Science of Contemporary Issues
NATS 1213
Spring 2006

Instructor: Dr. Verl Murugaverl
Department of Chemistry and Biochemistry, Olin 205 A.
303 871 2941, bmurugav@du.edu

Lectures: M, W, F 11:00 to 11:50 in Olin 205

Subject: ***Basic concepts of Environmental toxicology and Chemistry***

Course Description:

This course is designed to introduce students to **basic principles of toxicology** and their applications in understanding xenobiotics induced toxicity. Basic principles of chemical bonding, shapes of molecules and functional groups will be reviewed in the initial lectures to provide a foundation for the reminder of the course. Following this, background in basic toxicological concepts such as dose response, entry, mode of action, and metabolism of xenobiotics will be covered. The reminder of the course will introduce the students to specific environmental problems.

Lecture Text:

There is no single textbook currently available that adequately matches content of this course. Material covered in this course can be found in a variety of textbooks and web sites relating to toxicology, biochemistry and environmental chemistry. Topics covered in the lecture will be made available on the blackboard on short-term basis.

Exams:

a) There will be two one-hour exams and a final exam. <u>There will not be any make up exams under any circumstances</u> and your final grade for the course will be determined by your performance in <u>all the three exams</u>. If your score in the final exam is higher than any of the scores in the one-hour exams, the final exam score will replace the lowest score.
b) If anyone for any reason had to take the exam out side of the scheduled time, arrangements need to be made with the instructor at least one week advance. The instructor reserves the right to deny or accept the request and also to alter the exam. Often these non-scheduled exams are much harder than the regularly scheduled exams.
c) All exams will be comprehensive encompassing; lecture materials and laboratory material.

Grading: The break down of the course grades is as follows:

Exam 1		200 pts
Exam 2		200 pts
Final Exam		200 pts
Laboratory		200 pts
TOTAL	800 pts	

Tentative Lecture Schedule

	Topic	Assignment
March 27	**Introduction**, course requirement Environment, good life through chemistry, Politics, and Toxicology terminology	
March 28, 31 April 3 April 5, 7	**Fundamental concepts in chemistry**: Lewis dot symbols, electronegativity Chemical bonding Molecular shapes, polarity	
April 10 April 12 April 14, 17 April 19	Functional groups **Pharmacological concepts**: Determination of toxicity and Dose-Response Dose-response Plots and relationships Application of dose-response curves	
April 21	**Exam 1**	
April 24 April 26 April 28 May 1	**Mode of Entry into Human Body**: Comparison of routes of entry Translocation and Storage of Xenobiotics Concentration Gradient and Cell Membranes Cellular uptake	
May 3, 5 May 8	Enzymes, Receptors, Substrate and Storage of Toxins **Metabolism and elimination of xenobiotics**: Functional Group Modification and cytochrome P-450	
May 10	Conjugation, Glutathione Mode of action	
May 12	**Exam 2**	
May 15 May 17, 19 May 26, 31 June 2	**Environmental Pollution**: Air pollution Sources Photochemical smog Depletion of stratospheric ozone Green house effect	
June 5 (Monday)	**Final Exam (10:00 to 11:45 a.m.)**	

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Instructor: Dr. Balasingam (Verl) Murugaverl
Olin, Room 205A
Phone 303-871-2941

T.A.'s: Brooke Swanson and Marian O'Conner

Mailboxes: Chemistry Department Office: Olin202, x12436

Lab Location/Times:

Section 3	Tues. Afternoon	2:00-5:00 pm	BE 15
Section 4	Wed. Afternoon	2:00-5:00 pm	BE 15
Section 5	Mon. Evening	7:00-10:00 pm	BE 15
Section 6	Tues. Evening	7:00-10:00 pm	BE 15

You are required to do ***EVERY*** lab. You must attend the lab section you are registered in. There are **NO MAKE-UP LABS.** If you miss your lab section for any reason, you must make it up in the same week the lab is offered.

- If you cannot make your scheduled lab time you ***MUST*** get permission from your Teaching Assistant before changing.
- All lab assignments must be finished and handed in to the Teaching Assistant at the end of each laboratory period.
- Your comprehension of the material covered in the labs will be tested via the exams.

Laboratory classes starts on the week of April 3, 2006.

Laboratory Schedule

1. Chemical formula and structures
2. Determination of concentrations of zenobiotics in aqueous systems.
3. Dose-response and statistical methods
4. Determination of partition coefficient and concentration of zenobiotics in water/octanol systems.
5. Transportation of chemicals through membranes.
6. Chemical reactions in the detoxification process.
7. Electromegnatic radiations: IR and green house gases.

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Class Schedule (The class will follow this schedule fairly closely, but I reserve the right to change as necessary)
REVISED 10/11/05

Week	Topics	Chapter	Homework (DUE EACH FRIDAY)	Laboratory
Sept 12 14 16	Course introduction, expectations, grading The basics: chemistry, scientific method, measurements, conversions	D1	Memorize elements 1-36, symbols and names	No lab this week
Sept 19 21 23	The basics: matter, periodic table, elements and compounds **QUIZ 1**	D2	D1: 1.23 – 1.28, 1.37 – 1.40, 1.53 – 1.65, 1.71, 1.73, 1.75 – 1.79; CT 1,3	How to Lie With Statistics
Sept 26 28 30	The basics: atoms, electrons, protons, neutrons **QUIZ 2**	D3	D1 2.11 – 2.12, 2.15 – 2.24, 2.27 – 2.28; CT 4	Material Safety Data Sheets
Oct 3 5 7	The basics continued: valence electrons, info on the periodic chart Help session for 1st exam	D4	Memorize list of ions; D3: 3.15–3.32, 3.51, 3.53-3.54; CT 1	Chemical Bonds and Molecular Models
Oct 10 12 14	Guest lecture: *Dr. Phyllis Bronson* **WEDNESDAY! 1st comprehensive exam** The basics: chemical formulas, chemical bonds		**Homework delayed one week**	Gatorade
Oct 17 19 21	The basics: molecular shapes, Lewis structures Organic chemistry: intro, functional groups, nomenclature, alkanes, alkenes **QUIZ 3**	D11	D4: 4.29–4.30, 4.33–4.48, 4.53–4.56; CT 2; Memorize list of organic compounds	Mystery Lab
Oct 24 26 28	Organic chemistry: energy in society, petroleum refineries, renewables, sugars, natural oils Guest Lecture: *Biomass* **QUIZ 4**	D12	**No homework this week**	Chromatography
Oct 31 Nov 2 4	Organic chemistry: drugs and pharmaceuticals Guest lecture: *Air Quality Measurement* **QUIZ 5**	CIC4	D11: 11.19–11.21, 11.24, 11.31–11.52 (odd); CT 1; Memorize list of functional groups	Soil Moist – The Principle of Disposable Diapers
Nov 7 9 11	Organic chemistry: applications in the real world Help session for 2nd exam **FRIDAY! 2nd comprehensive exam**	CIC10	D12: 12.17-12.20, 12.21-12.30(odd), 12.49–12.52	Soaps and Fats
Nov 14 16 18	Biochemistry basics: the genetic code, proteins, the chemistry of diseases **QUIZ 6**	CIC7	TBD	Help Session for Final in all labs
Week of Nov 21	**Final examination**			