

# CHEM 899P – Special Topics: Chemical Management & Safety for High School Teachers (online – Spring 2010)

**1 credit hour**

**Online Format**

**(January 25 – March 5, 2010)**

**Instructor:** Christopher L. Exstrom

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**Required textbook:** None. All informational materials and internet references will be provided by the instructor

**Technical Requirements and Competencies.** Course delivery will be made entirely through Blackboard. A broadband internet connection (DSL, cable, etc.) is recommended but the instructor will make every effort to keep the size of course documents down to accommodate those with dial-up internet connections. Course documents may be in Adobe PDF or Microsoft Office (Word, Excel, Powerpoint) formats. Links to downloadable free viewers will be provided. It is expected that you are able to download documents and open them in their appropriate programs. Quizzes and exams will taken on Blackboard. Familiarity with standard online form functions – radio buttons, check boxes, fill-in blanks, etc. – is required.

**Course Description.** This course addresses chemical management and safety issues that are commonly encountered in high school chemistry laboratories and stockrooms. Of immediate concern is the identification of high-risk legacy chemicals that exist in many high schools. Chemical principles behind the hazards of high-risk and incompatible chemicals are discussed. Additional topics include chemical inventory storage, purchasing, chemical hygiene plans, and waste collection information.

**Course Learning Structure.** Course content is divided between three modules:

**Module 1 – Getting to Know Your Chemical Inventory**

(hazard rank factors for chemicals, classification and chemistry of high-risk chemicals)

**Module 2 – Chemical Storage and You!**

(individual chemical storage, inventory storage plans, chemical purchasing)

**Module 3 – Chemical Handling and Disposal**

(chemical hygiene plans, safety equipment, waste collection information)

Within each module, the following types of assignments must be completed:

**Readings** – web-based materials, instructor-generated supplemental handouts, and internet resources

**Discussion Board** – You will be required to contribute at least one response to each instructor-initiated thread pertaining to questions or issues within each module. The instructor will initiate one thread per module. A qualifying response must demonstrate a thorough analysis of the issue or question at hand. Your initial response will be graded on a scale of 1-to-5 points per thread. The instructor's role in discussion activities will primarily be that of a moderator, as threads will typically address open-ended issues and questions. Specific questions about the understanding of course material should be e-mailed directly to the instructor.

**For each module, you must complete the discussion board response before requesting access to that module's quiz.**

Your grade will be based on the number of accumulated points as a percentage of the total possible number of points according to the distribution given below:

### **GRADING DISTRIBUTION\***

Quizzes (3)	39% (13% each)
Discussion Board	11%
Inventory Report & Storage Plan Project	20%
Final Exam	30%

**Quizzes.** Three quizzes of 30-minute to 1-hour lengths will be given on Blackboard. Formats may include multiple choice, short answer, and possibly some longer essay problems. Each quiz will cover one module.

**For each module, you may request access to its quiz after completing the module's discussion board response. E-mail the instructor to request access to a quiz. He will e-mail you the password needed to access the quiz. Once all three quizzes are completed, you may request access to the final exam. Again, e-mail the instructor, and he will give you the password. Any quiz or exam access prior to consent from the instructor is considered an academic integrity violation and will result in a failing course grade.**

<b>QUIZ COMPLETION DEADLINES:</b>	<b>Quiz #1</b>	<b>7:00 am CT, Monday, February 15</b>
	<b>Quiz #2</b>	<b>7:00 am CT, Monday, February 22</b>
	<b>Quiz #3</b>	<b>7:00 am CT, Monday, March 1</b>

**Inventory Report & Storage Plan Project – DEADLINE: 5:00 pm CT, Friday, March 5.** Record the chemical inventory (substances and quantities) for your classroom and stockroom. This pertains **only** to areas and chemicals that service chemistry (high school) or science (middle school/junior high) courses. You will be provided with a spreadsheet on which to record inventory data. In a separate report, prepared using a word processor (10-12 point font, 1" paper margins), describe any potential hazards associated with legacy chemicals and current storage conditions for the entire chemical inventory. Propose and describe an updated storage plan that is consistent with the principles discussed in Module 2 and the Flinn Storage Classification system. The minimum report length expectation is 750 words.

**NOTE:** *This project is an educational exercise only, much like a lab experiment or term paper in other courses. This project does NOT serve as or replace official inspections by federal or state agency representatives, emergency responders, insurance companies, or certified waste management/disposal personnel. Information from your report will be treated by the instructor as confidential.*

**Final Exam – COMPLETION DEADLINE: 5:00 pm CT, Friday, March 5.** After all quizzes and discussion board responses have been completed, you make take the course final exam. This will be given on Blackboard and have a similar format to the quizzes but the exam will be longer. *This final exam also serves for Chemical Management & Safety Awareness Certification for the Nebraska School Chemical Cleanout Campaign created and administered by Keep Nebraska Beautiful.*

## CHEM 899P Course Material Outline and Objectives

Topic Area	Reading Coverage	Broad Objectives
Chemical Hazard Rank Factors	Module 1	<ul style="list-style-type: none"> <li>• Understand the concept of numerical hazard or risk factors associated with specific chemicals</li> <li>• Understand the fundamentals behind the National Fire Prevention Association and King County Hazardous Waste Management rating systems</li> </ul>
Classification and Chemistry of High-Risk Chemicals	Module 1	<ul style="list-style-type: none"> <li>• Understand the primary hazards and chemical properties of high-risk carcinogens and toxins -- mercury, cadmium, arsenic, chromate compounds, cyanides, chlorinated organic solvents, formaldehyde, phenol</li> <li>• Understand the primary hazards and chemical properties of high-risk corrosives -- Nitric acid, perchloric acid, hydrofluoric acid, ammonium hydroxide, Group 1 hydroxide salts, bromine</li> <li>• Understand the primary hazards and chemical properties of high-risk water- and air-reactive compounds -- Group 1 elements, phosphorus, calcium carbide, lithium aluminum hydride, sodium dithionate</li> <li>• Understand the primary hazards and chemical properties of high-risk explosives -- nitro-organics, azides, perchlorate compounds, organic peroxides, peroxidizable solvents</li> </ul>
Chemical Inventory Management	Module 2	<ul style="list-style-type: none"> <li>• Understand the types and functions of storage containers for individual gases, solids and liquids</li> <li>• Understand and apply the Flinn Storage Classification System to avoid storing incompatible chemicals together</li> <li>• Understand the various factors involved in planning chemical purchases – anticipated amounts to be used, hazards, storage capacity</li> </ul>
Chemical Handling and Disposal	Module 3	<ul style="list-style-type: none"> <li>• Understand the role and basic components of a chemical hygiene plan</li> <li>• Understand the functions of primary laboratory safety equipment</li> <li>• Understand chemical spill plans and the use of appropriate kits and chemicals for spill cleanups</li> <li>• Understand the fundamentals of chemical waste collection as they apply to the high school laboratory and stockroom</li> </ul>