The class will serve as an overview of current hot topics and modern methodologies in biochemistry before graduation. It is intended to prepare senior biochemistry majors for future careers or graduate studies in experimental biochemistry. **Three hours of course credit will be awarded for completion of this class.** Students will consider topics of current interest in biochemistry and read original scientific publications. In addition, students will research a hot topic in biochemistry and compose an original (10-page) mid-term paper that considers a current state of the problem, evaluates recent publications on the topic, and discusses the importance of the work to modern society or everyday life.

The **TEXTBOOKS** for this class are:


The **FINAL GRADE** for the class will derive from four components:

1. Midterm exam and quizzes **150** (40%)
2. Comprehensive final exam **150** (40%)
3. Research paper **100** (20%)
**TOTAL 400 POINTS**
<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Lecture topics</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug 24-28</td>
<td>Recombinant DNA technologies</td>
<td>V&amp;V, Chapter 5; N&amp;B, Chapter 11; lecture notes</td>
</tr>
<tr>
<td>7</td>
<td>Oct 5-9</td>
<td>Structural Biology</td>
<td>“Structural Genomics” Nature Structural Biology, 2000, vol. 7, No 11s</td>
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<td></td>
<td>Oct 9 Invited</td>
<td>Invited speaker Dr. Susan Schroeder: NMR in Biology</td>
<td></td>
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### Oct 23


### MIDTERM EXAM

#### Oct 26-30

**Antibiotic crisis and search for alternatives.**

Oct. 30 *Invited speaker Dr. Robert Cichewitz: “Natural Products in Drug Discovery”*


#### Nov 2-6

**Signal transduction and cancer**

Nov. 6 *Invited speaker Dr. Ann West: Two-component signal transduction*


#### Nov 9-13

**Antibodies and Immunochemistry**

V&V, Chapter 35


#### Nov 16-20

**Molecular Imaging**


Herman B. Applications of fluorescence microscopy. P.47-55.

#### Nov 23

**HIV life cycle and therapies.**


#### Nov 30-

**Stem Cell Technology**

Park I-H, Zhao R, West JA*et al.*: Reprogramming of human somatic cells to pluripotency with
Dec 4

Dan Ferber, Science, Vol 288, Issue 5467, 792-794
Carpenter MK, Frey-Vasconcells J, Rao MS:
Developing safe therapies from human pluripotent

16 Dec 7-11 Tissue engineering Science, 2002 Feb 8, 295: pp. 1004-1005, 1009-1016,

17 Dec 18 FINAL EXAM 8:00 -10:00 am
Topics for the mid-term paper

1. **Biochemistry of love**

   What is love, really? The initial feelings of attraction are heavily associated with the β-phenylethylamine (PEA) norepinephrine. Norepinephrine triggers the breakdown of glycogen and triacylglycerols, which provides the body a boost of energy. Explore the biochemistry of these reactions.

2. **DNA vaccines**

   It is possible to introduce into animals DNA that encodes for proteins of a disease-causing organism. An animal so inoculated expresses those genes. Recent clinical trials showed that DNA vaccines could indeed protect an animal against future infection with a live pathogen. Explore the mechanism behind DNA vaccination.

3. **Genetically modified foods and their detection**

   Genetic engineering is widely used to produce plants and animals with better nutritional values. More recently, plants and animals have been altered to contain completely new traits. Explore new advances in genetic engineering, techniques and pros and cons for genetically modified foods.

4. **Gene chips**

   The development of microarray technology and its recent culmination in the gene chip allows researchers to monitor the presence of thousands of genes in a fraction of the time previously required. This technology revolutionized gene expression analyses. Explore the recent advances in gene chips and their impact on medicine.

5. **Biochemistry of hibernation**

   Hibernation is one of the many mysteries of modern science. Hibernating animals can lower their body temperature to 2°C and their heart rate to 2 beats per minute, while reducing their intake of oxygen to 1/50 of their waking levels. All of this occurs without consuming food and can last for as long as 6 months. Current progress in biochemistry and genetic research has finally started to enable our knowledge to catch up to our curiosity in this field.

6. **HIV and AIDS lifecycle and therapies**

   As of the end of 2007, 36 million people were living with HIV/AIDS, growing at a rate of approximately 16,000 infections each day. Africa has 11.6 million AIDS orphans. Analyze what is known about HIV and current advances in development of treatments.

7. **Immunotoxins**
By tethering therapeutic agents to antibodies, "magic bullets" could be produced that specifically bind and deliver the therapeutic agent to sick or malevolent cells, having little or no effect on healthy cells in the body. This works because antibodies are proteins that have exquisite binding selectivity, which can be produced to bind to only one targeted protein, while ignoring a multitude of other proteins they might come in contact with.

8. **Molecular motors**

Molecular motors are involved in many important biological tasks. They shuffle chromosomes around during cell division; they move organelles and neurotransmitters around and inside brain cells, they help microbes move and they cause the motion of muscles. Human technology would also benefit greatly from being able to produce molecule-sized motors. Explore the different families of molecular motors and the great benefits that are reaped from them.

9. **Mad-cow disease and prions**

In 1986, England and the rest of the world were shocked to learn that a sheep infection had reached its way to the human populace. Even more staggering was the apparent nature of the disease. It was not caused by a bacteria, virus, or retrovirus. Instead, this new threat to humanity appeared to be caused by a self-replicating protein. Biochemistry of prions is a hot topic with significant ramifications.

The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with the instructor as early in the semester as possible. Students with disabilities must be registered with the Office of Disability Services prior to receiving accommodations in this course. The Office of Disability Services is located in Goddard Health Center, Suite 166, phone 405/325-3852 or TDD only 405/325-4173.

Each student should acquaint her or his self with the University's codes, policies, and procedures involving academic misconduct, grievances, sexual and ethnic harassment, and discrimination based on physical handicap.

Students engaging in academic misconduct (including cheating, plagiarism, and any other action that may improperly affect evaluation) will be subject to sanctions in accordance with the Norman Campus Academic Misconduct Code.

The instructor reserves the right to change this syllabus by modification, addition and/or subtraction of assignments, course content, due dates, and grading policies, as she deems necessary.