

**SYNTHESIS, STRUCTURAL STUDY AND ANTIBACTERIAL ACTIVITY OF Pd(II), Ru(III), Rh(III), Au(III) AND Pt(IV) COMPLEXES OF 4-NITRO-3-{{[4-(4-HYDROXYPHENYL)-2-METHYL-5-OXO-4,5-DIHYDRO-1H-IMIDAZOL-1-YL]IMINO}-1,3-DIHYDRO-2H-INDOL-2-ONE**

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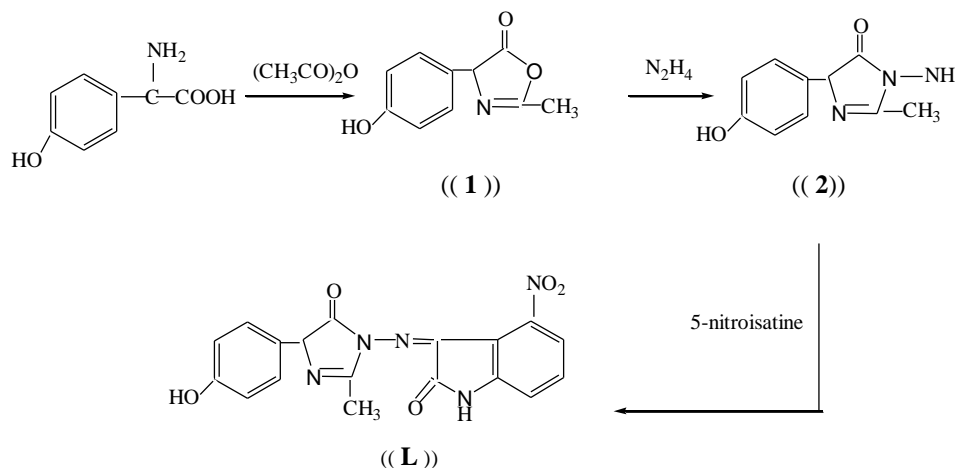
### Abstract

In this work lactone (1) was prepared from the reaction of amino acid with acetic anhydride which upon treatment with hydrazine afforded the lactame (2). The reaction of (2) with 5-nitroisatine obtained a new Schiff's base (L) in good yield. Complexes of Pd(II), Ru(III), Rh(III), Au(III) and Pt(IV) with the new Schiff's base (L) have been prepared. The compounds [1,2] were characterized by FT-IR, UV Spectroscopy, as well as the ligand (L) characterized by the same technique with elemental analysis (C.H.N). The prepared complexes were identified and their structural geometries were suggested by using elemental analysis (C.H.N), FI-IR and UV-Vis Spectroscopy, in addition to magnetic susceptibility and conductivity measurements. Metal to ligand [M:L] ratio was obtained for all complexes in (ethanol) using molar ratio method, which gave comparable results with those obtained for the solid complexes. As well as the apparent stability constant of the complexes have been studied with the time and their color were stable for more than (4) hours, Further more the molar absorptivities have been calculated. The antibacterial activity for the ligand (L) and their metal complexes were studied against three selected microorganisms (*Klesbsiella Pneumoniae*, *Staphylococcus aureus* and *Shigella flexneri*), as well as the minimal inhibitory concentration (MIC) have been studied to determine the low concentration for inhibitor.

### Introduction

Imidazol derivatives represent very important hetero cyclic compounds for their biological and pharmacological activities<sup>(1)</sup>. Effect of hydrazine derivatives on human serum Ch.E. activity was studied and the results showed that this compounds cause inhibition to enzyme activity<sup>(1)</sup>. Schiff's base have also been widely reported to be biologically versatile compounds having antifungal, herbicidal and plant growth regulating properties<sup>(2)</sup>. The present paper

describes the preparation of a new Schiff's base (L) derivative produced from the reaction of the [3-amino-5 (4-hydroxyphenyl)-2-methyl-3, 5-dihydro-4H-imidazol-4-one]<sup>(2)</sup> and (5-nitroisatine) to be used as a ligand, that provide three potential donor sites to form complexes with some heavy metal ions. The ligand (L) and its complexes have been fully characterized and their structures were determined as outlined below, Scheme (1).



**Scheme (1).**

## Experimental

All chemicals were of highest purity and were used as received.

### Physical measurements and analysis :

Melting points were recorded on Gallen Kamp melting point apparatus and were uncorrected. FT-IR spectra were recorded using FT-IR. 8300 Shimadzu in the range of (4000-200)  $\text{cm}^{-1}$ . Samples were measured as CsI disc. Electronic spectra were obtained using UV-1650 PC. Shimadzu Spectrophotometer at room temperature. The measurements were recorded using a concentration of  $10^{-3}$  M of the complex in chloroform as a solvent. Micro analytical data for C.H.N were obtained using EA-034, mth. Conductivity measurements were obtained using Corning conductivity meter 220. These measurements were obtained in (DMF) as a solvent using concentration of  $10^{-3}$  M at  $25^\circ\text{C}$ . Magnetic susceptibility measurements were obtained at  $25^\circ\text{C}$  on the solid state applying Faraday's method using Bruker BM6 instrument.

#### (A) Preparation of Schiff base (L) 4-(4-hydroxyphenyl)-2-methyl-1,3-oxazol-5(4H)-one. ((1))

A mixture of amino acid (5 gm) and acetic anhydride was refluxed for 3 hrs. excess of acetic anhydride was evaporated and the residue was purified by column chromatography silica gel and a mixture of (Ethanol: Water) as eluant.

#### (B) Synthesis of 3-amino-5-(4-hydroxyphenyl)-2-methyl-3,5-dihydro-4H-imidazol-4-one. ((2))

To a solution of compound ((1)) (0.01mole) in dry benzene (10 ml), hydrazine (10 ml) was added. The mixture was refluxed for (7 hrs), the solvent was removed and the solid product was collected and crystallized from methanol.

#### (C) Synthesis of 4-nitro-3-[[4-(4-hydroxyphenyl)-2-methyl-5-oxo-4,5-dihydro-1H-imidazol-1-yl]imino]-1,3-dihydro-2H-indol-2-one. ((L))

To general procedure stirring solution of ((2)) (0.01mole) in absolute ethanol (15 ml), 5-nitroisatine (0.01 mole) was added. The mixture was refluxed for (3hrs) and cooled to room temperature. The product was collected

as oily so it purified by column chromatography silica gel and a mixture of (Ethanol: Water) as eluant.

The compounds (1,2 and L) was characterized using elemental analysis and (FT-IR). The physical properties of the prepared ligand is described in Table (1).

### Preparation of Schiff's base complexes (R<sub>1</sub>-R<sub>5</sub>):

Ethanol solution of each of the following metal ion salts (0.50 mmol) [PdCl<sub>2</sub>(PhCN)<sub>2</sub>, RuCl<sub>3</sub>.xH<sub>2</sub>O, RhCl<sub>3</sub>.xH<sub>2</sub>O, H<sub>2</sub>AuCl<sub>4</sub>.H<sub>2</sub>O and H<sub>2</sub>PtCl<sub>6</sub>.H<sub>2</sub>O] was added to an ethanolic solution of (1.13 mmole) of (L) with stirring. The mixture was heated under reflux for one hour during this time a precipitate was formed. The product was isolated by filtration, washed several times with water and hot ethanol then dried under vacuum. The physical data of the prepared complexes are shown in Table (1).

### Study of Complex Formation in solution :

Complexes of (L) with metal ions were studied in solution using ethanol as a solvents in order to determined [M:(L)] ratio in the complex following Molar ratio method<sup>(3)</sup>. A series of solution were prepared having a constant concentration [ $10^{-3}$ M] of the metal ion and (L). The [M/(L)] ratio was determined from the relation ship between the absorption of the absorbed light and the mole ratio of [M:(L)]. The results of complexes formation in solution were listed in Table (1).

### Stability Constant of Schiff's base Complexes:

The conditional or apparent<sup>(3)</sup> stability constant of the (1:1) or (1:2) [Metal:Ligand] complex were evaluated as fallows:

Tow sets of solutions were prepared, the first set of solutions were formulated to contain stoichiometric amount (1ml) of ( $10^{-3}$ M) ligand to (1 ml) of ( $10^{-3}$ M) of metal ion by placing in to a three series of 10 ml volumetric flasks. The solution of the colored complexes were diluted to the mark with ethanol. The second set were formulated to contain five fold excess (5 ml) of ( $10^{-3}$ M) ligand, by placing in to a three series of (10 ml) volumetric flasks followed by addition of (1 ml) of ( $10^{-3}$ M) of metal ion, the volumes were then completed to the mark with ethanol. The absorbance (As and Am) of the solutions,

were measured at ( $\lambda_{\max}$ ) of maximum absorption. The stability constant (K), and the molar absorptivity ( $\epsilon_{\max}$ ) have been calculated, were listed in Table (4).

### Study of biological activity for Schiff's base and its complex :

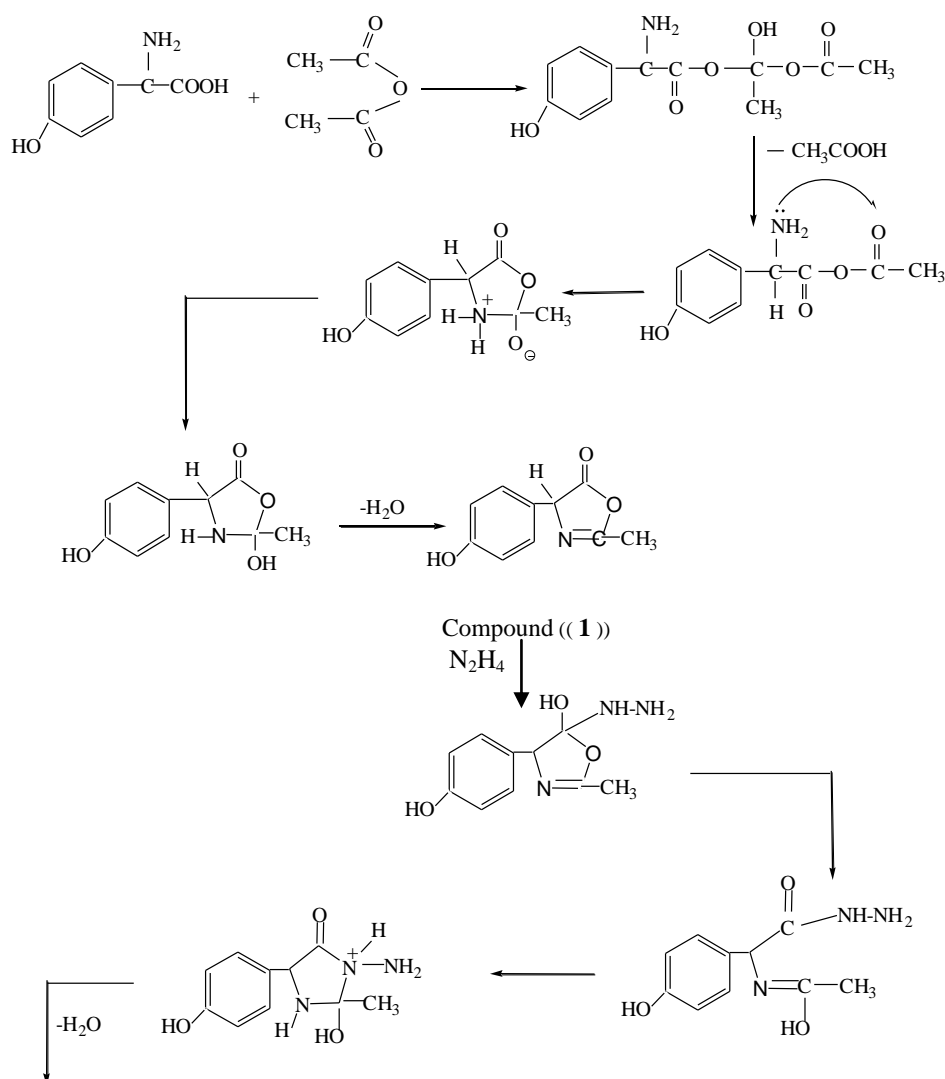
The biological activity of the prepared Schiff's base and their respective complexes were studied against selected types of bacteria which include (*Klebsiella pneumoniae*) and (*Shigella Flexneri*) as (Gram negative) and (*Staphylococcus aureus*) as (Gram positive) were cultivated in Nutrient agar medium.

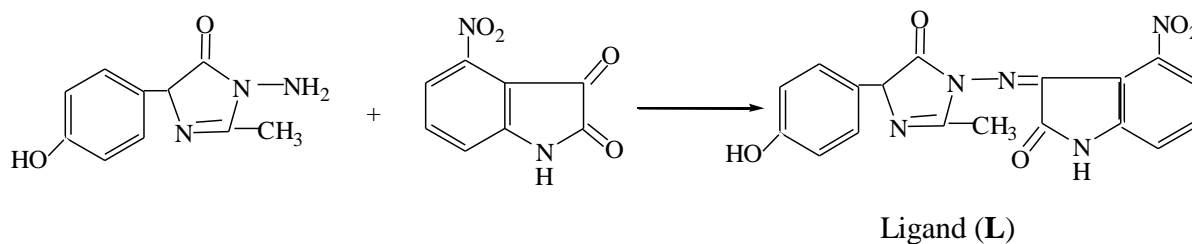
Two *in vitro* techniques were proceeded for studying antibacterial activity against the three strains, (DMSO) was used as a solvent and as a control, for both techniques, the constructions of the compounds in this solvent were  $10^{-3}$ M. The first technique was the Disc sensitivity Test<sup>(4)</sup>, this method involves the exposure of the zone of inhibition of bacterial growth around the disc was observed.

The second technique was to get the sensitivity of each micro-organism toward the new compounds by determining the minimal inhibitory concentration (MIC) which was achieved by using Tube Dilution Method<sup>(4)</sup>. The (MIC) of the compounds for each micro-organism was measured at the lowest concentration of the compound required to inhibit the growth of this micro-organism, these tubes containing different concentrations of the new compounds were incubated at 37°C for 45 hr.

### Results and Discussion

Reaction between amino acid and acetic anhydride afforded the lactone derivative (L) in good yield this compound was formed through the following suggest mechanism Scheme (2).





Compound (2)

Scheme (2).

**(A) Elemental Analysis**

The physical analytical data of (L) and its metal complexes are given in Table (1), in a satisfactory agreement with the calculated

values. The suggested molecular which are formulas also supported by subsequent spectral and molar ratio, as well as magnetic moment

**Table (1)**  
*physical data for (1,2,L) and Schiff base complexes (R<sub>1</sub>-R<sub>5</sub>).*

Comp. No.	Color	Melting point C°	Yield %	%Elemental analyses (found) (calc.)			M:L In (EtOH)	Suggested Formula
				C	H	N		
(1)	Yellow	Oily	80	-	-	-	-	C <sub>10</sub> H <sub>9</sub> NO <sub>3</sub>
(2)	Brown	203-205	63	-	-	-	-	C <sub>10</sub> H <sub>11</sub> N <sub>3</sub> O <sub>2</sub>
(L)	Orange	Oily	83	(55.72)	(3.11)	(17.61)	-	C <sub>18</sub> H <sub>13</sub> N <sub>5</sub> O <sub>5</sub>
[R <sub>1</sub> ]	Brown	210	80	(56.69)	(3.94)	(18.37)	1:2	[Pd(C <sub>18</sub> H <sub>13</sub> N <sub>5</sub> O <sub>5</sub> ) <sub>2</sub> ].Cl <sub>2</sub> .H <sub>2</sub> O
[R <sub>2</sub> ]	Dark Brown	215	72	(45.12)	3.34	(21.06)	1:2	[Ru(C <sub>18</sub> H <sub>13</sub> N <sub>5</sub> O <sub>5</sub> ) <sub>2</sub> ].Cl <sub>3</sub>
[R <sub>3</sub> ]	Deep Orange	204	78	(44.01)	3.47	(13.59)	1:1	[Rh(C <sub>18</sub> H <sub>13</sub> N <sub>5</sub> O <sub>5</sub> ) <sub>2</sub> Cl <sub>3</sub> ].H <sub>2</sub> O
[R <sub>4</sub> ]	Light Brown	208	83	(44.56)	(3.09)	(14.44)	1:1	[Au(C <sub>18</sub> H <sub>13</sub> N <sub>5</sub> O <sub>5</sub> ) <sub>2</sub> Cl <sub>3</sub> ].2EtOH
[R <sub>5</sub> ]	Deep red	217	87	(36.21)	(1.98)	(11.32)	1:1	[Pt(C <sub>18</sub> H <sub>13</sub> N <sub>5</sub> O <sub>5</sub> ) <sub>2</sub> Cl <sub>3</sub> ].Cl.EtOH
				(35.50)	(2.79)	(11.51)		
				(33.72)	(4.01)	(9.44)		
				(34.0)	(3.48)	(9.02)		
				(30.83)	(2.09)	(8.93)		
				(31.41)	(2.75)	(9.16)		

**(B) Infrared Spectroscopic Study**

The structure of compound (1) was confirmed by the presence of (C=O lactone) stretching vibrations at 1750 cm<sup>-1</sup> in addition to the bands at 2860-2990 cm<sup>-1</sup> for the (CH<sub>3</sub>) combined with the disappearance of NH<sub>2</sub> stretching bonds. The reaction of compound (1) with hydrazine hydrate afforded the derivative (2), the appearance of (IR) new absorption bands at 3410- 3360 cm<sup>-1</sup> and at 1700 cm<sup>-1</sup> due to (C=O lactame).

Moreover treatment of NH<sub>2</sub> in lactame with 5-nitroisatine to give Schiff base (L). This reaction was followed by disappearance of absorption bands at 3410-3360 cm<sup>-1</sup> due to (ν<sub>NH2</sub>) and characteristic band at 1640 cm<sup>-1</sup> for azomethine group (ν<sub>C=N</sub>) are utilized to confirm the structure of (L)<sup>(5)</sup>; Table (2). In the all complexes (R<sub>1</sub>-R<sub>5</sub>) the ligand (L) behave as a tridentate coordinating to the metal through the oxygen of carbonyl (isatine and imidazole) and nitrogen of the azomethine

groups, therefore the bands due to ( $\nu_{C=O}$  and  $\nu_{C=N}$ ) were shifted to lower frequencies<sup>(6)</sup>, Table (2). These observations were further indicated by the appearance of ( $\nu_{M-O}$ ,  $\nu_{M-N}$  and  $\nu_{M-Cl}$ ) respectively<sup>(6)</sup>, Table (2). A broad band

was observed around (3450-3508)  $\text{cm}^{-1}$  in the spectra of [R<sub>1</sub>, R<sub>3</sub>-R<sub>5</sub>] complexes, assigned to a  $\nu_{O-H}$  and suggested the presence of water or ethanol molecules in the complexes<sup>(5)</sup>.

**Table (2)**  
**Characteristic stretching vibrational frequencies ( $\text{cm}^{-1}$ ) located in the FT-IR of [L] and their metal complexes.**

Comp	$\nu_{C=O}$ for Isatine and imidazol	$\nu_{C=N}$ for azomethine	$\nu_{M-O}$	$\nu_{M-N}$	$\nu_{M-Cl}$
(L)	1690(S)	1640(S)	-	-	-
[R <sub>1</sub> ]	1681(m)	1632(m)	520(w)	498(w)	-
[R <sub>2</sub> ]	1680(m)	1630(m)	518(w)	494(w)	-
[R <sub>3</sub> ]	1683(m)	1634(m)	520(w)	496(w)	385(vw)
[R <sub>4</sub> ]	1683(m)	1632(m)	515(w)	498(w)	402(vw)
[R <sub>5</sub> ]	1681(m)	1633(m)	518(w)	490(w)	408(vw)

### **(A) Electronic Spectra, Magnetic Moment and Conductance Studies**

The UV spectrum of compound (1) mostly showed two intense maxima bands at 208 nm and 336 nm which belong to  $\pi \rightarrow \pi^*$  and  $n \rightarrow \pi^*$  respectively<sup>(5)</sup>, while these two bands were shifted to high wave length in the case of compound (2) and appeared at 215 nm and 350 nm due to the transitions  $\pi \rightarrow \pi^*$  and  $n \rightarrow \pi^*$ . The UV spectrum of Schiff base (L) showed intense bands at 267 nm and at 353 nm which belong to  $\pi \rightarrow \pi^*$  and  $n \rightarrow \pi^*$  respectively, Table (3).

The electronic spectra of the Schiff base metal complexes were recorded for their solution in chloroform in the range (200-1100) nm, while the molar conductance were measured in dimethylformamide (DMF) as a solvent.

[R<sub>1</sub>]:- The brown palladium complex exhibited a strong charge transfer bands that were extended to the visible region, so the ligand field bands couldn't establish easily.

Never the less absorption band as a weak shoulder at 19622  $\text{cm}^{-1}$  due to  ${}^3A_{2g} \rightarrow {}^3T_{2g}$  transition, which is equal to the value 10Dq for octahedral configuration<sup>(7)</sup>, and other band at 25389  $\text{cm}^{-1}$  due to  ${}^3A_{2g} \rightarrow {}^3T_{1g}$  transition. The position of these bands are in a good agreement with that reported for octahedral geometry<sup>(7,8)</sup>. In addition the measured magnetic moment for this complex was found to be (2.23 B.M), this value refer to high spin ( $d^8$ ) complex, which is the only case in octahedral environment<sup>(9)</sup>. The conductance measurements indicate that the complex was to be ionic, Table (3).

[R<sub>2</sub>]:- The electronic spectrum of this complex in chloroform gave four absorption bands appeared at (16950, 19600, 27631 and 34059  $\text{cm}^{-1}$ , following octahedral field with ( $d^5$ ) configuration<sup>(10-12)</sup>. The effective magnetic moment at room temperature was found to be (1.79B.M) revealing inner-orbital low-spin octahedral stereo chemistry of the ligand

around Ru(III) metal ion<sup>(13)</sup>. Conductivity in (DMF) showed that the complex was to be ionic, Table (3).

[R<sub>3</sub>]:- The solution spectrum of the deep orange complex gave weak band at 18098 cm<sup>-1</sup> and a shoulder at 22888cm<sup>-1</sup>, these two bands correspond to those of octahedral Rh (III) complex<sup>(11,14-16)</sup> and were assigned to <sup>1</sup>A<sub>1g</sub> → <sup>3</sup>T<sub>1g</sub> and <sup>1</sup>A<sub>1g</sub> → <sup>1</sup>T<sub>2g</sub> transitions respectively. The complex was found to be paramagnetic, Table (3). Conductivity measurement in (DMF) showed a non-conductive behavior of the complex, Table (3).

[R<sub>4</sub>]:- The UV-Vis. Spectrum of the prepared gold complex is largely dominated by charge transfer band at 38875 cm<sup>-1</sup>, the other bands at 33560cm<sup>-1</sup>, which is a shoulder on the previous one, and the weak band at 27792 cm<sup>-1</sup>, are assigned as ligand field bands due to the transitions <sup>3</sup>A<sub>2g</sub> → <sup>3</sup>T<sub>2g</sub> and

<sup>3</sup>A<sub>2g</sub> → <sup>3</sup>T<sub>1g</sub>. These assignments when compared to those published for octahedral low spin Au(III) complexes, it show good compatibility<sup>(8,17)</sup>, so octahedral stereochemistry is suggested for the named complex. The observed high magnetic value (1.88 B.M) of the present gold (III) complex (d<sup>8</sup>) configuration agree with octahedral geometry around Au(III), this result indicates a higher orbital contribution around metal ion<sup>(13)</sup>. Conduct metric measurement in (DMF) show the complex to be non-conducting, Table (3).

[R<sub>5</sub>]:- The prepared deep red Pt(IV) complex showed three bands at 19045, 24462 and 28637 cm<sup>-1</sup>, which indicate an octahedral geometry<sup>(18-20)</sup>. Magnetic moment of the solid complex (2.48 BM) showed a high spin Pt(IV) complex<sup>(10,11,13)</sup>. Conductivity in (DMF) showed that the complex was ionic, Table (3), therefore the (C1) atom is not considered to be coordinated with the metal ion and is located out side the coordination zone.

**Table (3)**  
**Electronic Spectra, Conductance (in DMF), and Magnetic moment (B.M) for ( L ) and their metal complexes.**

Comp. No.	Bands cm <sup>-1</sup>	Assignment	10 dq cm <sup>-1</sup>	Molar Cond. μs.cm <sup>-1</sup>	μ <sub>eff</sub> . B.M	Suggested structure
(L)	37453 28329	$\pi \rightarrow \pi^*$ $n \rightarrow \pi^*$	-	-	-	-
[R <sub>1</sub> ]	19622 25389	<sup>3</sup> A <sub>2g</sub> → <sup>3</sup> T <sub>2g</sub> <sup>3</sup> A <sub>2g</sub> → <sup>3</sup> T <sub>1g</sub>	19622	165	2.23	Octahedral
[R <sub>2</sub> ]	16950 19600 27631 34059	<sup>2</sup> T <sub>2g</sub> → <sup>4</sup> T <sub>1g</sub> <sup>2</sup> T <sub>2g</sub> → <sup>4</sup> T <sub>2g</sub> <sup>2</sup> T <sub>2g</sub> → <sup>2</sup> E <sub>g</sub> <sup>2</sup> T <sub>2g</sub> → <sup>2</sup> A <sub>1g</sub>	27631	233	1.79	Octahedral
[R <sub>3</sub> ]	18098 22888	<sup>1</sup> A <sub>1g</sub> → <sup>3</sup> T <sub>1g</sub> <sup>1</sup> A <sub>1g</sub> → <sup>1</sup> T <sub>2g</sub>	22888	18.33	2.04	Octahedral
[R <sub>4</sub> ]	27792 33560 38875	<sup>3</sup> A <sub>2g</sub> → <sup>3</sup> T <sub>2g</sub> <sup>3</sup> A <sub>2g</sub> → <sup>3</sup> T <sub>1g</sub> [L] → Au(C.T)	27792	22.61	1.88	Octahedral
[R <sub>5</sub> ]	19045 24462 28637	<sup>1</sup> A <sub>1g</sub> → <sup>3</sup> T <sub>1g</sub> <sup>1</sup> A <sub>1g</sub> → <sup>3</sup> T <sub>2g</sub> [L] → Pt(C.T)	-	86.90	2.48	Octahedral

**Solution Study :****a) Molar ratio**

The molar ratio method was followed to determine the [M:L] ratio. The results of complex in ethanol as a solvent, suggest that the metal to ligand ratio was (1:1) for [R<sub>3</sub>,R<sub>4</sub> and R<sub>5</sub>], while (1:2) for [R<sub>1</sub> and R<sub>2</sub>], which were comparable to those obtained from solid state study, Table (1).

**b) Stability constant of the schiff base complexes**

The apparent stability constant (K) and molar absorptivity ( $\epsilon_{\max}$ ) for all complexes were calculated, by using the following equations<sup>(3,21)</sup> :-

$$K = \frac{(1 - \alpha)}{\alpha^2 C}$$

where [1:1] of [M:(L)]

$$K = \frac{1 - \alpha}{4\alpha^3 C^2}$$

where [1:2] of [M:(L)]

$$A_m = \epsilon_{\max} bc$$

The degree of dissociation ( $\alpha$ ) of the complex were evaluated by calculating the average of three measurements of the absorption of solution containing a stoichiometric amount of ligand and metal ions(As) and the average of three measurements of the absorption of solution containing the same amount of metal and five fold excess of ligand (Am) where (As and Am) of the solution were measured at  $\lambda_{\max}$  of maximum absorption, Table (4).

The results in table (4), indicate that mole ratio of (1:2) for [R<sub>1</sub>and R<sub>2</sub>] complexes yielded rather high stability constants in contrast to the other values obtained with (1:1) for [R<sub>3</sub>,R<sub>4</sub> and R<sub>5</sub>] complexes, as well as the molar absorptivity of all complexes is rather high, this probably due to the presence of a bulk aromatic groups and a higher oxidation state of the metal ions. Further more the developed color for all complexes become stable after one hour, up to four hours.

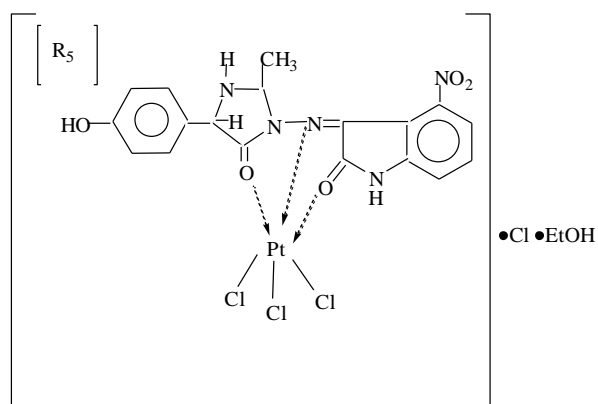
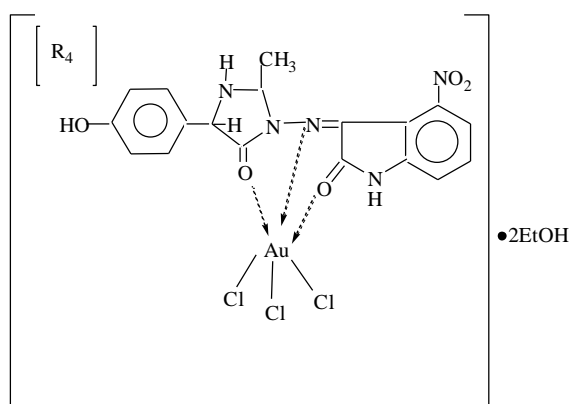
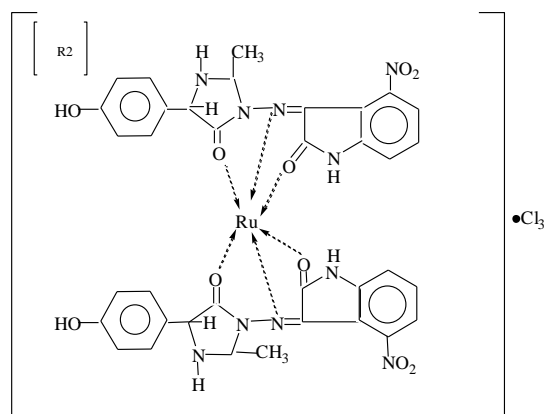
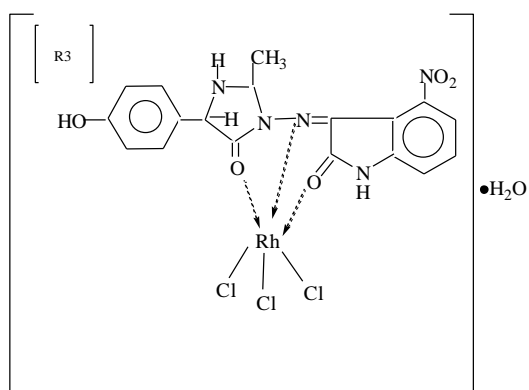
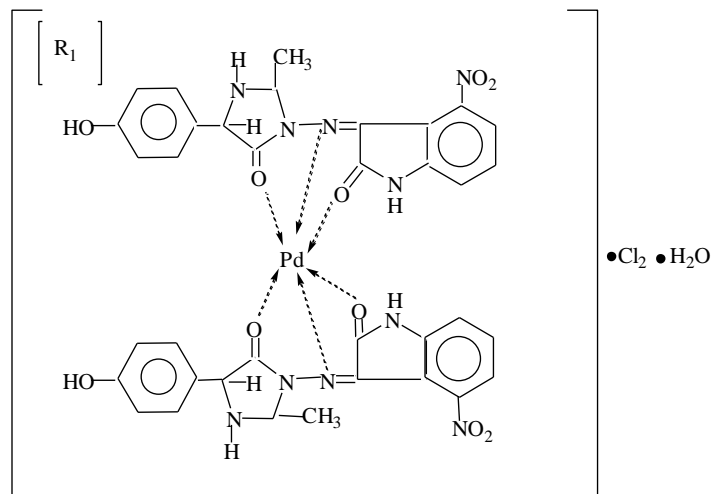
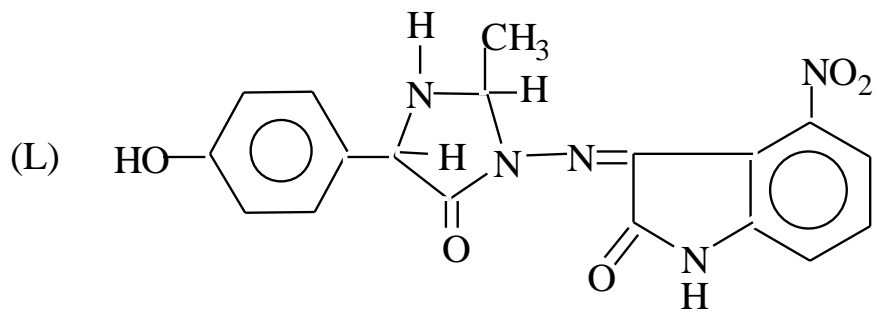
**Table (4)**

**Stability constant and molar absorptivities of Schiff base complexes at room temperature.**

complexes	As	Am	$\alpha$	K L.mol <sup>-1</sup>	$\epsilon_{\max}$ L.mol <sup>-1</sup> .cm <sup>-1</sup>	$\lambda_{\max}$ nm
[R <sub>1</sub> ]	0.402	0.422	0.047	6.11×10 <sup>10</sup>	5842	408
[R <sub>2</sub> ]	0.411	0.457	0.100	8.91×10 <sup>10</sup>	4572	512
[R <sub>3</sub> ]	0.407	0.428	0.049	5.22 ×10 <sup>5</sup>	4318	435
[R <sub>4</sub> ]	0.245	0.286	0.147	3.95×10 <sup>5</sup>	2862	400
[R <sub>5</sub> ]	0.410	0.458	0.104	4.25×10 <sup>5</sup>	3879	510

**Suggested Stereo Chemistry Structure for Schiff base(L) and their metal Complexes [R<sub>1</sub>-R<sub>5</sub>]**

According to the results obtained from elemental and spectral analyses as well as magnetic moment and conductivity measurements, the suggested structure of the above mentioned compounds can be illustrated as follow:





### Biological Studies

The new synthetic compounds were screened (*in vitro*) for their ability to inhibit the growth of representative (*Staphylococcus aureus*, as Gram Positive) and (*Klesbsiella pneumoniae* and *Shigella flexneri*, as Gram negative).

The [R<sub>1</sub>-R<sub>5</sub>] complexes were found to be more active than the corresponding ligand (L) against all the three bacteria tested, Table (5),

this was attributed to the synergetic effect between the metal ion and the ligand<sup>(22,23)</sup>, in addition to the differences in the structural varieties<sup>(23)</sup>. Furthermore the results of the (MIC) study for the (L) and their metal complexes [R<sub>1</sub>-R<sub>5</sub>] are shown in Table (6), these results indicate that some of the new compounds exhibited antibacterial activity against the studied bacteria at lower concentration, while they don't show such activity at higher concentration.

**Table (5)**  
*Antibacterial and antifungal activities for Schiff base and their metal complexes (10<sup>-3</sup> mgm.ml<sup>-1</sup>).*

Comp.	<i>Klesbsiella Pneumoniae</i>	<i>Staphylococcus aureus</i>	<i>Shigella flexneri</i>
Control (DMSO)	-	-	-
(L)	-	8	-
[R <sub>1</sub> ]	10	-	15
[R <sub>2</sub> ]	8	15	8
[R <sub>3</sub> ]	6	15	6
[R <sub>4</sub> ]	25	8	15
[R <sub>5</sub> ]	10	15	10

Where:- 6-8 (+), 8-10 (++) , >10 (+++).

**Table (6)**  
*Minimal inhibitory concentration (MIC) for Schiff base and their metal complexes (μgm.ml<sup>-1</sup>).*

Comp.	<i>Klesbsiella Pneumoniae</i>					<i>Staphylococcus aureus</i>					<i>Shigella flexneri</i>				
	0.05	0.1	0.2	0.5	1	0.05	0.1	0.2	0.5	1	0.05	0.1	0.2	0.5	1
(L)	+	+	MIC	-	-	+	+	+	MIC	-	+	+	+	MIC	-
[R <sub>1</sub> ]	+	MIC	-	-	-	+	+	+	MIC	-	MIC	-	-	-	-
[R <sub>2</sub> ]	+	+	+	MIC	-	MIC	-	-	-	-	+	MIC	-	-	-
[R <sub>3</sub> ]	+	+	MIC	-	-	MIC	-	-	-	-	+	+	+	MIC	-
[R <sub>4</sub> ]	MIC	-	-	-	-	+	+	MIC	-	-	+	MIC	-	-	-
[R <sub>5</sub> ]	+	+	+	MIC	-	+	MIC	-	-	-	+	+	MIC	-	-

Where :- (+) : Growth , (MIC) : 99% , (-) : No growth

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## الخلاصة

تم في هذا البحث تحضير مركب اللاكتون (1) من تفاعل الحامض الاميني مع انهدريد الخليك و الذي عند تعامله مع الهيدرازين يتكون اللاكتام (2) ومن تكاثف كل من (2) مع 5- نايترو اسياتين تم الحصول على قاعدة شف الجديدة (L). بعد ذلك تم تحضير معقدات الايونات الفلزية لكل من البلاديوم (II) و الروثينيوم (III) و الروديوم (III) و الذهب (III) و البلاتين (IV) مع قاعدة شف الجديدة (L). جرى تشخيص المركبات (1 و 2) باستخدام اطياف الاشعة تحت الحمراء و الفوق البنفسجية كذلك شخص الليكاند (L) بنفس التقنيات السابقة بالاضافة الى التحليل الدقيق للعناصر (C.H.N). شخصت المعقدات المحضرة وتم اقتراح الشكل الهندسي لها عن طريق دراستها باستخدام تقنية التحليل الدقيق للعناصر (C.H.N) و اطياف الاشعة تحت الحمراء (FT-IR) والاشعة فوق البنفسجية و المرئية (UV-Vis) اضافة لقياسات الحساسية المغناطيسية و التوصيلية الكهربائية. تم كذلك دراسة طبيعة المعقدات المتكونة في محلول الايثانول باتباع طريقة النسبة المولية ، وقد اعطت هذه الدراسة نتائجاً متطابقة مع التي تم الحصول عليها في الحالة الصلبة. كما درست ثوابت الاستقرار للمعقدات المتكونة مع الزمن وكانت مدة ثبات اللون اكثر من (4) ساعات، كما تم حساب قيمة الممتصية المولارية للمعقدات. تم تعيين الفعالية المضادة للبكتريا لقاعدة شف (L) و معقداته مع ثلاث انواع من البكتريا (*Klesbsiella Pneumoniae*, *Staphylococcus aurous and Shigella flexneri*) لهذا الغرض ، ودراسة اقل تركيز يحدث عنده التنشيط (MIC) .