

CHM 238Y
Introduction to Inorganic Chemistry
2017–2018

Brief Description:

This course consists of two portions: (1) introductory inorganic chemistry and (2) solid state materials. The inorganic portion of this course introduces the fundamental principles of inorganic chemistry. Acid base chemistry and redox chemistry are discussed with examples from the main group and transition metals. This is followed by a discussion of the important concepts in the chemistry of the transition elements including the formation of coordination complexes, electron counting and crystal field theory. After a brief review of the pertinent aspects of atomic structure, the structure and bonding in inorganic substances are examined. The localized (valence bond) and delocalized (molecular orbital) models are used to understand the bonding in covalent molecules of the main group elements. The solid state material portion of this course focuses on solid state structures, bonding, chemical and physical properties, and electronic architectures of metallic, semiconducting and insulating materials.

Lecturers:

D.F. McIntosh *	LM 223	416-946-3743	dmcintos@chem.utoronto.ca
D. Song	DB 343	416-978-7014	dsong@chem.utoronto.ca
G.A. Ozin	LM 326	416-978-2082	gozin@chem.utoronto.ca

* Course spokesperson

Lectures:	Mondays	3:00 – 4:00 pm	LM 158
	Wednesdays	3:00 – 4:00 pm	LM 158

Textbooks:

Inorganic Chemistry, 4th Edition, C.E. Housecroft and A.G. Sharpe, Pearson Educational, Harlow (2012).

Solid State Chemistry: An Introduction, 4th Edition, Lesley Smart and Elaine Moore, CRC Press, Boca Raton, Florida (2012).

Useful Reference Texts:

Inorganic Chemistry; Principles of Structure and Reactivity, 4th Edition, James E. Hugheey, Ellen A. Keiter and Richard L. Keiter, Harper Collins College Publishers, New York (1993).

Inorganic Chemistry, 6th Edition, Duward Shriver, Mark Weller, Tina Overton, Jonathan Rourke and Fraser Armstrong, W.H. Freeman and Company, New York (2014).

Advanced Inorganic Chemistry, 6th Edition, F. Albert Cotton, Geoffrey Wilkinson, Carlos A. Murillo and Manfred Bochmann, John Wiley and Sons, New York (1999).

Reactions and Characterization of Solids, Sandra E. Dann, Royal Society of Chemistry (2000).

Term Tests:

1st Term Test	Monday, November 13, 2017 Room 300	3:00 – 4:00 pm
2nd Term Test	Wednesday, February 07, 2018 Room 300	3:00 – 4:00 pm
3rd Term Test	Wednesday, March 28, 2018 Room 300	3:00 – 4:00 pm
Location:	The Examination Facility, 255 McCaul Street	

Marking Scheme

1st Term Test	11.25%
2nd Term Test	11.25%
3rd Term Test	7.50%
Final Exam	30.00%
Laboratory	40.00%

CHM 238 Laboratory 2017-2018

Laboratory Instructor:

D.F. McIntosh

LM 223

dmcintos@chem.utoronto.ca

Laboratory Technician:

Ms. Kuihua Cai

LM 227

kcai@chem.utoronto.ca

Experiments & Marks

Before Christmas:

Expt. 10, 2, 11	13.01% + 13.70% + 13.70%	40.41 %
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After Christmas:

Expt. 12, 5, 3	15.75% + 15.07% + 15.07%	45.89 %
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Check-Out	13.70%	<u>13.70 %</u>
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Total:		100.00 %
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For the First CHM 238Y Laboratory Period

- Go to the CHM 238 web site (click on *Course Notes* on the Department of Chemistry web site).
- Read the *CHM 238 Survival Guide*.
- Click on *Policy on Plagiarism* and read page 1 carefully.
- Print page 2 (*Policy Regarding Laboratory Academic Discipline*) and page 3 (*Academic Honesty Pledge*).
- Sign and bring page 2 to the first laboratory period.
- Sign and attach page 3 to each laboratory report you submit.
(Note: no report will be accepted unless page 3 has been attached to it !!)
- Bring your laboratory coat, eye protection and gloves to the 1st lab period.
- Bring your laboratory manual and notebook to 1st period.

Laboratory – Week 1

First laboratory period for the Fall (F) and Spring (S) terms:

Groups T11/T12

P0201

Tuesday

Sept. 12, 2017 (F)

Jan. 09, 2018 (S)

9:00 am – 1:00 pm

LM 211

Groups W11/W12

P0301

Wednesday

Sept. 13, 2017 (F)

Jan. 10, 2018 (S)

9:00 am – 1:00 pm

LM 211

**Laboratories run biweekly (i.e. alternating weeks)
throughout the Fall and Spring terms.**

Laboratory – Week 2

First laboratory period for the Fall (F) and Spring (S) terms:

Groups T21/T22

P0202

Tuesday

Sept. 19, 2017 (F)

Jan. 16, 2018 (S)

9:00 am – 1:00 pm

LM 211

Groups W21/W22

P0302

Wednesday

Sept. 20, 2017 (F)

Jan. 17, 2018 (S)

9:00 am – 1:00 pm

LM 211

**Laboratories run biweekly (i.e. alternating weeks)
throughout the Fall and Spring terms.**

CHM 238Y – Inorganic Laboratory Schedule (2017-2018)

Sections P0201 (Tuesday) and P0301 (Wednesday)

Demonstrator Groups: 211, 212 (Tuesday) 311, 312 (Wednesday)

Period 1 Sept. 12, 13	(1) Lab orientation and check locker equipment (2) Library presentation – P. Meindl (10:00-11:00 am – LM 108) (3) Prepare desiccator for use in next period
Period 2 Sept. 26, 27	(1) Expt. 10 – Preparation of $\text{Co}(\text{CH}_3\text{COCHCOCH}_3)_3$ (2) Submit Expt. 10 – Prelab exercises (by 9:00 am)
Period 3 Oct. 10, 11	(1) Expt. 2 – Preparation and reactions of CsICl_2 (2) Expt. 10 – Infrared spectrum of $\text{Co}(\text{CH}_3\text{COCHCOCH}_3)_3$
Period 4 Oct. 24, 25	(1) Expt. 3 – Period 1 – Magnetic Properties of Transition Metal Complexes Preparation of $[\text{Ni}(\text{NH}_3)_6]\text{SO}_4$ and $\text{NiCl}_2(\text{PPh}_3)_2$ (2) Expt. 2 – Complete reactions of CsICl_2 (3) Submit Expt. 10 – Formal Report to your demonstrator (by 1:00 pm)
Nov. 06 – 19	Reading Week
Period 5 Nov. 14, 15	(1) Expt. 11 – Preparation of two luminescent complexes: $\text{Al}(\text{8-hydroxyquinolinato})_3$ (Partner A) and $\text{Eu}(\text{thenoyltrifluoroacetato})_3(1,10\text{-phenanthroline})$ (Partner B) (2) Submit Expt. 2 – Formal report to your demonstrator (by 1:00 pm)
Nov. 28, 29	(1) Submit Expt. 11 – Formal report to your demonstrator (by 1:00 pm)

CHM 238Y – Inorganic Laboratory Schedule (2017-2018)

Sections P0201 (Tuesday) and P0301 (Wednesday)

Demonstrator Groups: 211, 212 (Tuesday) 311, 312 (Wednesday)

Period 6 Jan. 09, 10	(1) Expt. 12 – Preparation and Thermochromic Properties of Copper(II)- N,N-Diethylethylenediamine Complexes
Period 7 Jan. 23, 24	(1) Expt. 5 – Period 1 – Nitro- and Nitrito-pentamminecobalt(III) Chloride Preparation of $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ (2) Submit Expt. 12 - Formal report to your demonstrator (by 1:00 pm)
Period 8 Feb. 06, 07	(1) Expt. 5 – Period 2 – Nitro- and Nitrito-pentamminecobalt(III) Chloride Preparation of $[\text{Co}(\text{NH}_3)_5(\text{ONO})]\text{Cl}_2$ and $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$ (2) Expt. 5 – Infrared spectrum of $[\text{Co}(\text{NH}_3)_5(\text{ONO})]\text{Cl}_2$
Feb. 19 – 23	Reading Week
Period 9 Feb. 27, 28	(1) Expt. 3 – Period 2 – Magnetic Properties of Transition Metal Complexes Preparation of $\text{Ni}(\text{SCN})_2(\text{PPh}_3)_2$ (2) Expt. 5 – Period 3 – Nitro- and Nitrito-pentamminecobalt(III) Chloride Infrared spectrum of $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$
Period 10 Mar. 13, 14	(1) Expt. 3 – Period 3 – Magnetic Properties of Transition Metal Complexes Perform magnetic measurements on the three Nickel complexes (2) Clean-up and check-out locker equipment (3) Submit Expt. 5 – Formal report to your demonstrator (by 1:00 pm)
Period 11 Mar. 27, 28	(1) Submit Expt. 3 – Formal report to your demonstrator (by 1:00 pm)

CHM 238Y – Inorganic Laboratory Schedule (2017-2018)

Sections P0202 (Tuesday) and P0302 (Wednesday)

Demonstrator Groups: 221, 222 (Tuesday) 321, 322 (Wednesday)

Period 1 Sept. 19, 20	(1) Lab orientation and check locker equipment (2) Library presentation – P. Meindl (10:00-11:00 am – LM 108) (3) Prepare desiccator for use in next period
Period 2 Oct. 03, 04	(1) Expt. 10 – Preparation of $\text{Co}(\text{CH}_3\text{COCHCOCH}_3)_3$ (2) Submit Expt. 10 – Prelab exercises (by 9:00 am)
Period 3 Oct. 17, 18	(1) Expt. 2 – Preparation and reactions of CsICl_2 (2) Expt. 10 – Infrared spectrum of $\text{Co}(\text{CH}_3\text{COCHCOCH}_3)_3$
Period 4 Oct. 31, Nov. 01	(1) Expt. 3 – Period 1 – Magnetic Properties of Transition Metal Complexes Preparation of $[\text{Ni}(\text{NH}_3)_6]\text{SO}_4$ and $\text{NiCl}_2(\text{PPh}_3)_2$ (2) Expt. 2 – Complete reactions of CsICl_2 (3) Submit Expt. 10 – Formal Report to your demonstrator (by 1:00 pm)
Nov. 06 – 10	Reading Week
Period 5 Nov. 21, 22	(1) Expt. 11 – Preparation of two luminescent complexes: $\text{Al}(\text{8-hydroxyquinolinato})_3$ (Partner A) and $\text{Eu}(\text{thenoyltrifluoroacetato})_3(1,10\text{-phenanthroline})$ (Partner B) (2) Submit Expt. 2 – Formal report to your demonstrator (by 1:00 pm)
Dec. 05, 06	(1) Submit Expt. 11 – Formal report to your demonstrator (by 1:00 pm)

CHM 238Y – Inorganic Laboratory Schedule (2017-2018)

Sections P0202 (Tuesday) and P0302 (Wednesday)

Demonstrator Groups: 221, 222 (Tuesday) 321, 322 (Wednesday)

Period 6 Jan. 16, 17	(1) Expt. 12 – Preparation and Thermo-chromic Properties of Copper(II)-N,N-Diethylethylenediamine Complexes
Period 7 Jan. 30, 31	(1) Expt. 5 – Period 1 – Nitro- and Nitrito-pentamminecobalt(III) Chloride Preparation of $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ (2) Submit Expt. 12 - Formal report to your demonstrator (by 1:00 pm)
Period 8 Feb. 13, 14	(1) Expt. 5 – Period 2 – Nitro- and Nitrito-pentamminecobalt(III) Chloride Preparation of $[\text{Co}(\text{NH}_3)_5(\text{ONO})]\text{Cl}_2$ and $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$ (2) Expt. 5 – Infrared spectrum of $[\text{Co}(\text{NH}_3)_5(\text{ONO})]\text{Cl}_2$
Feb. 19 – 23	Reading Week
Period 9 Mar. 06, 07	(1) Expt. 3 – Period 2 – Magnetic Properties of Transition Metal Complexes Preparation of $\text{Ni}(\text{SCN})_2(\text{PPh}_3)_2$ (2) Expt. 5 – Period 3 – Nitro- and Nitrito-pentamminecobalt(III) Chloride Infrared spectrum of $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$
Period 10 Mar. 20, 21	(1) Expt. 3 – Period 3 – Magnetic Properties of Transition Metal Complexes Perform magnetic measurements on the three Nickel complexes (2) Clean-up and check-out locker equipment (3) Submit Expt. 5 – Formal report to your demonstrator (by 1:00 pm)
Period 11 Apr. 03, 04	(1) Submit Expt. 3 – Formal Report to your demonstrator (by 1:00 pm)

CHM 238 Tutorial Schedule 2017-18

Tutorial Number	Group 1 (TUT0101) Thursday (1:00-2:00)	Group 2 (TUT0201) Friday (2:00-3:00)
	UC144 (Fall Term) WI 523 (Winter Term)	BF215 (Fall Term) BF215 (Winter Term)
1	Sept. 21	Sept. 22
2	Oct. 05	Oct. 06
3	Oct. 19	Oct. 20
4	Nov. 02	Nov. 03
5	Nov. 23	Nov. 24
6	Jan. 18	Jan. 19
7	Feb. 01	Feb. 02
8	Feb. 15	Feb. 16
9	Mar. 08	Mar. 09
10	Mar. 22	Mar. 23

UC = University College
15 King's College Circle

WI = Wilson Hall (New College)
40 Willcocks St.

BF = Bancroft Building (Earth Sciences)
4 Bancroft Ave.