

## **DECLARATION**

I declare that the thesis, entitled '**Investigation of Multiple Equilibria Involving Transition / Inner-Transition Metal Ions**', is my own work conducted under the supervision of **Dr. Renu Ahuja (Nair)**, Assistant Professor, V.R. Govt. Girls P.G. College, Morar, Gwalior and **Dr. K. Dwivedi**, Professor, **School of Post Graduate Studies and Research in Chemistry, Jiwaji University, Gwalior (M.P.)**, approved by Research Degree Committee . I have put in more than 200 days of attendance with the supervisor/co –supervisor at the center.

I further declare that to the best of my knowledge, the thesis does not contain part of any work which has been submitted for the award of any degree either in this University or in any other University/Deemed University or examining body in any country.

Signature of Candidate  
(Jyotsna Gupta)

Signature of Supervisor  
Dr. Renu Ahuja (Nair)  
Asstt. Professor  
Deptt. Of Chemistry  
V.R.Govt. Girls PG College  
Morar, Gwalior

Signature of Co-supervisor  
Dr. K. Dwivedi  
Professor(Retd.)  
SOS in Chemistry  
Jiwaji University  
Gwalior

Forwarded

Signature of Head of the Department  
Dr. S.K. Srivastava  
Professor and Head  
SOS in Chemistry, Jiwaji University, Gwalior

## **CERTIFICATE**

This is to certify that the work entitled '**Investigation of Multiple Equilibria Involving Transition / Inner-Transition Metal Ions**', is a piece of research work done by **Jyotsna Gupta** under our guidance and supervision for the degree of Doctor of Philosophy in Chemistry of **Jiwaji University, Gwalior (M.P.) India**. It is further certified that the candidate has put in an attendance of more than 200 days with us.

To the best of our knowledge and belief the thesis:

- i. embodies the work of the candidate herself,
- ii. has duly been completed,
- iii. fulfills the requirements of ordinance relating to the Ph.D. degree of the university, and
- iv. is upto the standard both in respect of contents and language for being referred to the examiner.

Signature of Supervisor  
Dr. Renu Ahuja (Nair)  
Asstt. Professor  
Deptt. Of Chemistry  
V.R.Govt. Girls PG College  
Morar, Gwalior

Signature of Co-supervisor  
Dr. K. Dwivedi  
Professor(Retd.)  
SOS in Chemistry  
Jiwaji University  
Gwalior

Forwarded

Signature of Head of the Department  
Dr. S.K. Srivastava  
Professor and Head  
SOS in Chemistry, Jiwaji University, Gwalior

## LIST OF ABBREVIATIONS AND SYMBOLS

[A]	Free ligand concentration of $H_nA$
[B]	Free ligand concentration of $H_mB$
[M]	Free metal ion concentration
[H]	Hydrogen ion concentration
$H_nA$	Ligand 'A' associated with 'n' number of protons
$H_mB$	Ligand 'B' associated with 'm' number of protons
$C_A$	Total ligand 'A' concentration
$C_B$	Total ligand 'B' concentration
$C_M$	Total metal concentration
$\Delta G^\circ$	Standard free energy change
$\Delta H^\circ$	Standard enthalpy change
$\Delta S^\circ$	Standard entropy change
K	Conditional formation constant
$K_{a1}, K_{a2}, \dots, K_{an}$	First, second,.....n <sup>th</sup> dissociation constants of ligand 'A'
$K_{b1}, K_{b2}, \dots, K_{bm}$	First, second,.....m <sup>th</sup> dissociation constants of ligand 'B'
$K^{\mu \rightarrow 0}$	K extrapolated to zero ionic strength (Thermodynamic formation constant)
$a$	Moles of alkali added per mole of metal/ligand
$\mu$	Ionic strength
$\beta$	Overall formation constant

R	Universal gas constant
T	Absolute temperature
SCOGS	Stability constants of generalized species
Cd(II)	Cadmium (II)
Gd(III)	Gadolinium(III)
UO <sub>2</sub> (II)	Uranyl(II)
VO(II)	Vanadyl(II)
APCAs	Aminopolycarboxylic acids
MAL/mal	Malonic acid
NTA/nta	Nitrilotriacetic acid
IMDA/imda	Iminodiacetic acid
TYR/tyr	Tyrosine
DOPA/dopa	3,4-dihydroxyphenylalanine
DOPM/dopm	Dopamine