For each exam you will be expected to be familiar with the assigned readings, lectures, and class discussions and be able to discuss intelligently the concepts, issues, arguments, and criticisms involved on the topics covered. The exam will consist of two parts. The first part will be a series (~10) of objective, multiple-choice questions. The second part will consist of two short essays. Below is a list of concepts and issues you are expected to understand. A list of essay questions is also included.

**Concepts and Issues**

**Population Genetics**
- Mutation, Drift, Selection
- Haplotype
- Bottleneck
- Founder effect
- Sexual Selection
- SLC24A5
- Polygenetic traits
- Polymorphism
- SNP, VNTR, STR, Indel, LINEs, Alu
- Y chromosome
- Mitochondrial DNA
- Human migration patterns
- BiDil & DNA Ancestry Tests
- Recreational Genomics
- Pharmacogenomics
- Race: biological category or social construct?
- Race vs. Ancestry
- Genomic perspective: 99.9% identical
- Race as medical proxy

**Forensic Genetics**
- DNA Profiles (DNA Fingerprinting)
- Alec Jeffreys, 1985
- Identity and Kinship information
- Applications of DNA Profiles
- Immigration, Reuniting Families
- Thomas Jefferson and Sally Hemings
- Criminal Justice Cases
- CODIS
- DNA Evidence Backlog
- Innocence Project
- Surrpetitious Sampling
- Fourth Amendment
- Principle of Proportionality (Justice)
- CSI Effect (influence and three myths)
- CODIS Expansions: Who and What
- Risks and benefits of expansions
- DNA Dragnets
- 1986 Pitchfork case
- 2002/3 Louisiana case

**Behavioral Genetics**
- Nature vs. Nurture
- Twin Studies
- Minnesota Twin Studies, 1988
- Linkage Studies
- Dean Hamer
- “Gay Gene”, Xq28
- Association Studies
- Romantic Voles
- Four Difficulties with Behavioral Genetics
- Medicalization
- Fruitless flies and fighting styles
- Silver Fox domestication project
- Hatfields and McCoys – Hippel-Lindau disease
- XYY
- MAOA studies (1993 and 2002 studies)
- Causal Pathways: From gene to behavior
- Genetic predisposition: stronger/weaker
- Legal Responsibility
- Excuses: Insanity and diminished capacity
- Genetic Defense
- Guilt vs. Sentencing
- Legal status quo
- Future: Prediction and Prevention

**Recombinant DNA**
- Vector
- Plasmid
- Transgenic
- Recombinant drugs
- PCR
- DNA sequencing
- Kerry Mullis
- E. coli
- Autonomy of science
- Public oversight of science
- Biosafety Risks (Biohazards)
- Asilomar Conference, 1974: Results and Criticisms
- Playing God objection
- Franken-science objection
- Biotech Risks
- Patents: criteria and rationale
- Enabling technologies and patents
- Cohen-Boyer, BRCA, and Rifkin examples
**Essay Questions:** The following list includes eight possible essay questions for Midterm Exam #2. From this list we will pick four questions for the exam, and then you will be expected to write on two of your choice. Each answer should be given in essay form and be as complete and thorough as possible given the space and time for the exam. Some recommendations: Be sure to respond to each part of the question; include as much relevant detail as you can in an organized fashion; we encourage the use of examples to illustrate your points. Your goal should be to demonstrate to us that you have a competent grasp of the relevant concepts, processes, issues, arguments, and implications.

A. Describe the current theory of the global migration patterns of the human population and what kinds of genetic evidence support this theory. You are expected to provide an approximate timeline.

B. A piece of driftwood washes up on a volcanic island in the South Pacific. On board are ten small lizards. Assume that the lizards are of mixed sexes, and the island has at least a minimal level of food that they can eat. Use your knowledge of population genetics (Founder effect, drift, selection, mutation, etc.) to describe the forces that will act on the genes in this new population as it expands, and how the allele frequencies in the new population will be related to the allele frequencies in lizards back on the mainland.

C. What is the strategy of a twin study? What inferences can be made from twin studies about the genetic influence on complex behaviors? What are its limitations compared with linkage and association studies?

D. It has been found that vampire bats produce an excellent anti-clotting factor that your company wants to make and market as a drug. Using your knowledge of recombinant technology (PCR, plasmid, vector, transgenic, etc.), explain how you would go about producing this recombinant drug in bacteria?

E. What are the positive and negative consequences of using race for diagnosing or prescribing medicines (e.g., BiDil)? On balance, do you think it is more helpful or more harmful to use race as a medically relevant category? Be sure to provide support for your answer.

F. In general, do the expansions of CODIS violate the principle of proportionality? In your answer, include a description of the current or future expansions of CODIS and a brief description of the principle of proportionality. In particular, do you think DNA profiles in CODIS should include indicators for physical traits (e.g., eye and hair color, ancestry or race)? Defend your answer.

G. What is the value of looking for a genetic basis for complex sexual behavior? What are the potential social and ethical problems faced by finding a genetic basis for complex sexual behavior, such as homosexuality? Are these problems worth overcoming; that is, is the research valuable enough to pursue or should it be abandoned? Support your answer.
H. In legal cases, should genetic defenses (such as an appeal to “low MAOA” gene) be legitimate excuses for criminal responsibility? Should it play a role in sentencing? In your answer, provide a description of how a genetic defense might be argued, and support your answers.