

BIOLOGY 0848. DNA: Friend or Foe – Section 003 (3.0 credits).
Spring Semester, 2018. 9:00 AM - 9:50 MW. 110B Science Ed and Res Ctr.



DNA: Friend or Foe is a General Education course. First-year students who first enroll at Temple University at any time after the Fall 2008 semester must complete the GenEd curriculum, which consists of courses in 9 different areas. However, core students (who entered Temple before Spring 2009) can use Gen Ed courses to satisfy their Core requirements. DNA: Friend or Foe is classified as a Science B course in the core curriculum. Gen Ed students cannot take core courses such as Human Biology at Temple to satisfy their Gen Ed requirement.

There are no prerequisites or co-requisites for Biology 0848. This course cannot be used for credit toward a major in Biology.

DNA: Friend or Foe is an introduction to the principles of heredity and the genetic material that is responsible for heredity. DNA: Friend or Foe is an inquiry-based course that will link traditional genetics and genetic engineering concepts of modern biology in order to understand how modern biology affects our daily lives, and how it may impact future generations. This course will develop critical thinking, promote intellectual curiosity in the life sciences, and stimulate student-student interactions. By using tools of investigative science, students will examine basic concepts and applications of recombinant DNA technology. Topics will include DNA in modern forensic analysis, basic scientific and sociological aspects of human genetic information including genetic polymorphisms and disease, biological terrorism, embryonic and adult stem cells and therapeutic cloning, *in vitro* fertilization and pre-implantation genetic analysis, ethics of human and animal cloning, genes and behavior, pharmacogenetics and rational drug design, proteomics, and emerging infectious diseases. Other topics will include human gene therapy, susceptibility genes for neuropsychiatric and neurodegenerative disorders, plant biotechnology including insect-resistant plants, genetically modified foods, and bioremediation and phytoremediation. Finally, bioethical considerations of genetic information will be explored in detail throughout the course.

Labs for DNA: Friend or Foe meet on Fridays at 9 AM. All labs will meet in Room 151 of the Biology Life Sciences Bldg. (SW quadrant), 12th and Norris Streets. Entrance is on 12th Street or from Bell Tower side with a Temple ID card. Labs will meet once a week for one hour and 50 minutes in room 151 Biology Life Sciences Bldg. during the semester. However, the first lab of the semester will meet during the second week of the spring semester. Mandatory safety training will be held during your first lab. Please remember that attendance for lab is **mandatory**. If you miss the Thursday morning lab and wish to make up the lab t please contact Dr. Craig Brumwell. Dr. Brumwell is the lab coordinator for DNA: Friend or Foe. He will teach both lab sections for the course. His office is Room 248K Biology Life Sciences Bldg.

Instructor: Gregory Smutzer, Ph.D. Office: Biology Life Sciences Building, Room 352 (not 352A), Biology Life Sciences Building, Temple Main campus. Phone: (215) 204-1236, e-mail: smutzer@temple.edu.

Textbook: Four chapters from Johnson's Human Biology textbook in loose leaf format will be the textbook for the course. In addition, a reading assignment on DNA fingerprinting is posted on the class website.

Grading: This course has both lecture and laboratory component. The lab will make up 26% of the course grade.

The lecture component will comprise 74% of your final grade. For the lecture component, there will one midterm exam during the session and a final exam. Both exams will have almost equal weight, and both exams will comprise 69% of your final grade. Exams will be multiple-choice, true-false and discussion questions. The final exam will **NOT** be comprehensive.

The remaining 5% of your lecture grade will be from a genetics asst., an in-class assignment, and two announced quizzes. Finally, remember that a grade of C minus or better is required to receive credit for this course.

Mid-term exam	32.0 %	60 to 65 MC and TF and short answer questions.
Final Exam	37.0 %	(not comprehensive, approximately 120 MC and TF questions)
Announced quizzes	2.0 %	(Usually two quizzes per semester)
Genetics Assignment	2.0 %	Problem Set due Monday following Spring Break.
In class asst.	1.0 %	(One in-class assignment per semester, on first class after midterm)
Lab grade	26.0 %	(Attendance at labs is mandatory)

Grading Scale [curve] for Final Grade. Incomplete grades (I grades) are not normally given in this course. If you cannot complete the course, you will need to contact the lecture instructor for receiving an incomplete grade.

For test grade, take your score, and divide by the total number of points x 100. Plus-minus grading will be used for this course.

88% - 100%	A
78% - 87.9%	B
55% - 77.9%	C
50% - 54.9%	D
<50%	F

Extra credit. Extra-credit cannot be extended to individual students. Extra-credit questions for all students will be included in the lecture exams unless excessive talking occurs during lecture.

Fire Alarm during exam. In case of a fire alarm, place your exam face down on your desk, and immediately exit the room.

Lecture Attendance. Attendance at the lecture is **strongly** recommended.

Makeup exams: If the hourly exam is missed due to a medical or legal reason, you **MUST** take the exam during the two hour final exam time – *immediately* after you have completed the lecture exam. (**Monday, May 7, 2018 between 8:00 AM and 10:15 PM**). **There will be no exceptions.** In order to take a make-up exam, written documentation will be required during the final exam time. Written documentation includes medical, dental, and legal excuses from your physician, dentist, or lawyer. Notes from PAs, chiropractors, auto repair technicians, being a contestant on American Idol, public transit problems, and podiatrists are generally not accepted.

I will need a copy of the documentation for my files. **PLEASE UPLOAD YOUR EXCUSE TO OWLBOX BEFORE THE FINAL EXAM ON May 3rd.** If a medical, dental, or legal excuse is not presented by the student, then a missed exam will result in a grade of zero percent. **All makeup exams will be multiple-choice, true-false, short answer, and completion questions. Makeup exams will include very few true-false questions, and have a limited number of multiple-choice questions.**

Withdrawals: Monday, January 29th is the last day to withdraw from a course (**without** a W grade). Wednesday, March 21st is the last day to withdraw from graduate and undergraduate courses (**with** a W grade).

Makeup Quizzes: There will be no makeup quizzes, or makeups for the two in-class assignments. Please present a valid excuse for any missed quizzes or in-class assignments, and your grade for the missing quiz or assignment will be prorated. A committee of myself and your lab instructor will determine the appropriateness of all excuses.

Final Exam: All classes end Monday, April 30. Tuesday, May 1 and Wednesday, May 2 are study days **Final exam for lecture is on Monday, May 7th from 8 AM to 10 AM.** The final exam for lecture will **not** be comprehensive. The final exam will cover the second half of the course, along with the reading assignment and online video. We cannot administer the exam earlier (or later) than the scheduled date for anyone who is registered for the course.

Office hours: I will be in Room 352 BLS on Mondays, Wednesdays, and Fridays from 2 to 4 PM during the semester. Please e-mail me if you wish to come by at another time.

Cell Phones: SERC 110B is a Quiet Room. The first room in every building is a quiet room between the hours of 7 AM and 7 PM. Please have consideration for your fellow students. Please turn off all cell phones and electronic devices before the start of each class. Also, please start up any laptop computers before class starts. In addition, try not to leave and re-enter the classroom during lecture. The “Cell Phone Curve” will be in effect from Wednesday, January 18 until the end of the semester.



Canvas and Problem Sets: Depending on the subject matter, most multiple-choice questions with answers will be posted onto the Temple Canvas site (<http://tuportal.temple.edu>) to help you study. To reach Blackboard, you must use the link mentioned above. You **MUST** have a temple.edu e-mail address to access Blackboard. Your **USER NAME** in your e-mail address is your logon name. Please note that these problem sets are supplemental, and are to help you learn. We won't go over the multiple-choice questions in class. If you are unsure of any answers, please ask in class or during office hours. You can also post any questions on the **DISCUSSION BOARD** in the communication section (button to left of screen) of **Canvas**. Please type in the entire question so that I can check your answer. You can post

questions anonymously. Exam questions will likely include questions from the multiple-choice questions.

Academic Assistance.

The math-science center is located on the second floor of 1800 Liacouras Walk, extension 1-8466. This center provides instruction for the basic sciences, and preparation for exams. In addition, your teaching assistant can help with lecture or lab questions.

Temple e-mail account. You can obtain an e-mail account online. Go to: <http://www.temple.edu/cs/>, and press "activate account." You can instantly obtain a Temple e-mail account.

Accommodation.

Any student who has a need for accommodation based on the impact of a disability should contact Disability Resources and Services at 100 Ritter Annex (003-00), 1301 Cecil B. Moore Ave., Philadelphia, PA 19122. The phone number is 215-204-1280. Accommodations for exams and quizzes will be made for students with documented disabilities.

Academic Integrity

All relevant Temple University policies regarding Academic Integrity must be followed. These policies include no cheating, no plagiarism and reporting any knowledge thereof. Plagiarism is the act of presenting the intellectual work of others as if it were one's own. Please consult the Student Handbook, or the appropriate web-page (<http://oll.temple.edu/ih/writing/plagiarism2.htm>) for further information.

Student Learning Outcomes.

The student will demonstrate knowledge of fundamental information concerning DNA structure and function, proteins, genetics, biotechnology, bioterrorism, and bioethics. **Assessment:** Basic knowledge of these facts, processes, and concepts will be quantitatively assessed through the use of lecture quizzes, lecture exams, lab reports, class presentations, and lab quizzes.

Final Grades.

If you feel that your final grade is incorrect, we will recheck all of your grades to identify any potential errors. Please make sure that you fill in your name correctly on the blue Scantron sheets to minimize any grading errors. As a safeguard, you **should routinely examine your posted exam, quiz, and lab grades on the course Blackboard site** during the semester. If you are not satisfied with your final grade for the course, please contact the Biology Dept. ombudsperson, Room 159 B BLS.

DNA: Friend or Foe – Spring 2018. The reading Assignment and Video are Posted on Last Page of Syllabus.

Module One. General Background and Bioethics

- Introduction to the Scientific Method
- Bioethics and Informed Consent
- Tuskegee, Willowbrook, and Guatemala CIA programs
- Project MKULTRA studies
- Edgewood, Md. Arsenal studies
- Holmsburg prison studies and Retin A

Module Two. Brief Introduction to Proteins

- Proteins encoded by genes
- Primary, secondary, tertiary, quaternary structure of proteins
- Protein function
- Examples of proteins – Hemoglobin, myoglobin, keratin, thaumatin.

Chapter 1, Sec. 8

Module Three. Biological Warfare

- History of Biological Warfare
- Micro-organisms and Proteins - their use in Biological Warfare
- Ebola, Anthrax and 2001 Anthrax attacks in US.
- Tularemia*, Cholera, botulism
- Bubonic Plague, Ricin, Smallpox
- Modified proteins, GM viruses and Bioterrorism

Quiz 1 on Wednesday, February 7, 2018. 7-8 MC and TF questions. Bring a #2 pencil.

<i>Module Four.</i> DNA structure, DNA replication, Mitosis, Meiosis, Mendelian genetics	Chapter 1, Sec. 9
Nucleotides	
Nucleic acids - Structure of DNA and RNA	
DNA methylation	
Packaging of DNA in chromosomes – nucleosomes, TADs, histones	Chapter 2, Sec. 2
DNA replication and DNA polymerase	
Telomeres and Cellular Aging	
The cell cycle and mitosis.	Chapter 2, Sec.3
Brief overview of meiosis.	
Brief overview of Mendelian and Non-Mendelian Genetics	Chapter 3, Sec. 1-3
Mendel's first and second laws	
Punnett squares	

Genetics Assignment (Problem Set) due on Monday, March 12, 2018

<i>Module Five.</i> Human Genetics	Chapter 3, Sec. 4-6
Autosomal recessive disorders – PKU, etc.	
Autosomal dominant disorders – HD, etc.	
X-linked recessive genes –RG color blindness, Hemophilia A	
Sex-influenced genes	
CAIS	
XX males and XY females, unequal crossing over between sex chromosomes in males.	
Swyer syndrome	
Aneuploidy – Down syndrome, Klinefelter syndrome, etc.	
DNA methylation and Prader-Willi syndrome (non-Mendelian genetics)	
Genes and behavior (non-Mendelian genetics)	

Module Six. DNA and Genomic Medicine

<i>In vitro</i> fertilization	
Prenatal Diagnosis and Pre-implantation genetics	
The Genetics of Sex Determination	
Genetic Testing	Chapter 3, Current Issue
Human DNA tests, Genetic Testing (Breast cancer and BRCA1 & 2, AD and Apo ε4, etc.)	
Ancestry tests, genealogy, and SNP analysis	
Genomic SNP analysis, Manhattan Plots, and Disease risk	
GINA and Genetic discrimination	

Midterm Exam. Wednesday, March 14, 2018 in SERC 110B.

In class Assignment One. Monday, March 19, 2018.

<i>Module Seven.</i> Molecular Genetics and Genetic Engineering	Chapter 2, Sec. 2
An Introduction to Genes and Genomes	
Genetic Code, Gene transcription and gene regulation	
RNA polymerases	
Ribosomes and Protein Translation	
HUGO	
Mitochondrial genome	
<i>Module Eight.</i> Recombinant DNA Technology	Chapter 4
Classic Biotechnology	
Restriction Enzymes	
Plasmids	
DNA ligases,	
Reverse Transcriptases	
Polymerase Chain Reaction and gene amplification	

Automated DNA sequencing, and NextGen DNA sequencing
 Detection of SNPs – taste blindness, asparagus odor, SCA

Module Nine. DNA Fingerprinting

Single locus DNA fingerprinting via RFLP analysis
 VNTRs, STRs, modern DNA fingerprinting
 CODIS, Forensic DNA Analysis
 AMEL gene and DNA fingerprinting
 Mt DNA fingerprinting
 Y chromosome analysis
 Recent SCOTUS decision and DNA collection

Read “The Wrong Man” chapter

Module Ten. Applied Molecular Biology & Applications of Recombinant DNA technology

Proteins as Gene Products, Proteomics
 Animal Biotechnology, somatic nuclear transfer, animal cloning
 Possible cloning of extinct species
 Microbial Biotechnology
 Bioremediation using bacteria and plants
 Plant Biotechnology, gene transfer in plants
 Genetically modified foods – Starlink corn, Bt plants, food allergies

Quiz II. Wednesday, April 19, 2018

Module Eleven. Medical Biotechnology

Introduction to Medical Biotechnology
 Adult stem cells – umbilical cord and hematopoietic stem cells
 Embryonic Stem Cells and Stem Cell Therapy
 Therapeutic cloning and somatic cell nuclear transfer (SCNT)
 Should humans be cloned?
 Mitochondrial DNA replacement, and three-parent children
 Ethics of Stem Cell Therapy
 Human gene therapy
 Human vaccine production
 CRISPR (clustered regularly interspaced short palindromic repeats), gene editing and HIV, embryo modif.

Chapter 2, Current Issue



Module Twelve. Pharmacogenomics and Rational drug design

Primaquine, malaria, and G6PD
 Sovaldi [nucleotide analog prodrug], cost of drug treatment.
 Pharmacogenetics and SNPs.
 Personalized medicine and Genomic medicine.
 Herceptin and immunotherapy
 SSRI
 TPMT

Module Twelve Continued. Selected topics

HeLa cells – recent genome sequencing, bioethical concerns
 Gene Patents, patenting cell lines
 Patenting living organisms
 Confidentiality Agreements

Final Exam: Monday May 7, 8:00 AM - 10:00 AM in SERC 110B

- Remember:** Don't miss lab without a valid excuse. Missing two labs without a valid excuse will **LOWER YOUR FINAL GRADE BY ONE FULL LETTER GRADE. MISSING MORE THAN TWO LABS WITHOUT A VALID EXCUSE WILL RESULT IN A FINAL GRADE OF F.**
- Remember:** If you missed the mid-term lecture exam with a valid excuse, you need to make it up immediately following the final exam, and **during the 2.25 hours that are scheduled for the final exam.** Makeup exams will be multiple-choice, short answer, and completion questions.

3. **Remember:** You NEED TO bring a number two pencil for lecture exams. A pencil sharpener will be available for you to use.

One Reading Assignment from *When Science Goes Wrong* (Chapter 9)

One Video Assignment.

1. Chapter 9, Forensic Science, *The Wrong Man*, pages 181-198. Read for the final exam.
2. **Video Assignment** on CRISPR and HIV – View for the final exam. 2:07 minute video.
<http://www.umassmed.edu/news/news-archives/2015/04/editing-hiv-out-of-our-genome-with-crispr/>

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