

CHEM 241 – 3 CREDITS – INORGANIC CHEMISTRY I: INTRODUCTION TO PERIODICITY AND VALENCE THEORY

1. GENERAL INFORMATION

Course Format:	Lecture 01	--W-F	08:45-10:00	CC-320
	Lab 51	M-----	18:30-22:30	Wet: SP-210, Dry: SP \$185.07
	Lab 56	<i>Only for students granted a lab exemption from both wet & dry labs.</i>		

Professor:

Dr. Xavier Ottenwaelder (dr.x@concordia.ca)
Office hours: Wednesday 12:30-13:30 pm (or send an email)

Lab coordinator:

Jennifer Romero (jennifer.romero@concordia.ca)
Office hours: by appointment (see for issues regarding wet and dry labs)

TAs:

Refer to page 7 for contact information and office hours.

Moodle site:

CHEM 241 01 2224 (slides, videos, Zoom links, dry labs, solutions manual, sample exams, etc.)

2. COURSE DESCRIPTION

The structure of the atom; the periodic table; properties of atoms, covalent bonding treatments including Lewis theory, valence shell electron pair repulsion theory of structure, valence bond and molecular orbital theory. Crystal field theory applied to the structure and properties of transition metal complexes. Bonding theories of metallic materials and semi-conductors. Lectures and laboratory.

Prerequisites: CHEM 205, 206; PHYS 204, 206, 224, 226; MATH 203, 205; or equivalents for *all* of these.

3. OBJECTIVES

You should acquire familiarity with the concepts used to describe the bonding and some properties of a variety of types of compounds. You should be able to understand the ways in which structural and bonding information is presented for known molecules AND you should develop some predictive skills.

4. SCHEDULE (may be subject to change)

Important dates:	Lectures begin:	Wednesday, January 11 th
	Deadline to withdraw with tuition refund (DNE):	Monday, January 23 rd
	Labs begin:	Monday, January 23 rd (check-in & dry lab#1)
	CHEM 101 quiz closes:	Sunday, February 12 th at 23:55
	Midterm exam:	Wednesday, March 8 th during class time
	No class on:	Friday, April 7 th (University closed)
	Spring break (no class, no lab):	from Monday, February 27 th to Sunday, March 05 th
	Lectures end:	Tuesday, April 18 th (make-up class for April 7 th)
	Last day to hand in lab reports:	Monday, April 17 th
	Deadline to withdraw (DISC):	Tuesday, April 18 th
	Exam period:	starts Thursday, April 20 th
	Final exam date(s):	TBA, scheduled by the Exams Office

5. BEHAVIOUR

All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications.

Concordia students are subject to the [Code of Rights and Responsibilities](#) which applies both when students are physically and virtually engaged in any University activity, including classes, seminars, meetings, etc. Students engaged in University activities must respect this Code when engaging with any members of the Concordia community, including faculty, staff, and students, whether such interactions are verbal or in writing, face to face or online/virtual. Failing to comply with the Code may result in charges and sanctions, as outlined in the Code.

Sexual violence, including sexual harassment and sexual assault, is not tolerated at Concordia. Please see Concordia's policy on sexual violence for more information about awareness and prevention, support for survivors/ victims, responding

to disclosures and procedures for reports and complaints. You can also contact the Sexual Assault Resource Centre for information and support. More information and support are available at the Sexual Assault Resource Centre: <https://www.concordia.ca/conduct/sexual-assault.html>, by email sarc@concordia.ca or phone 514 848-2424 x 5972.

6. INTELLECTUAL PROPERTY

Content belonging to instructors shared in online courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member. It may not be distributed, published or broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without express permission of the instructor. Any unauthorized sharing of course content may constitute a breach of the [Academic Code of Conduct](#) and/or the [Code of Rights and Responsibilities](#). As specified in the [Policy on Intellectual Property](#), the University does not claim any ownership of or interest in any student IP. All university members retain copyright over their work.

7. EXTRAORDINARY CIRCUMSTANCES

In the event of extraordinary circumstances and pursuant to the [Academic Regulations](#), the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the changes.

<http://www.concordia.ca/academics/undergraduate/calendar/current.html>

8. COURSE MATERIALS

Readings List	Miessler <i>et al</i> 5 th Ed. Ch.1-3, 5, 7, parts of 6, 9-12 + gen. chem. text readings (p.6 of syllabus).
Required Text	" <i>Inorganic Chemistry</i> ", G. L. Miessler, P. J. Fischer & D. A. Tarr, Pearson, 5 th Ed. (CHEM 341 too) as hard copy or e-book (180-day access; see bookstore & www.coursesmart.com) + any General Chemistry text you already have (e.g., Kotz, Zumdahl, Petrucci, etc.)
Optional	" <i>Student Solutions Manual for Inorganic Chemistry</i> ", G. L. Miessler, P. J. Fischer & D. A. Tarr, Pearson, 5 th Ed. (relevant sections are posted on Moodle)
Lab Manual	" <i>Chem.241 Wet Labs</i> ", Dept. of Chem. & Biochem., Concordia (rev. Fall '22 - not older) on Moodle " <i>Dry Labs</i> ": see the Moodle site
Other Equipment	For labs – mandatory : lab coat, safety glasses.
Other Requirement	a Zoom login with, if possible, the same email address as on your Concordia record

9. GRADING

9.1. Grading. To pass CHEM 241, **you must pass both the course work and the laboratory work**, by obtaining at least 50% on the course work (class participation, quizzes, midterm and final exam) and at least 60% on the laboratory work. A failure in the laboratory part carries an automatic "R" grade, and a good lab mark will not compensate for a failure in the coursework. The final grade will be weighted as follows:

Lab work - (Wet Labs)	10%
Lab work - (Dry Labs)	10%
Graded quizzes	20% (1 review quiz + 4 course-material quizzes, 4% each)
Midterm Exam*	20% (scheduled on Wednesday, March 8 th during class time)
Final Exam*	40% (in April, scheduled by the Exams Office)

*The midterm examination will cover all material taught in the period preceding it. The final examination will cover the entire course.

The **grading scheme** is as follows:

A mark ≥	0%	40	50.00	53.33	56.67	60.00	63.33	66.67	70.00	73.33	76.67	80.00	83.33	86.67
and <	40	50	53.33	56.67	60.00	63.33	66.67	70.00	73.33	76.67	80.00	83.33	86.67	100%
gets an:	R	F	D–	D	D+	C–	C	C+	B–	B	B+	A–	A	A+

NB: if you do not complete "CHEM 101" (section 10.2 below), you will earn an INC notation, and a grade one step lower than you would otherwise deserve (for example "B/INC" instead of "B+").

Important: to pass CHEM 241, you must pass the theory part and the lab part separately.

- Theory pass: quizzes + midterm exam + final exam ≥ 40/80

- Theory fail: quizzes + midterm exam + final exam < 40/80; **“F” grade**, even if you passed the lab
- Lab pass: wet + dry labs $\geq 12/20$, and no more than 1 lab missed, excused or not. If you do not complete a lab for a legitimate reason, it will be excused, but not more than 1 time.
- Lab fail: you will receive an automatic “R” grade for the course, *whatever your theory mark might be*.

For the midterm and final examinations, only non-programmable calculators will be accepted. The Faculties of Arts & Science and of Engineering have selected and recommend two inexpensive models: the Sharp EL-531 and the Casio FX-300MS. Note: the ENCS sticker is NOT required.

In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.

9.2. Laboratory Information (more details on p.7)

The labs in CHEM 241 are mandatory. They will further your experience of the practical aspects of inorganic chemistry and of the concepts studied in class. Laboratory performance is graded on the quality of the experimental work and the report. During the **second week** of term, lab groups will be created for each section. Each section will be divided into two groups which will alternate weekly for the rest of the term, between:

- Wet Labs. These are conventional (small scale) experiments. Your TA/demonstrator will tell you which experiment you will do in which week. A printed lab manual is sold in the University bookstore and can also be downloaded from the Moodle website.

You will not be permitted to enter the laboratory if you are not wearing a lab coat and safety glasses, if you have not submitted the prelab exercises in time, or if you are late.

- Dry Labs. These are computer-based exercises illustrating concepts in the course for which wet labs are not feasible.

More details can be found in the lab instruction pages (p.7) of this syllabus. Remember that experimental chemistry can be dangerous; there is no shame and no penalty in asking any kind of questions. Your experimental skills will be evaluated through your lab reports. Hence, pay extra care for the **scientific significance** and the **scientific presentation** in your reports. A good report goes beyond superficial questions and is based on **critical thinking**. In other words, ask yourself constantly why you are doing this and that during the experiment and relate this to your knowledge.

Incomplete labs and absences: If you do not complete a lab, you must provide to the lab coordinator a written excuse appropriately signed (e.g., doctor or employer) within one week or you will receive a grade of **zero**. **No more than one absence is allowed.**

Lab exemptions: If you have taken CHEM 241 at Concordia, once, and passed both the wet & dry lab components (>12/20) in or after Fall 2018, you should request a lab exemption. Your previous lab mark will be used in calculating your grade this term. If you are not satisfied with your previous lab grades, you must repeat ALL labs instead of requesting an exemption. If you have not yet applied for a lab exemption, download the application form from the department website at <https://www.concordia.ca/content/dam/artsci/chemistry/docs/labexempt.pdf>. **To get a lab exemption, you must (1) submit the lab exemption application by e-mail to chemistry.reception@concordia.ca no later than Friday, January 13th at 4pm AND (2) register in lab section 56 (students in all other lab sections must perform ALL labs). All late lab-exemption requests will be refused.**

9.3. Class Participation

Teaching & learning research has shown that active participation in class significantly improves student engagement and success. I will probe your knowledge and intuition using the **polling option in Zoom** during class time. This entails multiple-choice questions to which you can answer easily in just one click or finger tap on a window that opens automatically in Zoom. Because discussion with peers will be involved as well, some advance preparation is a good idea: the questions are in the Lecture Slides on Moodle.

Zoom information will be posted on Moodle.

As a note, please be aware that using a login information belonging to another student in order to fake their presence in the class when they are actually not present is a severe form of cheating under the Academic Code of Conduct (impersonation). ☹

10. ETHICAL BEHAVIOR

10.1. Rights and Responsibilities of the Student

Read the Moodle site within the first week of classes:

Full explanations of the course policies, activities, and helpful tips are provided there. Please read it before the second week of class – by registering for the course, you are agreeing to follow these rules. The information will remain accessible all term for your reference. If you have questions, please ask the professor and/or lab coordinator.

Be prepared for lectures & labs:

Lectures: Read the lecture materials before class, and then be ready to (i) answer "polling" questions (including calculations) during the lecture and (ii) engage in discussion with small groups of classmates to clarify each other's understanding.

Labs: Read the experiment thoroughly & complete the pre-laboratory exercises (individually), and then be ready to (i) perform the experiment together with a lab partner and (ii) write a lab report based on your data (individually).

Contribute to a positive learning environment:

Disruptive or disrespectful behaviour will not be tolerated in classrooms, Zoom sessions or laboratories. Cell phones, other electronic communication devices, laptop computers and tablets may not be used in these settings, except for answering clicker questions and taking notes. Students engaging in inappropriate behaviour will be asked to leave, without the opportunity to make up the missed work.

10.2. Complete the CHEM 101 seminar & quiz (MANDATORY COURSE REQUIREMENT)

As part of this course, you are **required** to i) attend a Chemistry and Biochemistry Departmental Seminar on the academic conduct code and the appropriate use of information sources and ii) pass the online quiz associated with this seminar (the passing grade for the quiz is 100%). (**Note:** this quiz is graded by the Department of Chemistry and Biochemistry, and you do not have access to it until after you have attended the seminar. Therefore, any other quiz you may have taken on the academic code of conduct does not count toward the CHEM 101 requirement.) The aim of this seminar and quiz is to clarify the academic conduct code in terms of which practices will be considered unacceptable with regards to work submitted for grading in your CHEM course. **You are only exempt from repeating the seminar and the quiz if you have done both in Winter 2018 or more recently,*** otherwise you are required to repeat both this term. This short seminar (<1 hour) will be held at the following times (note that you will not be given credit if you join too late and/or leave too early):

Date (Winter 2023)	Time (EST)	Mode	Registration link
Tuesday, January 24 th	21:00-22:00	Zoom	https://concordia-ca.zoom.us/meeting/register/tZurcemqrj4tHNYUyp-gnOR8uREtmKGlyU9u
Thursday, January 26 th	21:00-22:00	Zoom	https://concordia-ca.zoom.us/meeting/register/tZckf-GhqDkuHNA4TuWQ5yWQqBPGD_Ai27-I

As space for each of the Zoom seminars is limited, please **register early** for your preferred slot (copy the corresponding link above into your browser). You will **receive** a notice from Zoom with the link to the actual seminar. Then do not forget to **attend** that seminar slot on the date above!

We will take attendance at the Zoom seminar.

If you do not complete this course requirement, your final grade for the course may be lowered by one full letter grade with an incomplete (INC) notation until such time as this requirement is completed. Please refer to the undergraduate calendar (section 16.3.5) for details on removal of an incomplete notation.

* You are exempt if you can locate your ID with a 100% score in the PDF file located on the Departmental website (<http://www.concordia.ca/content/dam/artsci/chemistry/docs/Compliance-list.pdf>) and if there is no entry in the "quiz" column for you.

10.3. Plagiarism and Other Forms of Academic Dishonesty

The Academic Code of Conduct can be found in [section 17.10](#) of the academic calendar. Any form of unauthorized collaboration, cheating, copying, or plagiarism found in this course will be reported and the appropriate sanctions applied. The mandatory seminar is a clear and fair opportunity to learn what our faculty regards as academic misconduct. Failure to take part in this learning opportunity and thus ignorance of these regulations is no excuse and will not result in a reduced sanction in any case where academic misconduct is observed.

Plagiarism: the most common offense under the Academic Code of Conduct is plagiarism, which the Code defines as “the presentation of the work of another person as one’s own or without proper acknowledgement.”

This includes material copied word for word from books, journals, Internet sites, professor’s course notes, etc. It refers to material that is paraphrased but closely resembles the original source. It also includes for example the work of a fellow student, an answer on a quiz, data for a lab report, a paper or assignment completed by another student. It might be a paper purchased from any source. Plagiarism does not refer to words alone –it can refer to copying images, graphs, tables and ideas. “Presentation” is not limited to written work. It includes oral presentations, computer assignments and artistic works. Finally, if you translate the work of another person into any other language and do not cite the source, this is also plagiarism.

In Simple Words: Do not copy, paraphrase or translate anything from anywhere without saying where you obtained it.

(Source: The Academic Integrity Website: concordia.ca/students/academic-integrity)

11. CONCORDIA UNIVERSITY SERVICES FOR STUDENTS (partial list)

- Access Centre for Students with Disabilities: <http://www.concordia.ca/students/accessibility.html>
- Counselling & Psychological Services: <http://www.concordia.ca/students/counselling-life-skills>
- Concordia Library Citation & Style Guides: <https://library.concordia.ca/help/citing/>
- Academic Integrity Website: <https://www.concordia.ca/students/academic-integrity.html>
- Student Advocacy Office: <https://www.concordia.ca/offices/advocacy.html>
- Financial Aid & Awards: <http://www.concordia.ca/offices/faao.html>
- Student Success Centre: <http://www.concordia.ca/students/success.html>
- New Student Program: <http://newstudent.concordia.ca/>
- Health Services: <https://www.concordia.ca/students/health.html>

CHEM 241 – TOPICS COVERED IN COURSE (+ TOPICS TO RE-MASTER FIRST ON YOUR OWN)

Subject to change. Readings come from Inorganic Chemistry by Miessler, Fischer and Tarr, 5th Ed. AND from any general chemistry textbook (e.g., Chemistry & Chemical Reactivity by Kotz, Treichel, Townsend & Treichel, 9th Ed.). Sometimes, lectures will go into greater or lesser detail than the textbook - **lectures guide how deeply you should learn the material**. There may be additional reading assignments (e.g., journal articles) announced in class. Any readings may form the basis for clicker questions and/or exam questions. Chapter numbers below are following the Miessler's chapters.

CRITICAL REVIEW (on own): QUIZZED DURING WEEK 1!

Topics from any recent General Chemistry textbook

Atomic Structure (Kotz 9th Ch.6):

Atomic line spectra & the (inaccurate) Bohr model of the atom
Quantum model: wave-particle duality, quantum #s, shapes of orbitals
Electron spin, the Pauli exclusion principle
Do: Kotz Ch.6 #24,60,68,78; OR Miessler Ch.2 #1,3,15,16,46(spd)

Electron Configurations & Chemical Periodicity (Kotz 9th Ch.7):

Atomic subshell energies (orbital-filling order)
Electron configurations of atoms & ions (aufbau principle, Hund's rule)
Atomic properties & periodic trends (size, ionization E, electron affinity)
Do: Kotz Ch.7 #45,46,53,70 OR Miessler Ch.2 #23,26,33,44

Covalent Bonding & Molecular Structure (Kotz 9th Ch.8):

Lewis structures, formal charge, resonance, exceptions to octet rule
Molecular shape (VSEPR) & molecular polarity
Bond order, length & energy
Do: Kotz Ch.8 #34,37,75,21-23,78; OR Miessler Ch.3 #4,5,8-10,13,16

Valence Bond Theory (Kotz 9th Ch.9.1 in part):

Hybridization of atomic orbitals: memorize link to geometry
Do: Kotz Ch.9 #7,29,30,35

The Chemistry of Acids & Bases (Kotz 9th Ch.16.10):

Lewis concept of acids & bases
Do: Kotz Ch.16 #79,80,117; OR Miessler Ch.6 #1,2,20

Nuclear Structure & Isotopes (Kotz 9th Ch.2):

Protons, neutrons, atomic number, mass number
Do: Kotz Ch.2 #18,98

CHEM 241 - INORGANIC CHEMISTRY I

UNDERLINED = SELF-STUDY BEFORE CLASS (NOT "TAUGHT")

Topics from both textbooks: Kotz 9th & Miessler 5th

Chapter 1. Introduction to Inorganic Chemistry

Miessler Ch.1 + Kotz Ch.25 + lecture slides

- 1.1-2. What is Inorganic Chemistry? vs Organic Chemistry
- 1.3-5. Nuclear Chemistry (not part of CHEM 241 but available upon request if you need a refresher)

Chapter 2. Atomic Structure & Periodicity

Miessler Ch.2

- 2.1. Historical Development of Atomic Theory
 - 2.1.1. The Periodic Table
 - 2.1.2. Discovery of Subatomic Particles & the Bohr Atom
- 2.2. The Schrödinger Equation
 - 2.2.1. The Particle in a Box
 - 2.2.2. Quantum Numbers & Atomic Wave Functions
 - 2.2.3. The Aufbau Principle
 - 2.2.4. Shielding
- 2.3. Periodic Properties of Elements: **FOCUS ON CAUSE**
 - 2.3.1. Ionization Energy
 - 2.3.2. Electron Affinity
 - 2.3.3. Covalent and Ionic Radii

Chapter 3. Simple Bonding Theory

Miessler Ch.3

- 3.1. Lewis Electron-Dot Diagrams
 - 3.1.1-3 Resonance, Higher e⁻ Counts, Formal Charge
 - 3.1.4 Multiple Bonds in Be & B Compounds
- 3.2. Valence Shell Electron-Pair Repulsion Theory

3.2.1-2 Lone-Pair Repulsion, Multiple Bonds

3.2.3. Electronegativity & Atomic Size Effects

3.2.4. Ligand Close Packing

3.3-4 Molecular Polarity, Hydrogen Bonding

Valence Bond Theory

Kotz Ch. 9.1-9.2 + lecture slides

Orbital overlap model of bonding, σ and π bonding
Limitations: hybridization, hypervalency, resonance

Chapter 5. Molecular Orbital Theory

Kotz Ch.9.3 + Miessler Ch. 5 + lecture slides

- Principles of MO theory: orbital symmetry, delocalization
- 5.1. Formation of Molecular Orbitals from Atomic Orbitals
 - 5.1.1-3 Molecular Orbitals from s Orbitals, p Orbitals, d Orbitals
 - 5.1.4. Nonbonding Orbitals & Other Factors
 - 5.2. Homonuclear Diatomic Molecules
 - 5.2.1. Molecular Orbitals
 - 5.2.2. Orbital Mixing
 - 5.2.3. Diatomic Molecules of the 1st & 2nd Periods
 - 5.2.4. Photoelectron Spectroscopy
 - 5.3. Heteronuclear Diatomic Molecules
 - 5.3.1. Polar Bonds
 - 5.3.2. Ionic Compounds & Molecular Orbitals
 - 5.4. Molecular Orbitals for Larger Molecules
 - 5.4.1-3 Linear & Bent AX₂ molecules
 - 5.4.4-5 AX₃ molecules

Chapter 6. Lewis Acids and Bases

Miessler Ch. 6.4&6.6

*Depending on the course progression, this chapter may **not** be treated*

- 6.4 Lewis Acid-Base Concept & Frontier Orbitals
- 6.6 Hard and Soft Acids and Bases (in part)
 - 6.6.1 Theory of Hard and Soft Acids and Bases

Chapter 7. Crystalline Solid State

Kotz Ch.12.1-2,4 + Miessler Ch. 7.1-3

- 7.3. MOs & Band Structure: Bonding in Metals & Semiconductors
 - 7.3.1. Diodes, Photoelectric Effect, Light-Emitting Diodes
- 7.1. Formulas & Structures
 - 7.1.1. Simple Structures (e.g., metals)
 - 7.1.2. Structures of Binary Compounds (e.g., ionic compounds)
 - 7.1.3. Radius Ratio
- 7.2 Thermodynamics of Ionic Crystal Formation
 - 7.2.2. Solubility, Ion Size, and HSAB

Chapter 9. Coordination Chemistry I: Structures, Isomers

Chapter 10. Coordination Chemistry II: Bonding

Kotz Ch.22 + Miessler Ch. 9-10 parts

- Properties of the Transition Elements, review of oxidation states
Coordination compounds: structure, bonding, colour, magnetism
- 9.1. History
 - 9.2. Nomenclature
 - 9.3. Isomerism: Stereoisomers, 4- vs 6-Coordination, Chirality, Constitutional isomers, Separation of isomers...
 - 9.4. Coordination Numbers & Structures
 - 10.1. Experimental Evidence for Electronic Structures: Thermodynamic data, Magnetic Susceptibility, Electronic Spectra, Shapes
 - 10.2. Bonding Theories: Crystal-field theory

Topics are subject to change as term progresses

CHEM 241 – Laboratory Instructions

Coordinator: Jennifer Romero

Office: SP 234.01
Hours : email for appointment
(include "CHEM 241/01" in the subject line)
✉: jennifer.romero@concordia.ca

Dry lab TA: Zujhar Singh

Office: Zoom
Hours: TBD
✉: zujhar.singh@mail.concordia.ca

Wet lab TA: Christopher Copeman

Zoom: <https://concordia-ca.zoom.us/j/6630975503>
Hours: Tue 11:00-12:00
✉: christopher.copeman@mail.concordia.ca

Dry lab marker: Pedro Donnarumma

Office: Zoom
Hours: Email for appointment
✉: pedro.donnarumma@mail.concordia.ca

1. WET LABS

Wet Laboratory Experiments

The complete lab manual is available in the Concordia Bookstore (Loyola) and on the course Moodle web site. It includes safety information with which you should be familiar before being allowed to begin the experiments. You will be required to sign a form attesting that you have read the information.

The five experiments in the manual are listed below. You will be told the order/schedule for doing them during the check-in period, and the schedules will be posted on Moodle.

- Paper Chromatography Separation of Inorganic Cations
- The Nine-Solution Problem
- Copper: Its Chemical Transformations. Preparation of Copper(II) Compounds with Glycine
- Semiconductors: Preparation of Semiconducting Thin Films
- Synthesis of Isostructural Zr₆-Based Metal–Organic Frameworks

It is probably cheaper to buy the complete manual from the Bookstore, rather than print it yourself from the Moodle site. If any of the diagrams are not reproduced well in the bookstore version, or if you need to print a clean copy of the report forms, refer to the downloadable files on the Moodle site.

Wet Lab Rules

1. You must arrive on time for all labs. Teaching assistants, lab instructors or technical staff may refuse admission to students arriving late.
2. Contact lenses are strictly forbidden.
3. Safety glasses and lab coats are mandatory.
4. Long hair must be tied back.
5. For safety reasons, cell phones may be used as calculators or cameras, but nothing else! You must remove your gloves before using your cell phone as there is a danger of transferring chemicals to your skin.
6. Prelabs (see below) must be submitted by the deadline (wet labs: in person at the lab door, dry labs: on the Moodle submission link). The TA will not let you in the lab if the prelab is not completed.
7. Lab reports are due two weeks after the experiment is completed and must be submitted at the beginning of the lab period, otherwise they may be considered a day late. Exception: **the last lab report must be handed in absolutely no later than Monday, April 17th** (this may be <2 weeks after you performed the experiment; if this is >2 weeks after you performed the experiment, late penalties will apply).
8. Late lab reports are subject to a 10% per day penalty (≤3 days late) or a grade of zero (≥ 4 days late). All reports should be handed in using the correct link on Moodle. Documents must be a single merged pdf file. Only 1 document can be submitted per submission link.
9. Your TA will mark your lab reports on Moodle within 2 weeks after submission. Once the report is graded, you will see the comments and corrections online. Please let the lab coordinator and the professor know immediately if your TA is late with their marking.

10. You must submit all medical/employer notes **within one week** to the lab coordinator, Jennifer Romero (not your TA), in the case of a missed lab.
11. You are required to inform the lab coordinator *in advance* if you foresee a conflict with attending a lab, for example due to a religious holiday.
12. You have 4 hours to complete the experiments *and clean up*. All workstations must be clean prior to leaving the lab.

Lab Reports for Wet Labs

- Please consult the individual experiments for details.
- You must prepare a written prelab summary before going to do the experiment. You will not be permitted to enter the lab unless this has been done. If the TA believes that your prelab is incomplete, you will not be allowed to perform that experiment and will receive a mark of zero.
- Prelabs and lab reports must be identified with the experiment number and title, and must include your name, student number and date.
- Each lab has some questions to be answered and submitted with your lab report.
- Each lab describes the basics of what should be included in the report. There is a tear-out form on which to record your observations and data, which must be included as part of the report.

Grading of Wet Labs

You will be graded out of a total of 20 marks.

2. DRY LAB “EXPERIMENTS”

- Molecular Models in Inorganic Chemistry
- Lewis Bonding Theory and VSEPR Theory
- The Bohr Atom - The Electronic Spectrum of Hydrogen
- The Probabilistic Interpretation of Atomic Orbitals
- Molecular Orbital theory - Linear Combinations of Atomic Orbitals

These “dry labs”, available only on the Moodle site, involve computer exercises which:

- **must be worked on** (at least in part) during your scheduled lab period on Chemistry/Biochemistry Department computers in SP S185.07 where a teaching assistant will be available to help you. **The sessions for the dry labs are mandatory**
- **have prelab questions that must be completed and uploaded on Moodle by the deadline before performing the experiment (the VSEPR dry lab is an exception, and does not have a prelab component).**
- can be finished on your own time.

The dry labs are to be done in the specific order above, connected approximately to the lecture schedule.

You *must* hand in your dry lab reports to your TA via Moodle by the deadline (two weeks after they are scheduled). Make sure you know when that is! The exception: **the last dry lab must be handed in no later than Monday, April 17th.**

Your TA is required to mark the reports so that they can provide feedback two weeks after you hand them in so that you can learn from your mistakes. Please let the professor and/or lab instructor know immediately if your TA is late doing his or her marking.

Lab Reports for Dry Labs

You have to answer all questions found on the web page of each Dry Lab. The answers should be concise, yet complete.

Grading of Dry Labs

You will be graded out of a total of 10 marks. The number of marks allotted to each question is indicated on the web pages.
