COURSE SYLLABUS

<table>
<thead>
<tr>
<th>Course Number:</th>
<th>CHM 3610</th>
<th>Course Title:</th>
<th>Intermediate Inorganic Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite(s):</td>
<td>CHM 1045 and CHM 1046 with passing grades.</td>
<td>Course Credit:</td>
<td>3</td>
</tr>
<tr>
<td>College:</td>
<td>Arts and Sciences</td>
<td>Course Hours:</td>
<td>3 per week</td>
</tr>
<tr>
<td>Department:</td>
<td>Chemistry</td>
<td>Required Text(s):</td>
<td>Inorganic Chemistry by Housecroft &amp; Sharpe, 3rd edition (Pearson/Prentice Hall 2008).</td>
</tr>
<tr>
<td>Faculty Name:</td>
<td>Dr. Maurice Edington</td>
<td>Supplies:</td>
<td>Scientific calculator.</td>
</tr>
<tr>
<td>Office Location:</td>
<td>Jones Hall 219</td>
<td>Term and Year:</td>
<td>Spring 2009</td>
</tr>
<tr>
<td>Telephone:</td>
<td>599-8420</td>
<td>Place and Time:</td>
<td>Jones Hall Rm 202. MW 5:00 – 6:15 p.m.</td>
</tr>
<tr>
<td>e-mail:</td>
<td><a href="mailto:maurice.edington@famu.edu">maurice.edington@famu.edu</a></td>
<td></td>
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</tr>
</tbody>
</table>

Office Hours

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30 am - 12:00 pm</td>
<td>10:30 am - 12:00 pm</td>
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</table>

Course Description

Fundamental Principles of Inorganic Chemistry including periodic trends, chemical bonding, correlation of structure and reactivity, bonding models including MO, acids/bases, and solvents.

Course Purpose

Required course for chemistry majors at the sophomore/junior level.

References

The Conceptual Framework in the Professional Education Unit (PEU) at Florida A&M University is an integrated approach to providing educational experiences that result in exemplary professional educators. The Framework is comprised of six themes with the mission of developing high quality classroom teachers, administrators and support personnel. The term “exemplary” refers to the kind of graduates the PEU strives to produce. The figure below provides a diagram of the Exemplary Professional Conceptual Framework:

**TECHNOLOGY**

•CF 2

•Through this focal area, the FAMU professional education candidate will:

<table>
<thead>
<tr>
<th>CF</th>
<th>Description</th>
<th>F:</th>
<th>I:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 (S)</td>
<td>Use of available technology and software to support student learning.</td>
<td>4,12</td>
<td>6</td>
</tr>
<tr>
<td>2.5 (S)</td>
<td>Use fundamental concepts in technology.</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>2.7 (S)</td>
<td>Facilitate the use of technology by students.</td>
<td>4,12</td>
<td>6</td>
</tr>
</tbody>
</table>

**VALUES**

•CF3

•Through this focal area, the FAMU professional education candidate will:

<table>
<thead>
<tr>
<th>CF</th>
<th>Description</th>
<th>F:</th>
<th>I:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.4(D)</td>
<td>Be committed to individual excellence.</td>
<td>11</td>
<td>5,9</td>
</tr>
<tr>
<td>3.5(D)</td>
<td>Recognize the importance of peer Relationships in establishing a climate for learning.</td>
<td>2,7</td>
<td>5,10</td>
</tr>
</tbody>
</table>

**CRITICAL THINKING**

•CF4

•Through this focal area, the FAMU professional education candidate will:
<table>
<thead>
<tr>
<th>CF: 4.3 (D)</th>
<th>Value critical thinking and self-directed learning as habits of mind.</th>
<th>F: 4</th>
<th>I: 1.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF: 4.5 (S)</td>
<td>Demonstrate the use of higher order thinking skills.</td>
<td>F: 8</td>
<td>I: 4</td>
</tr>
</tbody>
</table>

**PROFESSIONALISM**

- **CF 5**
- Through this focal area, the FAMU professional education candidate will:

| CF: 5.1 (K) | Know the content | F: 8 | I: 1 |

**National and State Standards Addressed in the Course**

**Interstate New Teacher Assessment and Support Consortium (INTASC) Standards**

**Standard 1: Subject Matter:** The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and can create learning experiences that make these aspects of subject matter meaningful for students.

1.10 Knowledge
1.12 The teacher understands how students' conceptual frameworks and their misconceptions for an area of knowledge can influence their learning.

1.13 The teacher can relate his/her disciplinary knowledge to other subject areas.

1.20 Dispositions
1.24 The teacher is committed to continuous learning and engages in professional discourse about subject matter knowledge and children's learning of the discipline.

1.30 Performances
1.35 The teacher develops and uses curricula that encourage students to see, question, and interpret ideas from diverse perspectives.

**Standard 4: Instructional Strategies:** The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.

4.10 Knowledge
4.11 The teacher understands the cognitive processes associated with various kinds of learning (e.g. critical and creative thinking, problem structuring and problem solving, invention, memorization and recall) and how these processes can be stimulated.

4.12 The teacher understands the principles and techniques, along with advantages and limitations, associated with various instructional strategies (e.g. cooperative learning, direct instruction, discovery learning, whole group discussion, independent study, interdisciplinary instruction).

4.13 The teacher knows how to enhance learning through the use of a wide variety of materials as well as human and technological resources (e.g. computers, audio-visual technologies, videotapes and discs, local
experts, primary documents and artifacts, texts, reference books, literature, and other print resources).

4.20 Dispositions
4.21 The teacher values the development of students' critical thinking, independent problem solving, and performance capabilities.

4.23 The teacher values the use of educational technology in the teaching and learning process.

4.30 Performances
4.31 The teacher carefully evaluates how to achieve learning goals, choosing alternative teaching strategies and materials to achieve different instructional purposes and to meet student needs (e.g. developmental stages, prior knowledge, learning styles, and interests).

4.33 The teacher constantly monitors and adjusts strategies in response to learner feedback.

4.34 The teacher varies his or her role in the instructional process (e.g. instructor, facilitator, coach, audience) in relation to the content and purposes of instruction and the needs of students.

4.36 The teacher uses educational technology to broaden student knowledge about technology, to deliver instruction to students at different levels and paces, and for advanced levels of learning.

Standard 5, Learning Environment
The teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.

5.10 Knowledge
5.11 The teacher can use knowledge about human motivation and behavior drawn from the foundational sciences of psychology, anthropology, and sociology to develop strategies for organizing and supporting individual and group work.

5.12 The teacher understands how social groups function and influence people, and how people influence groups.

5.13 The teacher knows how to help people work productively and cooperatively with each other in complex social settings.

5.14 The teacher understands the principles of effective classroom management and can use a range of strategies to promote positive relationships, cooperation, and purposeful learning in the classroom.

5.15 The teacher recognizes factors and situations that are likely to promote or diminish intrinsic motivation, and knows how to help students become self-motivated.

5.20 Dispositions
5.21 The teacher takes responsibility for establishing a positive climate in the classroom and participates in maintaining such a climate in the school as a whole.

5.22 The teacher understands how participation supports commitment, and is committed to the expression and use of democratic values in the classroom.

5.23 The teacher values the role of students in promoting each other's learning and recognizes the
importance of peer relationships in establishing a climate of learning.

5.24 The teacher recognizes the values of intrinsic motivation to students' life-long growth and learning.

5.25 The teacher is committed to the continuous development of individual students' abilities and considers how different motivational strategies are likely to encourage this development for each student.

**5.30 Performances**

5.31 The teacher creates a smoothly functioning learning community in which students assume responsibility for themselves and one another, participate in decision making, work collaboratively and independently, and engage in purposeful learning activities.

5.32 The teacher engages students in individual and group learning activities that help them develop the motivation to achieve, by, for example, relating lessons to students' personal interests, allowing students to have choices in their learning, and leading students to ask questions and pursue problems that are meaningful to them.

5.33 The teacher organizes, allocates, and manages the resources of time, space, activities, and attention to provide active and equitable engagement of students in productive tasks.

5.34 The teacher maximizes the amount of class time spent in learning by creating expectations and processes for communication and behavior along with a physical setting conducive to classroom goals.

5.35 The teacher helps the group to develop shared values and expectations for student interactions, academic discussions, and individual and group responsibility that create a positive classroom climate of openness, mutual respect, support, and inquiry.

5.36 The teacher analyzes the classroom environment and makes decisions and adjustments to enhance social relationships, student motivation and engagement, and productive work.

5.37 The teacher organizes, prepares students for, and monitors independent and group work that allows for full and varied participation of all individuals.

**Standard 6, Communication**
The teacher uses knowledge of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.

**6.10 Knowledge**

6.11 The teacher understands communication theory, language development, and the role of language in learning.

6.12 The teacher understands how cultural and gender differences can affect communication in the classroom.

6.13 The teacher recognizes the importance of nonverbal as well as verbal communication.

6.14 The teacher knows about and can use effective verbal, nonverbal, and media communication techniques.

**6.20 Dispositions**
6.21 The teacher recognizes the power of language for fostering self-expression, identity development, and learning.

6.22 The teacher values many ways in which people seek to communicate and encourages many modes of communication in the classroom.

6.23 The teacher is a thoughtful and responsive listener.

6.24 The teacher appreciates the cultural dimensions of communication, responds appropriately, and seeks to foster culturally sensitive communication by and among all students in the class.

6.30 Performance
6.31 The teacher models effective communications strategies in conveying ideas and information and in asking questions (e.g., monitoring the effects of messages, restating ideas and drawing connections, using visual, aural, and kinesthetic cues, being sensitive to nonverbal cues given and received).

6.32 The teacher supports and expands learner expression in speaking, writing, and other media.

6.33 The teacher knows how to ask questions and stimulate discussion in different ways for particular purposes, for example, probing for learner understanding, helping students articulate their ideas and thinking processes, promoting risk-taking and problem-solving, facilitating factual recall, encouraging convergent and divergent thinking, stimulating curiosity, helping stimulate students to question.

6.34 The teacher communicates in ways that demonstrate a sensitivity to cultural and gender differences (e.g., appropriate use of eye contact, interpretation of body language and verbal statements, acknowledgment of and responsiveness to different modes of communication and participation).

6.35 The teacher knows how to use a variety of media communication tools, including audio-visual aids and computers, including educational technology, to enrich learning opportunities.

Standard 9: Reflection and Professional Development: The teacher is a reflective practitioner who continually evaluates the effects of her/his choices and actions on others (students, parents, and other professionals in the learning community) and who actively seeks out opportunities to grow professionally.

9.10 Knowledge
9.11 The teacher understands the historical and philosophical foundations of education.

9.12 The teacher understands methods of inquiry that provide him/her with a variety of self-assessment and problem-solving strategies for reflecting on his/her practice, its influences on students' growth and learning, and the complex interactions between them.

9.13 The teacher is aware of major areas of research on teaching and of resources available for professional learning (e.g., professional literature, colleagues, professional associations, professional development activities).

9.20 Dispositions
9.21 The teacher values critical thinking and self-directed learning as habits of mind.

9.22 The teacher is committed to reflection, assessment, and learning as an ongoing process.

9.23 The teacher is willing to give and receive help.
9.24 The teacher is committed to seeking out, developing, and continually refining practices that address the individual needs of students.

9.25 The teacher recognizes her/his professional responsibility for engaging in and supporting appropriate professional practices for self and colleagues.

**9.30 Performance**

9.31 The teacher uses classroom observation, information about students, and research as sources for evaluating the outcomes of teaching and learning and as a basis for experimenting with, reflecting on, and revising practice.

9.32 The teacher seeks out professional literature, colleagues, and other resources to support her/his own development as a learner and a teacher.

9.33 The teacher draws upon professional colleagues within the school and other professional arenas as supports for reflection, problem-solving and new ideas, actively sharing experiences and seeking and giving feedback.

**Standard 10: Collaboration, Ethics, and Relationships:** The teacher communicates and interacts with parents/guardians, families, school colleagues, and the community to support students' learning and well-being.

**10.10 Knowledge**

10.11 The teacher understands schools as organizations within the larger community context and understands the operations of the relevant aspects of the system(s) within s/he works.

10.12 The teacher understands how factors in the students' environment outside of school (e.g. family circumstances, community environments, health and economic conditions) may influence students' life and learning.

10.13 The teacher understands and implements laws related to student's rights and teacher responsibilities (e.g. for equal education, appropriate education for students with disabilities, confidentiality, privacy, appropriate treatment of students, reporting in situations related to possible child abuse).

**10.20 Dispositions**

10.21 The teacher values and appreciates the importance of all aspects of a child's experience.

10.22 The teacher is concerned about all aspects of child's well-being (cognitive, emotional, social, and physical), and is alert to signs of difficulties.

10.23 The teacher respects the privacy of students and confidentiality of information.

10.24 The teacher is willing to consult with other adults regarding the education and well-being of her/his students.

10.25 The teacher is willing to work with other professionals to improve the overall learning environment for students.

**10.30 Performances**
10.31 The teacher participates in collegial activities designed to make the entire school a productive learning environment.

10.32 The teacher makes links with the learners' other environments on behalf of students, by consulting with parents, counselors, teachers of other classes and activities within the schools, and professionals in other community agencies.

10.33 The teacher can identify and use community resources to foster student learning.

10.34 The teacher establishes respectful and productive relationships with parents and guardians from diverse home and community situations, and seeks to develop cooperative partnerships in support of student learning and well being.

10.35 The teacher talks with and listens to the student, is sensitive and responsive to clues of distress, investigates situations, and seeks outside help as needed and appropriate to remedy problems.

10.36 The teacher acts as an advocate for students.

**Florida Educator Accomplished Practices (FEAP)**

**Accomplished Practice #2: COMMUNICATION**

2.1 The preprofessional teacher recognizes the need for effective communication in the classroom and is in the process of acquiring techniques which she/he will use in the classroom.

2.2 STANDARD: Communication -- Uses effective communication techniques with students and all other stakeholders.

2.a Establishes positive interactions in the learning environment that uses incentives and consequences for students.

2.b Establishes positive interactions between the teacher and student that are focused upon learning.

2.c Varies communication (both verbal and nonverbal) according to the nature and needs of individuals.

2.d Encourages students in a positive and supportive manner.

2.e Communicates to all students high expectations for learning.

2.h Practices strategies that support individual and group inquiry.

2.j Identifies communication techniques for use with colleagues, school/community specialists, administrators, and families, including families whose home language is not English.

**Accomplished Practice #4: Critical-thinking**

4.1 The pre-professional teacher is acquiring performance assessment techniques and strategies that measure higher order thinking skills in students and is building a repertoire of realistic projects and problem-solving activities designed to assist all students in demonstrating their ability to think creatively. (A) Uses appropriate techniques and strategies which promote and enhance critical, creative, and evaluative thinking capabilities of students.

1. Uses assessment strategies (traditional and alternate) to assist the continuous development of the learner. ASSESSMENT

4.2. Uses appropriate techniques and strategies which promote and enhance critical, creative, and evaluative thinking capabilities of students.

4.a Provides opportunities for students to learn higher-order thinking skills.

4.b Identifies strategies, materials, and technologies that she/he will use to expand students’ thinking abilities.

4.g Demonstrates and models the use of higher-order thinking abilities.
Accomplished Practice #7: HUMAN DEVELOPMENT AND LEARNING
7.1 Drawing upon well established human development/learning theories and concepts and a variety of information about students, the preprofessional teacher plans instructional activities.
7.a Recognizes developmental levels of students and identifies differences within a group of students.
7.d Communicates with students effectively by taking into account their developmental levels, linguistic development, cultural heritage, experiential background, and interests.
7.e Varies activities to accommodate different student learning needs, developmental levels, experiential backgrounds, linguistic development, and cultural heritage.
7.h Develops short-term personal and professional goals relating to human development and learning.

Accomplished Practice #8: KNOWLEDGE OF SUBJECT MATTER
8.2 Demonstrates knowledge and understanding of the subject matter.
8.b Increases subject matter knowledge in order to integrate the learning activities.
8.f Develops short- and long-term personal and professional goals relating to knowledge of subject matter.

Accomplished Practice #11: ROLE OF THE TEACHER
11.1 The preprofessional teacher communicates and works cooperatively with families and colleagues to improve the educational experiences at the school.
11.2 STANDARD: Role of the Teacher -- Works with various education professionals, parents, and other stakeholders in the continuous improvement of the educational experiences of students.
11.b Provides meaningful feedback on student progress to students and families and seeks assistance for self and families.

Accomplished Practice #12: TECHNOLOGY
12.b Uses technology tools on a personal basis.
12.c Demonstrates awareness of and models acceptable use policies and copyright issues.
12.d Identifies and uses standard references in electronic media.
12.i Selects and utilizes educational software tools for instructional purposes based upon reviews and recommendations of other professionals.
12.j Uses digital information obtained through intranets and/or the Internet (e.g., e-mail and research).
12.k Uses technology to collaborate with others.
12.l Develops professional goals relating to technology integration.

National Science Teachers Association Standards (NSTA)

Standard 1: Content

Teachers of science understand and can articulate the knowledge and practices of contemporary science. They can interrelate and interpret important concepts, ideas, and applications in their fields of licensure; and can conduct scientific investigations. To show that they are prepared in content, teachers of science must demonstrate that they:

a. Understand and can successfully convey to students the major concepts, principles, theories, laws, and interrelationships of their fields of licensure and supporting fields as recommended by the National Science Teachers Association.
b. Understand and can successfully convey to students the unifying concepts of science delineated by the National Science Education Standards.
c. Understand and can successfully convey to students important personal and technological
applications of science in their fields of licensure.
d. Understand research and can successfully design, conduct, report and evaluate investigations in science.
e. Understand and can successfully use mathematics to process and report data, and solve problems, in their field(s) of licensure.

B.2. In relation to the physical sciences, science specialists at this level should have all of the competencies described for the elementary generalist, but also should be prepared in chemistry and physics to lead students to understand:
13. States of matter and bonding in relation to molecular behavior and energy. (CHM 1045)

B.4. To create interdisciplinary perspectives and to help students understand why science is important to them, elementary/middle level science specialists should have all of the competencies described for the elementary generalist, but also should be prepared to lead students to understand:
33. Use of technological tools in science, including calculators and computers.

C.3.a. Core Competencies. All teachers of chemistry should be prepared lead students to understand the unifying concepts required of all teachers of science, and should in addition be prepared to lead students to understand:
1. Fundamental structures of atoms and molecules.
2. Basic principles of ionic, covalent, and metallic bonding.
3. Physical and chemical properties and classification of elements including periodicity.
7. Transition elements and coordination compounds.

C.3.b. Advanced Competencies. In addition to the core competencies, teachers of chemistry as a
17. Lewis adducts and coordination compounds.
20. Solvent system concepts including non-aqueous solvents.

Standard 10: Professional Growth
Teachers of science strive continuously to grow and change, personally and professionally, to meet the diverse needs of their students, school, community, and profession. They have a desire and disposition for growth and betterment. To show their disposition for growth, teachers of science must demonstrate that they:

a. Engage actively and continuously in opportunities for professional learning and leadership that reach beyond minimum job requirements.
b. Reflect constantly upon their teaching and identify ways and means through which they may grow professionally.
c. Use information from students, supervisors, colleagues and others to improve their teaching and facilitate their professional growth.

Professional Organization/Learned Society Standards

National Society of Science Teachers Association
Florida Teacher Certification Examination (FTCE) Subject Area Examination (SAE) Competencies and Skills

Professional Society / National and State Standards Addressed in the Course

American Chemical Society (ACS) Expected Outcomes:
This course should ensure that students know basic chemical concepts such as stoichiometry, states of matter, atomic structure, molecular structure and bonding, thermodynamics, equilibria, and kinetics. Students need to be competent in basic laboratory skills such as safe practices, keeping a notebook, use of electronic balances and volumetric glassware, preparation of solutions, chemical measurements using pH electrodes and spectrophotometers, data analysis, and report writing.

Course Artifacts

<table>
<thead>
<tr>
<th>Standards</th>
<th>Name of the Artifact 1</th>
<th>Name of the Artifact 2</th>
<th>Name of the Artifact 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEU CF</td>
<td>Use various bonding theories to describe molecular geometries</td>
<td>Describe variation in properties of metallic elements using the periodic table</td>
<td>Distinguish between strong and weak acids and bases</td>
</tr>
<tr>
<td>FEAP</td>
<td>2.1, 2.2, 2.a, 2.b, 2.c, 2.e, 2.h, 2.j, 2.k, 4.1, 4.2, 4.a, 4.b, 4.g, 8.2, 8.a, 8.b, 8.f, 11.1, 11.2, 11.b, 12.b, 12.c, 12.i, 12.j, 12.l.</td>
<td>2.1, 2.2, 2.a, 2.b, 2.c, 2.e, 2.h, 2.j, 2.k, 4.1, 4.2, 4.a, 4.b, 4.g, 8.2, 8.a, 8.b, 8.f, 11.1, 11.2, 11.b, 12.b, 12.c, 12.i, 12.j, 12.l.</td>
<td>2.1, 2.2, 2.a, 2.b, 2.c, 2.e, 2.h, 2.j, 2.k, 4.1, 4.2, 4.a, 4.b, 4.g, 8.2, 8.a, 8.b, 8.f, 11.1, 11.2, 11.b, 12.b, 12.c, 12.i, 12.j, 12.l.</td>
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<td>INTASC</td>
<td>1, 4, 5, 6, 9, 10</td>
<td>1, 4, 5, 6, 9, 10</td>
<td>1, 4, 5, 6, 9, 10</td>
</tr>
<tr>
<td>FTCE</td>
<td>3.2, 3.3, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13</td>
<td>3.2, 3.11</td>
<td>1.4, 1.5, 4.13, 4.20</td>
</tr>
<tr>
<td>NSTA</td>
<td>1; 1.B.2.13; 1.B.4.33; 1.C.3.a.1, 2, 3, 7, 8; 1.C.3.b.17, 20; 10.a, 10.b, 10.c.</td>
<td>1; 1.B.2.13; 1.B.4.33; 1.C.3.a.1, 2, 3, 7, 8; 1.C.3.b.17, 20; 10.a, 10.b, 10.c.</td>
<td>1; 1.B.2.13; 1.B.4.33; 1.C.3.a.1, 2, 3, 7, 8; 1.C.3.b.17, 20; 10.a, 10.b, 10.c.</td>
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Rubric for evaluation (for all artifacts):

- 4 points - Calculation, formulae used and results are correct.
- 3 points - Calculations and formulae used are correct.
- 2 points - Calculations are correct.
- 1 point - Calculations are partly correct.
<table>
<thead>
<tr>
<th>Assignment</th>
<th>Behavioral Objectives</th>
<th>INTASC Standards</th>
<th>FTCE SAE</th>
<th>FEAPS</th>
<th>NSTA</th>
<th>PEU Conceptual Framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework: Selected inorganic chemistry problems from the textbook and additional instructor addendums Each homework assignment will address course content and is aimed at development of problem solving skills.</td>
<td>Students will 1. Demonstrate knowledge of the lecture material, and 2. Develop and enhance the skill of analytical analysis and problem solving</td>
<td>1, 4, 5, 6, 9, 10</td>
<td>3.2, 3.3, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 1.4, 1.5, 4.13, 4.20</td>
<td>2, 4, 7, 8, 11, 12</td>
<td>1; 1.B.2.13; 1.B.4.3; 1.C.3.a.1, 2, 3, 7, 8; 1.C.3.b.17, 20; 10.a, 10.b, 10.c.</td>
<td>2.1, 2.5, 2.7, 3.4, 3.5, 4.3, 4.4, 5.1</td>
</tr>
<tr>
<td>Quizzes Selected inorganic chemistry problems from the textbook and additional instructor addendums Each homework assignment will address course content and is aimed at development of problem solving skills.</td>
<td>Develop critical thinking and written communication skills</td>
<td>1, 4, 5, 6, 9, 10</td>
<td>3.2, 3.3, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 1.4, 1.5, 4.13, 4.20</td>
<td>2, 4, 7, 8, 11, 12</td>
<td>1; 1.B.2.13; 1.B.4.33; 1.C.3.a.1, 2, 3, 7, 8; 1.C.3.b.17, 20; 10.a, 10.b, 10.c.</td>
<td>2.1, 2.5, 2.7, 3.4, 3.5, 4.3, 4.4, 5.1</td>
</tr>
<tr>
<td>Exams: Three one-hour tests, each test covering specific chapters. Final exam is comprehensive and will cover the material of Chapters 1 - 21.</td>
<td>Develop critical thinking and written communication skills</td>
<td>1, 4, 5, 6, 9, 10</td>
<td>3.2, 3.3, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 1.4, 1.5, 4.13, 4.20</td>
<td>2, 4, 7, 8, 11, 12</td>
<td>1; 1.B.2.13; 1.B.4.33; 1.C.3.a.1, 2, 3, 7, 8; 1.C.3.b.17, 20; 10.a, 10.b, 10.c.</td>
<td>2.1, 2.5, 2.7, 3.4, 3.5, 4.3, 4.4, 5.1</td>
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</tbody>
</table>

**Overall Goals of the Course**

This is a one-semester course that is intended to introduce you to the basic concepts of inorganic chemistry at an intermediate level. The student should be developing a disciplined attitude toward learning and analytical reasoning skills, i.e., the ability to read, understand, and devise solutions to problems. The course objectives have been chosen in order to help students acquire a sound knowledge of inorganic chemistry.
**Specific Behavioral Objectives**

**Chapter 1: Basic Concepts: atoms (Standards Addressed in this chapter: FTCE 2.8, 2.9, 5.1, 5.2 5.3, 5.4, 5.5, 5.7; ACS)**

1. Have a detailed understanding of the electronic structure of hydrogen.
2. Describe the shapes and orientations of s, p, and d orbitals of the hydrogen atom.
3. Use the periodic table to predict trends in atomic properties, such as electronegativity and electron affinity.
4. Describe the solutions of the Schrödinger equation for the hydrogen atoms (shells 1 and 2).
5. Understand and explain the theory of the particle in the box problem.

**Chapter 2: Basic Concepts: molecules (Standards Addressed in this chapter: FTCE 3.2, 3.3, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13; ACS)**

1. Describe ionic bonding and properties of ionic compounds using electron configurations.
2. Describe covalent bonding and properties of covalent compounds using electron-dot symbols, bond order, bond length, and bond energies.
3. Draw molecular orbital diagrams for homonuclear diatomic molecules.
4. Use molecular orbital theory to predict properties of homonuclear diatomic molecules.
5. Use various bonding theories to describe molecular geometries, including shape and bond angle.
7. Estimate electronegativity values using the Pauling, Mulliken, and Allred-Rochow scales.

**Chapter 3: Nuclear Properties (Standards Addressed in this chapter: FTCE 2.1, 5.1, 5.7, 5.8, 5.9, 5.10, 5.11; ACS)**

1. Describe the relationship between mass number and binding energy of nuclei.
2. Understanding the different properties exhibited by alpha, beta, and gamma particles.
3. Describe the process by which nuclei undergo radioactive decay.
4. Differentiate between nuclear fission and fusion.
5. Describe how spectroscopic methods can be used to identify and characterize isotopic substances.

**Chapter 4: An Introduction to Molecular Symmetry (Standards Addressed in this chapter: FTCE 2.9, 3.1, 3.9; ACS)**

1. Describe symmetry operations, symmetry elements and point groups of basic compounds.
2. Have a general understanding of how character tables are used to characterize molecular properties.
3. Understand how spectroscopy is used to characterize molecular properties.

**Chapter 5: Bonding in Polyatomic Molecules (Standards Addressed in this chapter: FTCE 3.7, 3.8, 3.9, 3.10; ACS)**

1. Use valence bond and molecular orbital theory to understanding bonding interactions in polyatomic compounds.
2. Draw molecular orbital diagrams for simple polyatomic molecules.

**Chapter 6: Structures and Energetics of Metallic and Ionic Solids (Standards Addressed in this chapter: 3.2, 3.11; ACS)**
1. Use the concept of packing of spheres to determine the lattice structures of simple metallic and ionic solids.
2. Calculate metallic radii.
3. Describe the variation in properties, such as melting point, of metallic elements using the periodic table.
4. Describe the basic properties of semiconductors.

Chapter 7: Acids, Bases and Ions in Aqueous Solution (Standards Addressed in this chapter: FTCE 1.4, 1.5, 4.13 4.20; ACS)

1. Understand the acid/base properties of water.
2. Distinguish between the different types of acids and basis.
3. Understand the difference between molecular and net ionic equations.
4. Understand the key events in precipitation and acid-base reactions.
5. Describe the common-ion effect.
6. Distinguish between strong and weak acids and bases.
7. Predict the relative solubilities of ionic salts.

Chapter 8: Reduction and Oxidation (Standards Addressed in this chapter: FTCE 4.16, 4.18; ACS)

1. Determine oxidation states of ions.
2. Use standard reduction potentials to predict chemical reactivity.

Professional Society/National and State Standards Addressed in the Course

American Chemical Society (ACS) Expected Outcomes:
This course should ensure that students know basic chemical concepts such as stoichiometry, states of matter, atomic structure, molecular structure and bonding, thermodynamics, equilibria, and kinetics. Students need to be competent in basic laboratory skills such as safe practices, keeping a notebook, use of electronic balances and volumetric glassware, preparation of solutions, chemical measurements using pH electrodes and spectrophotometers, data analysis, and report writing.

Florida Teacher Certification Examination (FTCE) Subject Area Examination (SAE) Competencies and Skills

1 Knowledge of the nature of matter
   1. Differentiate between pure substances, homogeneous mixtures, and heterogeneous mixtures.
   2. Determine the effects of changes in temperature, volume, pressure, or quantity on an ideal gas.
   3. Apply units of mass, volume, and moles to determine concentrations and dilutions of solutions.
   4. Analyze the effects of physical conditions on solubility and the dissolving process.
   5. Evaluate problems relating colligative properties, molar mass, and solution concentrations.
   6. Analyze the effects of forces between chemical species on properties (e.g., melting point, boiling point, vapor pressure, solubility, conductivity) of matter.
   7. Solve problems involving an intensive property (e.g., density, specific heat) of matter.
8. Differentiate physical methods (e.g., chromatography, filtration, extraction) for separating the components of mixtures.

2 Knowledge of energy and its interaction with matter
1. Distinguish between different forms of energy (e.g., thermal, electrical, nuclear).
2. Relate temperature and heat to kinetic molecular theory.
3. Interpret a phase diagram of a pure substance.
4. Interpret a heating/cooling curve of a substance.
5. Calculate thermal changes in chemical reactions, such as heats of reaction, heats of formation, and/or heats of combustion, from data.
6. Analyze entropy changes during solution formation, phase changes, and chemical reactions.
7. Predict spontaneity of a chemical process given initial and final values of free energy, temperature, enthalpy, and/or entropy.
8. Relate regions of the electromagnetic spectrum to the energy, wavelength, and frequency of photons.
9. Relate regions of the electromagnetic spectrum to their effect on chemical or physical properties of matter.
10. Analyze energy transformations in physical and biological systems (e.g., energy from the Sun to electricity, from food consumption to physical activity).

3 Knowledge of bonding and molecular structure
1. Identify the basic theory and applications of spectroscopy (e.g., MRI, x-ray, mass spectrometry, UV, microwave, NMR, IR).
2. Identify types and examples of metallic, ionic, and covalent (polar and nonpolar) bonds.
3. Apply electronegativity to bond type.
4. Identify characteristics of simple organic compounds.
5. Given the structural formula for a simple organic compound, identify the hybridization of the atoms.
6. Identify sigma and pi bonds in a compound.
7. Interpret the information derived from the following models: Lewis electron dot structures, valence shell electron pair repulsion (VSEPR) theory, and molecular orbital (M/O) theory.
8. Select the most probable Lewis electron dot structure for an ionic or covalent formula (e.g., CO$\text{$_2$}$, Na$\text{$_2$}$CO$\text{$_3$}$) that follows the octet rule.
9. Predict geometry of simple molecules (e.g., symmetry elements).
10. Predict polarity of simple compounds.
11. Predict physical or chemical properties based upon the type of bonding involved.
12. Identify an inorganic chemical formula (ionic or molecular), given the name.
13. Select the name of an inorganic chemical compound (ionic or molecular), given its formula.
14. Identify properly named formulas for simple organic compounds.
15. Identify common organic functional groups.
16. Differentiate between the structures of common biochemical compounds, such as lipids, amino acids, carbohydrates, and nucleic acids.

4 Knowledge of chemical reactions and stoichiometry
1. Balance chemical equations.
2. Given common chemical species and reaction conditions, predict probable reaction products.
3. Solve mass-mass stoichiometry problems.
5. Solve solution stoichiometry problems.
7. Determine empirical formulas from experimental data.
8. Analyze the effects of concentration, temperature, pressure, surface area, and the presence or absence of catalysts on the rates of reaction.
9. Assess the effects of changes in concentration, temperature, or pressure on a state of a system initially at equilibrium (Le Chatelier’s principle).
10. Determine rate laws from concentration and rate data.
11. Calculate either the equilibrium constant or concentration of a reaction species at equilibrium (e.g., \(K_{a}, K_{b}, K_{sp}, K_{w}, K_{eq}\)).
12. Identify the characteristics of a chemical system in dynamic equilibrium.
13. Identify major characteristics of strong and weak acids or bases.
14. Evaluate the properties of buffer systems.
15. Interpret graphical and numerical titration data.
17. Balance incomplete redox equations in acidic and basic solutions.
18. Determine the spontaneity of a chemical reaction using standard reduction potentials.
19. Identify the characteristics of biochemical and fossil fuel combustion reactions.
20. Solve problems related to pH of strong acids or bases.
21. Analyze electrolytic and/or voltaic cells.

5 Knowledge of atomic theory and structure
1. Using the periodic table, determine the number of protons, neutrons, and electrons in a specific isotope of an atom or ion.
2. Using the periodic table, relate the physical properties of atoms and ions to the elements’ positions on the table.
3. Using the periodic table, relate the chemical reactivity of elements to their positions on the table.
4. Using the periodic table, determine electron configurations for main group and transition elements.
5. Relate chemical activity to electron configuration.
6. Identify characteristics of the wave and particle nature of matter.
7. Identify characteristics of unstable nuclei and the particles and energies emitted.
8. Given measurable quantities, calculate parameters of radioactive decay.
10. Analyze the processes of nuclear fission and fusion, including interconversion of mass and energy.
11. Identify electron density distribution diagrams and characteristics for s, p, and d orbitals (e.g., nodes).

<table>
<thead>
<tr>
<th>Topic</th>
<th>Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Concepts: atoms</td>
<td>1</td>
</tr>
<tr>
<td>Basic Concepts: molecules</td>
<td>2</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---</td>
</tr>
<tr>
<td>Nuclear Properties</td>
<td>3</td>
</tr>
<tr>
<td>An Introduction to Molecular Symmetry</td>
<td>4</td>
</tr>
<tr>
<td>Bonding in Polyatomic Molecules</td>
<td>5</td>
</tr>
<tr>
<td>Structures and Energetics of Metallic and Ionic Solids</td>
<td>6</td>
</tr>
<tr>
<td>Acids, Bases and Ions in Aqueous Solution</td>
<td>7</td>
</tr>
<tr>
<td>Reduction and Oxidation</td>
<td>8</td>
</tr>
</tbody>
</table>

**Teaching Methodology & Evaluation**

Lecture Style, Use of Overheads, and PowerPoint.

**Course Evaluation**

Written quizzes and Exams, Homework.

**Grading**

- There will be impromptu quizzes, homework assignments, and **three in-class exams**.
- If a student is absent from a quiz or an exam, the student will earn zero points for that quiz /exam.
- A brief literature report (written and oral) on a recent inorganic chemistry publication found in *Journal of the American Chemical Society, Journal of Biological Inorganic Chemistry, Journal of Physical Chemistry* or *Inorganic Chemistry* must be presented by each student during the final week of class.

The final grade for this class will be based on the following:

**Grading Scale:**

<table>
<thead>
<tr>
<th>Final Grade</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams</td>
<td>300</td>
</tr>
<tr>
<td>Homework/Quizzes</td>
<td>100</td>
</tr>
<tr>
<td>Literature Report</td>
<td>100</td>
</tr>
<tr>
<td>Final Exam</td>
<td>200</td>
</tr>
</tbody>
</table>

Total: 700 points

**Course Schedule**
DATE | Exams | Approximate Coverage
---|---|---
Feb. 4th | Exam 1 | Ch. 1, 2 & 12
March 11th | Exam 2 | Ch. 13, 3. 4, & 6
April 15th | Exam 3 | Ch. 5, 7, & 8
April 26th-30th | Final Exam | Ch. 1-9, 12 & 13 (COMPREHENSIVE)

** Exact coverage of each exam will be announced by instructor before the exam **

**Course Policies**

Missed Exams: It is your responsibility to notify me promptly if you will miss a test. If you are excused, the final grade replaces the missed exam grade. UNDER NO CIRCUMSTANCE IS A MAKE-UP EXAM GIVEN!! Unexcused absences from tests result in a grade of zero.

Attendance Policy: ATTENDANCE IS TAKEN DURING EACH CLASS MEETING. IT IS YOUR RESPONSIBILITY TO WRITE YOUR SIGNATURE NEXT TO YOUR NAME ON THE DAILY ROLL SHEET. IF YOU FAIL TO DO THIS, YOU ARE ABSENT—No exceptions. THREE (3) UNEXCUSED ABSENCES FOR THE CLASS MAY RESULT IN YOUR RECEIVING A GRADE OF "F", ACCORDING TO UNIVERSITY POLICIES.

Final Exam: The final examination covers all topics in course.

Students with Disabilities: Students with disabilities that fall under the Americans with Disabilities Act should follow the following procedures: 1) Provide documentation of your disability to the FAMU student disability resource center; 2) During the first week of class, provide your instructor with a statement from the FAMU student disability resource center indicating that you have registered with FAMU student disability services. The statement should indicate the disability and the special accommodations that will be required.

Academic Honesty: It is your responsibility to know the university’s policy on academic/intellectual dishonesty (Section 6C3-2.012(10)(s) of the FAMU Student Handbook). Any student caught cheating in any manner is awarded the grade of F. No warnings are given; it is your responsibility to do your own work. All persons collaborating in cheating will receive the grade of F.

Non-discrimination policy statement: It is the policy of the University to assure that each student is permitted to attend classes in an environment free from any form of discrimination, including race, religion, color, age, handicap, sex, marital status, national origin and veteran status.

Procedure for Resolving Faculty-Student Conflict:
- Student first attempts to resolve issue with instructor
- Student submits written notification of problem to chair.
- Chair forwards student letter to instructor.
- Instructor responds in writing to chair.
- Chair meets with instructor and/or student if necessary.