

MIT OpenCourseWare
<http://ocw.mit.edu>

SP.235 / ESG.SP235 Chemistry of Sports
Spring 2009

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.

SP.235 Chemistry of Sports or Understanding how exercise affects your body chemistry

Patti Christie

Experimental Study Group (ESG)

Chemistry and Biology Lecturer

Steve Lyons

Professional Triathlete

SP.235



Photo courtesy of Floyd Lozano.
Used with permission.

After the Olympic distance
race last year
Alex Slocum, Chris
Carper, Steve Lyons and
Patti Christie



Photo by Patricia Christie.

At the start of the Half-Iron man
last year at Mooseman, Alex is in
there somewhere, Chris is farther
along the beach.

Goals of the Course

- Apply the principles of chemistry to studying sports
- These principles include:
 - Atomic and molecular interactions
 - Thermodynamics
 - Acid/base chemistry
 - Bonding
 - Electrochemistry
- There will be weekly reading of scientific literature related to the topic of the week

Goals of the Course

- Understand the chemistry of their own biological system through observations written in a training journal
- Study the science of a triathlon (swim, bike, run) from a molecular/chemical/biological point of view
- Improve your own personal fitness level by training for the Mooseman triathlon (either Olympic distance or Half-ironman) and earn PE points or by maintaining your own exercise program

PE Points details

- Option to earn PE points
 - Do the Mooseman Triathlon
 - Olympic distance, 2 points,
 - Half-ironman - 4 points
 - Participate in twice weekly supervised workouts
 - Earn 2 PE points
- Anyone interested?

Class Website

This will have the pdfs of the powerpoint presentations, reference papers to read and helpful information

Syllabus

Week 1 -Wednesday February 6th, 2008

- Introduction
- Talk about the triathlon –
 - ○ do some basic ideas about training
 - ○ present a plan for the novice triathlete
 - ○ make your training journal
- Sign up for the fitness evaluation at the Z center with the personal trainer
 - Explain the tests that are going to be done

Syllabus

Week 2-Wednesday February 13th, 2008

- Chemistry review
 - Anatomy and Physiology of the Basic systems of your body: focusing on Cardiovascular, Respiratory, Nervous system, skeletal, muscular

Week 3-Wednesday February 20th, 2008

- Training your body:
 - Lungs
 - Muscle
 - Repair and maintenance of body

Week 4-Wednesday February 27th, 2008

- Nutrition
- fueling you body
- picking the best training food, calories
- How to determine how much you need to eat each day

Syllabus

Week 5-Wednesday March 5th, 2008

- repair and maintenance
- how to rebuild your body after a workout
- Glucosamine and other joint lubricants.

Week 6-Wednesday March 12th, 2008

- Epigenetics
- Reprogramming your biology through gene regulation.

Syllabus

Week 7-Wednesday March 19th, 2008

- Science of swimming
 - wetsuit making,
 - how chlorine affects you (why do you wear goggles, how does your hair turn green), chlorine removal products,
 - swimming in cold vs. warm water
 - mechanics of swimming (guest speaker Bill Paine, coach of MIT masters swimming)

Week 8 -Wednesday March 26th, 2008

- SPRING BREAK - NO CLASS – continue training

Syllabus

Week 9-Wednesday April 2nd, 2008

- Science of running AND shoes
 - Correct form, how its important to minimize damage.
 - Hopefully including a guest speaker to come and talk to us about how running shoes are designed and manufactured

Week 10- Wednesday April 9, 2008

- Science of bicycles
 - including a field trip to a bicycle shop

Syllabus

Week 12-Wednesday April 23, 2008

- Chemistry of cheating
 - illegal substances and how they test for the
 - Affects on your body: Anabolic steroids, EPO

Week 13-Wednesday April 30th, 2008

- Legal means of manipulating your body
- Examples include: Glutamic acid, isoleucine and lysine – used by athletes to enhance performance

Syllabus

Week 14-Wednesday May 7, 2008

- Triathlon logistics
- get a guest speaker to talk about doing a triathalon

Week 15-Wednesday May 14, 2008

- Chemistry in other sports,
- Do another set of testing to see how improved your system is.
- Course evaluation material

Syllabus

Week 16 - week of Finals (May 19th)

- continue training

Week 17 - week of May 26th

- continue training

Week 18 - June 7 and 8 -Race day!

Mooseman Triathlon

- <http://www.timbermantri.com/mooseman/>
- June 7- International (Olympic) Distance
 - 1.5K (.93 mile) fresh water lake swim in pristine Newfound Lake
 - 44K (27.25 miles) spectacular, scenic one-loop course on the shores of Newfound Lake
 - 10K (6.2 miles) Run is a scenic out and back course along the shores of Newfound Lake with rolling hills, passing by the majestic Granite Ledges
 - Fee is \$90.00
- June 8 - Half Iron Distance
 - 1.2 mile fresh water lake swim in pristine Newfound Lake
 - 56 mile spectacular, scenic two-loop course on the shores of Newfound Lake
 - 13.1 mile Run is a scenic double out and back course along the shores of Newfound Lake with rolling hills, passing by the majestic Granite Ledges
 - Fee is \$175.00

Mooseman Triathlon

- Who wants to do it?
- Need to get the forms filled out and back to Patti
- Talk about logistics after class with those who want to do it

Not interested in the Triathlon?

- You can still participate in the course, but you need to maintain a physical exercise program throughout the semester.

Grades

- Pass/Fail 6 unit seminar
- Meets 2 hours a week on Wednesdays from 3 to 5 pm
- PE Points option if anyone is interested

Training Journals

- Part of research is to document your experiments
- Since you are using your own body as the experimental device, you need to document how the experiment is going
- You will keep a training journal throughout the term.

Training journals

- Things that you want to think about for your training journal
 - Think about the entire term as preparation for the race in the first weekend of June
 - Write down distance, time, intensity of each of your workouts for each day
 - Indicate how the workout went for instance felt great, was unable to focus
 - Keep track of your eating habits and how it relates to your physical performance
 - Keep track of the amount of sleep you get
 - Keep track of hydration
 - Review on a weekly basis to gauge how your training is going

Make your own training journal

- Class activity

Potential Training schedules

- These are all posted on the class website:
- They are from the book Essential Week-by-Week Training guide by Matt Fitzgerald
- You need to read chapters 1 and 2 and then the specific chapter/fitness level for the event you are training for.

Fitness Testing

- One of the goals of the course is to improve your fitness over the term
- To help gauge this, we are going to do a pre- and post-course fitness tests
- These tests are going to be done at the Z center and are called Fitness Assessments

Fitness Assessment

- What will be done:
 - Age
 - Resting heart rate
 - Resting blood pressure
 - Weight
 - % body fat using calipers to measure skin folds
 - for females - tricep, hip and thigh
 - For males - chest, abs and thigh
 - Flexibility - sit and reach
 - Push-ups
 - Aerobic conditioning VO_2 - bike test

Measuring blood pressure

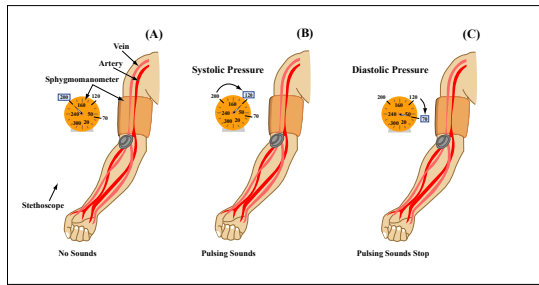


Image by MIT OpenCourseWare.

- Pressure in the cuff is increased to close both the arteries and veins. No sounds is audible
- Pressure in the cuff is gradually lowered until the sound of a pulsing flow of blood through the constriction in the artery is heard. At this time, pressure in the cuff is just below the peak systolic pressure in the artery
- Pressure is further lowered until the sound becomes continuous. At this time, the cuff is just below the diastolic pressure in the artery.

Fitness Assessment

- Goal is to look at your baseline fitness and see if you can improve it over the course of the term
- This is accomplished through a regular exercise program

Fitness Assessment

- Signing up for the fitness assessment: budget on 45-60 minutes

- Need to fill out the fitness assessment form before you leave today.