UNIVERSITY COLLEGE OF THE FRASER VALLEY

COURSE INFORMATION

DISCIPLINE/DEPARTMENT: Chemistry **IMPLEMENTATION DATE**: May 1994

Revised:

Chemistry 321	Intermediate Inorganic Chemistry	4
SUBJECT/NUMBER OF COURSE CREDITS	**DESCRIPTIVE TITLE**	**UCFV**

CALENDAR DESCRIPTION: This course concentrates on the coordination chemistry of the transition metals. Topics covered include isomerism, symmetry, group theory, molecular orbital theory, uv-visible spectroscopy, and the kinetics and mechanisms of ligand substitution reactions. If time permits, organometallic chemistry and bio-inorganic chemistry will als be introduced.

RATIONALE:

COURSE PREREQUISITES: CHEM 221

COURSE COREQUISITES: None

HOURS PER TERM FOR EACH STUDENT	**Lecture**	**42**	**hrs**	**Student Directed Learning**	**hrs**
	Laboratory	**32**	**hrs**		
	Seminar		**hrs**	**Other - specify:**	
	Field Experience		**hrs**	24 hrs of extra time will be used for tutorials and exams.	**hrs**
				TOTAL 98	**HRS**

MAXIMUM ENROLMENT: 24

Is transfer credit requested? **9** **Yes** **:** **No**

AUTHORIZATION SIGNATURES:

Course Designer(s): Dr. N.S. Dance **Chairperson**: T. Cooper
Curriculum Committee

Department Head: A. Last **Dean**: W. Welsh

PAC: Approval in Principle _____ **(Date)**

PAC: Final Approval: November 27, 1996 **(Date)**

CHEM 321
NAME & NUMBER OF COURSE

SYNONYMOUS COURSES:

(a) replaces _____
(course #)

(b) cannot take _____ for further credit
(course #)

SUPPLIES/MATERIALS:

TEXTBOOKS, REFERENCES, MATERIALS (List reading resources elsewhere)

"Inorganic Chemistry," G.L. Miessler and D.A. Tarr, 1991 Ed., Prentice-Hall Publishers, ISBN 01-346-56598.
UCFV Laboratory Manual for Chemistry 321.

OBJECTIVES:

The course is designed to enable students to:

1. Relate theories of bonding and structure to the properties of inorganic materials.

2. Perform laboratory work safely and with care and precision.

3. Interpret laboratory results in terms of theoretical material covered in the course, and to understand the relationship between experimental and theoretical science.

METHODS:

Presentation of the course will be by inter-related theory classes ("lectures"), discussion periods ("seminars") and laboratory sessions. Audio-visual aids will be used where appropriate, and students will be given instruction in the use of various instrumental techniques, and in the use of an academic library.

STUDENT EVALUATION PROCEDURE:

Evaluation will be based on the following system:

First In-Term Test	20%
Second In-Term Test	20%
Laboratory (reports and technique)	25%
Final Examination	35%

CHEM 321
NAME & NUMBER OF COURSE

COURSE CONTENT:

	Lecture Time
Chapters are those covered in Miessier and Tarr.	
1. Introduction. Chapter 10.	
Coordination numbers , geometry, isomerism and types of ligands found in coordination compounds. Nomenclature.	2 hrs
2. Symmetry. Chapter 4.	
Symmetry operations and Group Theory.	4 hrs
3. The Metal-Ligand Bond. Chapters 3, 8 and 9.	
Valence Bond theory, Crystal Field theory and Molecular Orbital Theory. Correlation diagrams and group orbitals. Application of group theory to molecular orbitals. Octahedral, tetrahedral square-planar geometries. Magnetic moments, visible spectra, the spectrochemical series, Jahn-Teller distortion. Application of the angular overlap model for sigma and pi interactions.	15 hours
4. Complex Stability. Chapter 3.	
Stability constants. The effect of Crystal Field Stabilisation Energy and choice of ligand on the thermodynamic stability of complexes.	3 hrs
5. Kinetics. Chapter 11.	
Inert and labile compounds, dissociative. interchange and associative mechanisms. Kinetic chelate effect. The Trans effect. Inner and outer-sphere redox reactions.	6 hrs
6. Organo-transitionmetal Chemistry. Chapter 12.	
Nomenclature, the 16-18 electron rule and electron counting. Application of 18 electron rule to various geometries. Bonding of carbonyl, alkyl, alkene, alkyne, allyl and arene ligands.	8 hrs
7. Bioinorganic Chemistry. Chapter 15	
Structures, electron configurations and properties of iron porphyrin and related compounds.	3 hrs
8. Recent Advances in Inorganic Chemistry.	
Reprint material will be used to illustrate recent advances in the area.	3 hrs

Chemistry 321
NAME & NUMBER OF COURSE

LABORATORY EXPERIMENTS.

Experiments are taken from:
Microscale Inorganic Chemistry - Z Szatran. R Pike and M Singh,
and from the 1992 UCFV Chem 221 lab manual

8 or 9 labs will be chosen from the following list:

Experiment 1. Preparation of Geometric Isomers of Potassium Diaquodioxalatochromium (III)

Experiment 2. Determination of the formula of the Cuprammonium ion

Experiment 3. Spectrophotometric Determination of the formula of Ni ethylenediamine complexes.

Experiment 4. Determination of Crystal Field Splitting in Cr (III) Complexes.

Experiment 5. Determination of Magnetic Moments for Octrahedral complexes.

Experiment 6. Preparation and Study of $[Co(NH_3)_4CO_3]C1$ and $[Co(NH_3)_5C1]Cl_2$

Experiment 7. Kinetics of the Hydrolysis of $[Co(NH_3)_5Cl]Cl_2$

Experiment 8. Kinetics of the Reaction of Cr (III) with EDTA.

Experiment 9. Preparation of Linkage Isomers of $[Co(NH_3)_5NO_2]Cl_2$

Experiment 10. Preparation of a Low Oxidation State Complex Tetrakis(triphenylphosphine)platinum(O).