The concept of organic compounds: Organic compounds are known as "chains and rings of carbon and hydrogen atoms[6] "

Classification of organic compounds

Organic compounds can be classified in general, according to the type of atoms involved in their formation, as follows:[7]

1-Hydrocarbon compounds: only carbon and hydrogen are included in their composition

2-Oxygen organic compounds: include oxygen, in addition to carbon and hydrogen.

[4] PP.22-23 Methodology of Scientific reseach,Translated from French to Arabic'Manio Gedair,"

[5] Ibid,Pp.24-

[6] Chemestry Book, first class,secondary school,Yemeni Republic,2013-In Arabic,P.53

[7] Ibid

3-Nitrogenous compounds: Nitrogen in addition to oxygen and hydrogen.

The following figure shows that

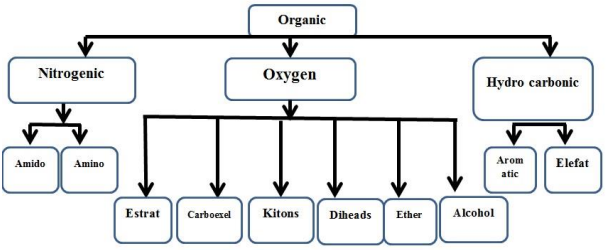


Figure No (1): Shows the categories of organic compounds

Source: Book of Chemistry for the second secondary class, Ministry of Education, Yemen, (Edition: 2013), p. 135.

We will discuss in detail only oxygen organic compounds, as they are the subject of this research as follows:

Second: oxygen organic compounds

Oxygen organic compounds: They are organic compounds that include oxygen in addition to carbon and hydrogen[8]. The functional symbol of the oxygen organic compounds can be illustrated in the following table:

Table No. (1): The functional symbol describes the oxygen organic compounds

Series	Name	formula	Structural formula	Compound name
ketones	Carbonyl	C = o Or R - C - R	R - Co - R	Canon
Aldehyde	aldehyde (formyl)	- Cho	R - CH0 or R - C - H	canal
alcohols	Hydroxyl	- Oh	R –OH	cannole
acids	Carboxylic	- CooH	- CooH R	alkanoic acid
Ether	Ether	- O -	R - O - R	alkene
Ester	Ether	coo	R - Coo - R	cannons

Source: Chemistry Book for the third grade of secondary education, Ministry of Education, Republic of Sudan, (I, 2017 AD), p. 5(in Arabic)

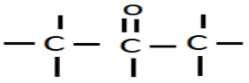
[8] Chemestry book-2nd.Class-IbidP.53

Classification of oxygen organic compounds

The oxygen compounds are classified into: ketones, aldehydes, alcohols, ethers, carboxylic acids and esters, and we will address them as follows:

1- Ketones[9]

Ketone is an organic compound in which the carbonyl group (group) binds to two carbon seeds, as in the example



That is, the carbonyl group () is not at the end of the carbon chain, unlike aldehyde, and this is the difference between them. Therefore, the simplest ketone has three carbon atoms, which is propanol and ketone is called by adding the syllable "w" to the alkane to become the "canon".

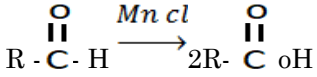
The general partial formula for ketones is: CnH2nO

The general structural formula for ketones is: R - - R or R - Co – R

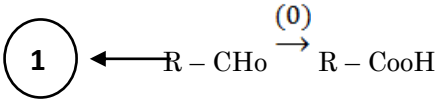
2- Aldehydes

a) Aldehydes oxidation[10]

Aldehydes oxidize with oxygen and produce the corresponding carboxylic acid in the presence of manganese ion with manganese chloride as an aid. This method is used in preparing carboxylic acids in large quantities as in the following equations



Or



[9] Sudanese Chemestry book ,for 3rd. year class,Ibid,P.25

[10] Ibid,p.53

b) Reducing Aldehydes:[11]

2 ⟵ equation $R - CHo + H_2 \xrightarrow{NI} R - CooH$

c) When adding hydrogen to the aldehyde, it gives a corresponding primary alcohol, as in the following equation :-[12]

3 ⟵ Equation $R - \overset{\overset{O}{\|}}{C} - H + H_2 \xrightarrow{NI} \underset{\underset{H}{|}}{CH_3} - \overset{\overset{O}{\|}}{C} - H$

3- Alcohols are divided into:

- Primary alcohols: in which the hydroxyl group (-oH) binds to an initial carbon seed (i.e. At the end of the carbon chain) and thus is linked to at least two hydrogen atoms.

Its general form is as follows: R - CH2oH

- Secondary alcohols: in which the hydroxyl group (-oH) is bound to a secondary carbon seed, not a primary.
- Tri-alcohols: in which the hydroxyl group (-oH) is related to a triple carbon seed, meaning that it is linked to a carbon atom bound to three other carbon atoms .

$$R - \underset{\underset{R}{|}}{\overset{\overset{OH}{|}}{C}} - R$$

The general structural formula for triglycerides is:
There is also another division according to the number of hydroxyl groups in the two parts of one alcohol.

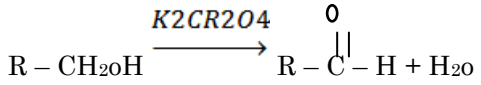
d) Primary alcohol oxidation:[13]

Primary alcohols are oxidized by strong oxidizing agents such as acidic potassium dichromate (H2SO4) or acidic potassium permanganate (H2SO4) to the corresponding aldehyde, and water, in the formula:

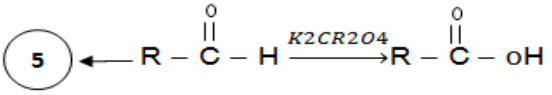
4 ⟵ $R - oH \xrightarrow{K2CR2O4} R - CHO + H_2O$

[11] Ibid,P.40
[12] Ibid,P.52
[13] Chemistry book-2nd.Class-IbidP37

Or



This oxidation continues as aldehydes are oxidized to the corresponding carboxylic acids, as in the equation :



4- Carboxylic acids[14]

Organic acids are known as carboxylic acids as a ratio of the presence of the carbonyl group C and the hydroxyl group, the resulting group was called- C - OH( )

Carboxyl group (- CooH

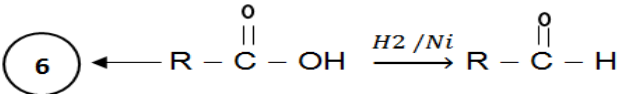
The carboxylic acid is called by adding the syllable (wake) to the name of the alcan to become (canoek) with the addition of the word acid, and reads (canoeic acid)

The general molecular formula for organic acids is: CnH2nO2

The general structural formula for organic acids is: R - Co2H or R - CooH

Reducing carboxylic acids:

When reducing the carboxylic acids, using hydrogen (H2) and in the presence of a metallic catalyst (Ni), the reduction is done by removing the oxygen atom from the carboxyl group, and the corresponding aldehyde is given as in equation:([15])

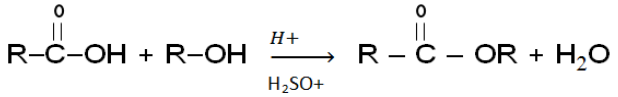


[14] Ibid,P.28

[15]https://twitter.com/salman_sa93/status/914243988194054145?lang=ar.

5- Esters:

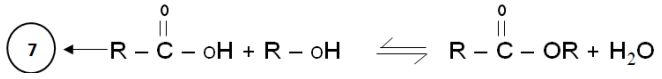
Esters are prepared from the interaction of organic acids with alcohols in the presence of concentrated sulfuric acid to extract two parts of water, forming ester and water. These reactions are called pallets, as in the following equation- :



Also, the ester in the presence of an excess of water is broken down into alcohol and acid, as in the equation:

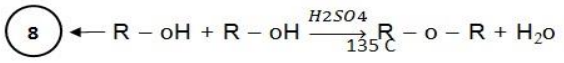
R-COO – R + H_2O $\rightarrow$ R – COOH + R - oH

The two previous equations can be combined into one equation as follows:[16]



4- Ethers:

At a low temperature (135 ° C), the concentrated sulfuric acid removes the water molecule from two alcohol molecules and is formed that does not excite the counterpart and the water as in equation-



RESEARCH RESULTS

This research began from valid scientific introductions and data (chemical equations) in proving the validity of the discovered scientific base, and in this topic we will review these starting points to demonstrate the validity of the discovered base, as follows- :

First: the starting points:

The foundations of the scientific base are as follows- :

1-Equations of scientifically proven chemical reactions.

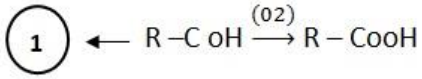
2-Aldehydes are the main source of the rest of the oxygen organic compounds.

[16] Chemistry book for 3rd class secondary school, Sudan in Arabic, 2017, P.69

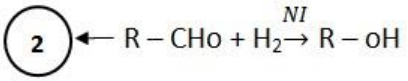
Second: Steps to build the scientific base:

The researcher followed several steps in building the discovered scientific base. We will review these steps as follows- :

1- Aldehydes oxidize with oxygen and produce the corresponding carboxylic acid in the presence of manganese ion with manganese chloride as a catalyst. This method is used in preparing carboxylic acids in large quantities as in the following equation [17]

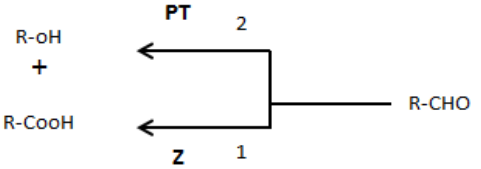


2-When the aldehydes are reduced, the corresponding first alcohol is produced, as in the following formula- :[18]

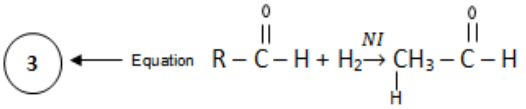


- From the previous equations (1) and (2) the following figure is produced :

Figure No. (2) Shows the oxidation and reduction of aldehydes



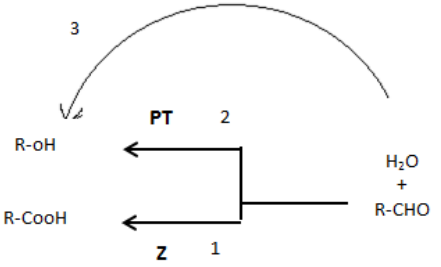
3- When adding hydrogen to the aldehyde, it gives a corresponding primary alcohol, as in the following equation :-[19]



By adding the previous equation(3) to the previous figure, it produces the following form:

[17] Ibid,P.35
[18] Ibid,P.40
[19] Ibid,P.52

Figure No. (3) shows the product of adding hydrogen to the aldehyde

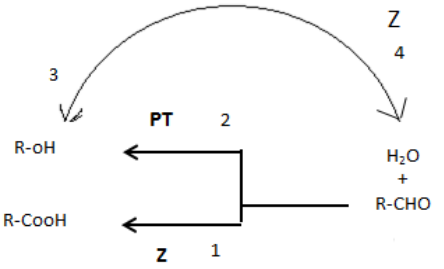


Primary alcohols are oxidized by strong oxidizing agents such as acidic potassium dichromate (H2SO4) or acidic potassium permanganate (H2SO4) and the corresponding aldehyde and water are produced, as in the following formula- :[20]

4 ← Equation R – oH $\xrightarrow{K2CR2O4}$ R – C Ho + H_2O

By adding the previous equation (4) to the previous figure, it produces the following figure- :

Figure No. (4) Shows the primary alcohol oxidation result



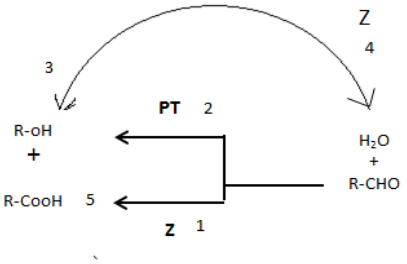
This oxidation continues with the previous oxidizing agents and aldehydes are oxidized to the corresponding carboxylic acids as in the following equation[21]-

5 ← R – C(=O) – H $\xrightarrow{K2CR2O4}$ R – C(=O) – oH

[20] Ibid,P.37
[21] Ibid,P.37

By adding the previous equation (5) to the previous figure, it produces the following figure- :

Figure No. (5) Shows the oxidation result of aldehydes to the corresponding carboxylic acids

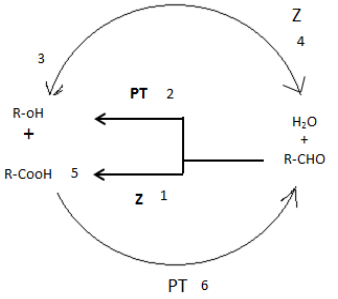


6-When reducing the carboxylic acids, using hydrogen (H2) and in the presence of a metallic catalyst (Ni), the reduction is by removing the oxygen atom from the carboxyl group, and the corresponding aldehyde is given as in equation[22]- :

$$\textbf{6} \longleftarrow R-C-OH \xrightarrow{H2\ /Ni} R-C-H$$

By adding the previous equation (6) to the previous figure, it produces the following form- :

Figure No. (6) shows the product of reducing carboxylic acids



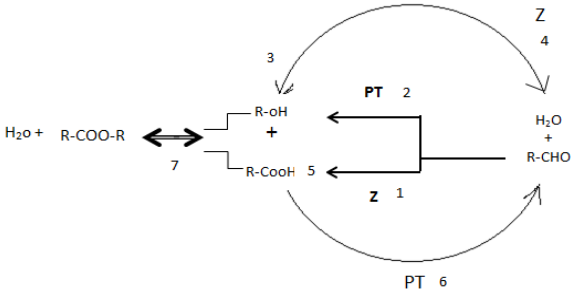
[22] (https://twitter.com/salman_sa93/status/914243988194054145?lang=ar.

Carboxylic acids interact with alcohols in the presence of concentrated sulfuric acid to extract two parts of the water that produce ester and water, and vice versa. The ester interacts with an excess of water to produce alcohol and acid, as in the following formula [23]- :

7 ⟵ $R - C - oH + R - oH \rightleftharpoons R - C - OR + H_2O$

By adding the above equation (7) to the previous figure, it produces the following form- :

Figure (7) shows the result of the interaction of carboxylic acids with alcohols and vice versa



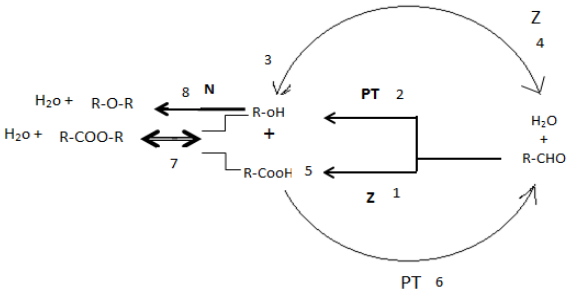
At a low temperature (135 ° C), the concentrated sulfuric acid removes the two parts of water from two alcohols, and does not give rise to the counterpart and the water, as in the equation- :[24]

8 ⟵ $R - oH + R - oH \xrightarrow[135\,C]{H2SO4} R - o - R + H_2o$

By adding the previous equation No. (8) to the previous form, we have reached the final form of the discovered scientific base, thanks to God and his success, as in the following figure- :

[23] Chemestrybook, Sudanibid,p.69
[24] Iibid,P.39

Figure No. (8) shows the discovered scientific base



Key words:
Z: means oxidation.
PT: Means reduction.
N: Snatch.
1,2,3,4, Means the equation number as above.
Alcohol: In this rule, it means primary alcohol only, because secondary alcohol is oxidized to Ketone and triple alcohol are otherwise oxidized

Recommendations:

The researcher recommends the following- :
1 -The scientific base discovered in the academic curriculum of organic chemistry for the second year secondary school students included the scientific section of the Republic of Yemen, the fact that oxygen organic compounds are among the courses on them.
2 -The scientific base discovered in the academic curriculum of organic chemistry for third-graders of secondary education includes the scientific section of the Republic of Sudan, the fact that oxygen organic compounds are among the courses on them.

Suggestions:

The researcher suggests conducting scientific research similar to this research in order to reach other scientific rules similar to this one.

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