

BIOLOGY 0848. DNA: Friend or Foe – Sections 001 - 005 (3.0 credits).
Fall Semester, 2017. Room 166 Beury Hall. August 28, 2017 - Dec 20, 2017.



DNA: Friend or Foe is a General Education course. First-year students who first enroll at Temple University in or 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.

Lecture for DNA: Friend or Foe. Monday and Wednesday 1:00 PM – 1:50 PM. **Labs** for DNA: Friend or Foe meet on Thursdays and Fridays. 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 start the second week of the fall semester.

Instructor: Gregory Smutzer, Ph.D. Office: Biology Life Sciences Building, Room 352, Biology Life Sciences Building, Temple Main campus. Phone: (215) 204-1236, e-mail: smutzer@temple.edu.

Textbook: No textbook is required for this course. Two reading assignments (chapters) are posted on the last page of syllabus. Finally, one video is assigned for viewing online.

Grading: This course has both lecture and laboratory component. The lab will make up 25% of the course grade.

Labs: Labs will meet once a week for one hour and 50 minutes in room 151 Biology Life Sciences Bldg. All labs will meet on Fridays. Labs are held every week during the semester. However, the first lab of the semester will meet during week two (September 4, 2017). Mandatory safety training will be held during your first lab. Please remember that attendance for lab is **mandatory**. If you miss the morning lab and wish to make up the lab that afternoon or evening, please contact your teaching assistant.

The lecture component will comprise 75% of your final grade. For the lecture component, there will one midterm exam during the session and a final exam. Both exams will have equal weight, and each exam will make up 36% of your final grade. The two exams will comprise 72% of your final grade. Exams will be multiple-choice, true-false and possibly discussion questions. The final exam will **NOT** be comprehensive.

The remaining 3% of your lecture grade will be from class attendance, two in-class assignments, and announced quizzes. Finally, remember that a grade of **C minus or better** is required to receive credit for this course.

Mid-term exam	36.0 %	60 to 70 MC and TF questions.
Final Exam	36.0 %	(not comprehensive, approximately 100 MC and TF questions)
Announced quizzes	1.0 %	(Usually one quiz per semester)
In class assts.	1.0 %	(Usually one in-class assignments per semester)
Lab grade	26.0 %	(Attendance at labs is mandatory)

Grading Scale for Final Grade. Incomplete grades (I grades) are not normally given in this course. If you cannot

complete the course, you will need a note from your Temple U. academic advisor.

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. Attendance will be taken at the end of lecture (after week one) by use of a sign-in sheet at the front wall or desk. Sign in sheets will be organized according to your lab section. Please use the last four digits of your TUID when signing in.

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. (**Friday, December 15, 2017 between 10:30 AM and 12:45 PM in Beury 166**). **There will be no exceptions.** In order to take a makeup exam, written documentation will be required. Written documentation includes medical, dental, and legal excuses from your physician, dentist, or lawyer. Notes from PAs, chiropractors, auto repair technicians, hair stylists, being a contestant on American Idol, or podiatrists are generally not accepted. I will need a copy of the documentation for my files.

PLEASE BRING YOUR MEDICAL OR LEGAL EXCUSE WITH YOU, AND TURN IN YOUR EXCUSE JUST AFTER YOU FINISH YOUR FINAL EXAM ON Friday, DECEMBER 15th. 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.

Withdrawals: Monday, September 11th, is the last day to withdraw from a course (without a W grade). Tuesday, October 24th is the last day to withdraw from an undergraduate course (with a W grade).

Makeup Quizzes: There will be no makeup quizzes, or makeups for the 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: Classes end on Monday, December 11th. Our last lecture is Monday, December 11th. Tuesday, Dec. 12th and Wednesday Dec. 13th are study days. **Final exam for lecture is on Friday, December 15th from 10:30 AM to 12:30 PM.** The final exam for lecture will **not** be comprehensive. The final exam will cover the second half of the course, along with reading assignments. Due to the large size of the class, 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 (not 352A) on Mondays and Wednesdays from 2 to 3 PM during the semester. Please e-mail me if you wish to come by at another time.

Cell Phones: Beury 166 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 before the start of each class. Also, please boot 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, August 30, 2017 through Monday, December 11th, 2017 during lecture.



Blackboard and Problem Sets: Depending on the subject matter, some multiple-choice questions with answers will be posted onto the Temple Blackboard 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. If you have specific questions, 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 **Blackboard**. Please type in the 3 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 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 Department ombudsperson, Room 159 B BLS.

DNA: Friend or Foe – Fall 2017. The two reading Assignments 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 LSD studies
- Edgewood, Md. Arsenal studies
- Holmsburg prison studies and Retin A

Module Two. Brief introduction to Proteins

- Chemical bonding
- Brief introduction to Proteins
- Primary, secondary, tertiary, quaternary structure of proteins
- Protein function <http://www.bioinfo.org.cn/book/biochemistry/chapt07/sim1.htm>
- Examples of proteins – Hemoglobin, myoglobin, keratin, thaumatin.

Module Three. Biological warfare

- History of Biological Warfare
- Micro-organisms and Proteins - their use in Biological Warfare
- Anthrax, Tularemia, botulism, Ricin, Smallpox
- Salmonella as a bioweapon

Quiz 1 on Wednesday, September 27, 2017. (Bring a number 2 pencil to class)

Module Four. DNA structure & Mendelian genetics http://biology.kenyon.edu/courses/biol63/watson_06.pdf

Nucleic acids - Structure of DNA and RNA

DNA methylation

Packaging of DNA in chromosomes, Chromosome structure

Telomeres and Cellular Aging

The cell cycle and mitosis.

Brief overview of meiosis.

Brief overview of Mendelian and Non-Mendelian Genetics

Mendel's first and second laws

Human Genetics

autosomal recessive genes

autosomal dominant genes

X-linked recessive genes

sex-influenced genes

CAIS

XX males and XY females, unequal crossing over between sex chromosomes.

Swyer syndrome

Genes and behavior

Module Five. DNA and Genomic Medicine

In vitro fertilization

Prenatal Diagnosis and Pre-implantation genetics

The Genetics of Sex Determination, family balancing

Genetic Testing

Human DNA tests, Genetic Testing (Breast cancer and BRCA1, HIV, etc).

Human neurological disorders & genetics – Alzheimer's Disease and Apo ε4 allele

Parkinson's Disease and alpha-synuclein,

Huntington's Disease and genetic testing.

Ancestry tests and SNPs

GINA and Genetic discrimination

Midterm Exam. Monday, October 9, 2017 in Beury 166.

In class Assignment One. Wednesday, October 11, 2017.

Module Six. Molecular Genetics and Genetic Engineering

An Introduction to Genes and Genomes

HUGO

Mitochondrial genome

Genetic Code, Gene Transcription and gene regulation

DNA methylation

Protein Translation

Recombinant DNA Technology Plasmids

DNA ligases,

Reverse Transcriptases

Restriction Enzymes

DNA and RNA polymerases

PCR

Automated DNA sequencing, and NextGen DNA sequencing

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

Proteins as Gene Products, Proteomics

Animal Biotechnology and recombinant proteins

Mammalian cloning and genomic imprinting

Possible cloning of extinct species
 Microbial Biotechnology and production of recombinant proteins
 Plant Biotechnology, gene transfer in plants
 Genetically modified foods – Starlink corn, Bt plants, food allergies
 Bioremediation using bacteria and plants

Module Eight. DNA Fingerprinting

Read “The Wrong Man” (BB)

RFLP analysis – Narborough case
 VNTRs, RFLP, modern DNA fingerprinting
 CODIS, Forensic DNA Analysis
 mtDNA fingerprinting
 Y chromosome analysis
 Supreme Court decision and DNA collection
 Detection of SNPs – taste blindness, asparagus odor

Module Nine. Medical Biotechnology and Pharmacogenomics

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

Read “The Genes of Death” (BB)

Module Ten. Pharmacogenomics and Rational drug design – SSRI, Herceptin, etc.

Primaquine, malaria, and G6PD
 Sovaldi [nucleotide analog prodrug] and Hepatitis C, cost of drug treatment.
 Pharmacogenetics and SNPs.
 Personalized medicine and Genomic medicine.

Module Eleven. Selected topics

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

Final Exam: Friday, December 15, 2017 from 10:30 AM to 12:30 PM in Room 166 Beury Hall.

- Remember:** Don't miss lab without a valid excuse. Missing two labs without a valid excuse will **LOWER YOUR FINAL GRADE BY ONE 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 possibly completion questions.
- Remember:** You **NEED TO** bring your Temple ID and a number two pencil for lecture exams. A pencil sharpener will be available for you to use.



Two Reading Assignments from *When Science Goes Wrong*, and one Video Assignment.

Read Chapters 6 and 9 and view the video for the Final Exam.

- Chapter 9, Forensic Science, The Wrong Man, pages 181-198.
- Chapter 6, Gene Therapy, The Genes of Death, pages 121-142.
- YouTube video Assignment** on CRISPR – View for the final exam.
<https://www.youtube.com/watch?v=jAhjPd4uNFY>

