BIOLOGY 202
FALL 2019

Genome Sci 200:
Tues/Thurs 2:00-3:15

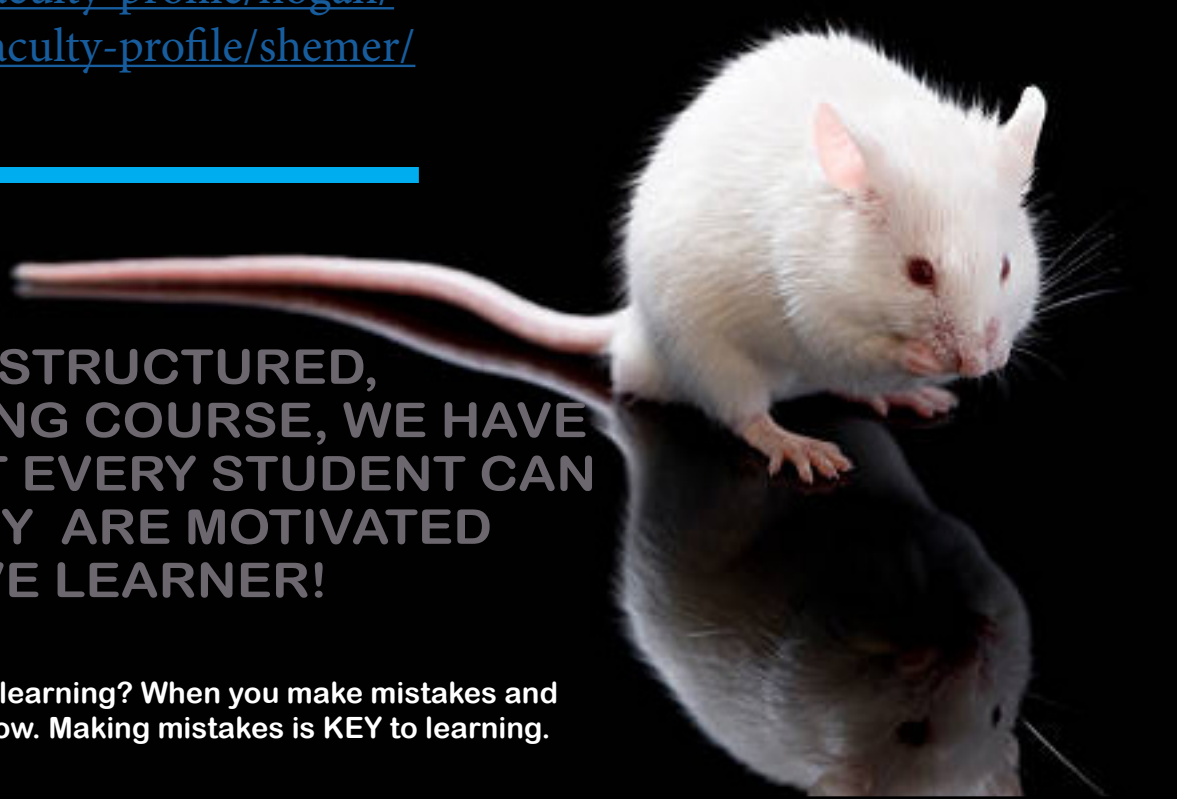
genetics & molecular biology

Dr. Kelly Hogan & Dr. Gidi Shemer

Dr. Hogan: leek@email.unc.edu (pronouns: she/her)
Dr. Shemer: bishemer@email.unc.edu (pronouns: he/his)

Office hours: Check front page of Sakai for details about office hour times

https://bio.unc.edu/faculty-profile/hogan/
https://bio.unc.edu/faculty-profile/shemer/



IN THIS HIGHLY STRUCTURED, ACTIVE LEARNING COURSE, WE HAVE EVIDENCE THAT EVERY STUDENT CAN ACHIEVE IF THEY ARE MOTIVATED TO BE AN ACTIVE LEARNER!

How do you know you are learning? When you make mistakes and identify what you don't know. Making mistakes is KEY to learning.

RECITATIONS LED BY GRADUATE TAS:

ANNA PARKER (pronouns: she/her)
(aparker5@live.unc.edu)

BRANDON FULLER (pronouns: he/his)
(jbfull@live.unc.edu)

601 Th 11:00 (Brandon)
602 Th 12:30 (Brandon)
603 Th 3:30 (Anna)
604 Th 5:00 (Anna)
605 Th 6:00 (Anna)
606 Fri 10:10 (Anna)
607 Fri 11:15 (Brandon)
608 Fri 12:20 (Brandon)

we have three main additional resources to enhance your learning:

1. Supplemental Instruction ("S.I.")
2. Peer Mentoring Hours
3. Learning Center

check sakai for times and locations.

MAIN GOALS OF THE COURSE

GENETIC INFORMATION

STORAGE
How is genetic information stored? What is the basis for variation?

TRANSMISSION
How information copied from cell to cell or generation to generation?

FLOW
How does the information get used to make functional RNA and proteins?

1. You will learn the basic language and common themes within the field of genetics and molecular biology. For those of you continuing in biology, this is just the tip of the iceberg. Thoroughly learning the principles is about making connections between material learned at the beginning, middle, and end of the semester! Practice is key to building a foundation of knowledge, the course is designed around many times to practice.

The major theme of the course is "Information". We're explore how genetic information is stored, transmitted, and how information flows from DNA to RNA and proteins.

2. You will learn introductory skills necessary to become a scientist, including testing hypotheses, designing experiments, interpreting results, considering the impact of the science on society, and collaborating with peers. We'll practice these skills both inside and outside the classroom/recitation sections.

3.This course will prepare you to succeed in future science courses. You will be an active learner in the lecture hall, helping you learn how to actively study. Educational research has shown that students in this course who do reading/ homeworks before class, actively participate in class, and review notes regularly can and will succeed. Feeling underprepared? The course is designed to equalize your readiness before class—while you may take several hours reading and preparing, another student may need less time. Yet when you get to class, your effort will pay off as we practice these concepts together and you gain confidence in your ability!

REQUIRED TEXTBOOK

Klug et al.: Essentials of Genetics 9th edition
(ebook with Modified Mastering and Learning Catalytics access)

It is expected that you will spend several hours reading and working problems associated with each class. If you stay on top of your reading and homework, there will be no need to cram for an exam. Practice, practice, and practice more.

See UNC bookstore to purchase the correct material. If you purchase elsewhere, be sure to have ebook package. Modified Mastering allows you two free weeks-- so no excuses about why you are not prepared if you are enrolled in the course.
Why the ebook? This ebook comes with a web-based software package called Modified Mastering Genetics that will be the medium through which you will be quizzed and receive short pre-lecture and post-lecture assignments. Learning Catalytics, our classroom response software is included too.

what is the course code? shemer32254

REQUIRED ASSIGNMENTS

see detailed schedule for exact assignments and due dates.

Late assignments receive a 0% if not excused

BEFORE CLASS
Guided Reading Questions + Mastering Assignments

DURING CLASS
Learning Catalytics + other participation activities

AFTER CLASS
Post-class assignments through Mastering + Sakai

THIS IS NOT A CLASS FOR PASSIVE LEARNERS. You are expected to be actively engaged in this course through before and after class, during class discussions and activities and in recitation.

You are expected to stay on top of reviewing weekly. **SUCCESSFUL STUDENTS REVIEW AND PRACTICE ROUTINELY.** Really. Don't wait. Attend SI sessions to review material with your SI leaders, do one-on-one meetings with peer mentors from class or visit the Learning center learning specialists. Successful students ask questions and get help, ROUTINELY!

COURSE WEBSITE: on Sakai

This site will have postings from our lectures such as outlines, power point slides, supplemental material that we mention in lecture. We will also post announcements on this site. It is your responsibility to check it regularly and receive email announcements.

HOW IS MY FINAL GRADE DETERMINED?

THREE MIDTERM EXAMS = (18% EACH)
ONE CUMULATIVE FINAL EXAM (18 %)
MASTERING GENETICS PRE/POST/QUIZ (10%)
RECITATION + OPEN-ENDED HW (10%)
LEARNING CATALYTICS + GRQS (8%)

Final grades will be assigned on the total number of points for the entire semester:

A 93-100	C 73-76
A- 90-92	C- 70-72
B+ 87-89	D+ 66-69
B 83-86	D 60-65
B- 80-82	F <60
C+ 77-79	

EXAMS

Exam questions (multiple choice and open-ended) will be taken from class meetings and assigned readings. Exams must be taken on the dates indicated; no makeup exams except in special circumstances, i.e. medical or family emergency documented in writing. Students missing an exam are expected to have an excused absence note and notify the instructor prior to missing an exam. A make-up exam must be taken within one week of the exam, otherwise the final exam score may count for that portion of the grade missed. We may use the http://testingcenter.web.unc.edu/ for make ups. If you feel an error has been made in determining an exam score, you may submit the exam for a re-grade in a timely manner after the exam has been returned to the class. You must submit in writing your reasons for requesting a re-grade. All exams will be kept by TAs; see a TA to review.

PRE-CLASS ASSIGNMENTS

Pre-class assignments allow you to gauge what you are learning from the reading and what is unclear. These assignments will be due by 1:45 PM on the day of class. (That is, they are done *before* class starts.) Most days this include competing a Mastering Genetics assignment and submitting Guided Reading Questions (GRQS) through Sakai. GRQs are graded for completion. Dishonesty on this work only hurts you later on exams. It's okay if you find these questions challenging, the idea is to figure out what you need more practice with.

POST-CLASS ASSIGNMENTS

Post-class assignments are low-stakes assessments that help you periodically review concepts and skills, in preparation for higher stakes exams. These are to be completed independently and are usually due at 1:45 PM with other assignments.
There are three types:
- Mastering assignments (not timed)
- Mastering Quizzes (timed)
- Sakai open-ended homework (to practice open-ended questions)

LEARNING CATALYTICS

Learning Catalytics is used as part of an inclusive strategy for participation. It is required for answering questions during class. You can submit your responses using a laptop or other mobile device with a UNC WiFi connection. You can log in through Mastering or go directly to learningcatalytics.com with your Mastering log in. Questions will be for participation, but you should always try for correctness. It behooves you to come prepared to class and to work collaboratively with peers in class when told to do so! Note - missing just a couple of classes can quickly affect your grade! Each student will get some freebie points to account for sickness, varsity travel, technology glitches, etc. Please do not email single class excuses. If you have extended absence or excused travel, hold onto all proof and submit it at the end of the semester.

**Learning Catalytics is to be done with students who are in the classroom participating. If you are found answering and you are not in the classroom, you may receive a zero for this part of the final grade for the semester. Additionally, this is an honor code violation and the matter will be send to the honor court.

REQUIRED RECITATION

During recitations, TAs will lead you through activities or problem solving practices. This course is a 4 credit hour course, and the recitations are not simply "going over the material that was learned in class", but rather a core component of the course. For example, we will learn to read and analyze a scientific paper over several of the sessions. There will be no make-up opportunities for in-class assignments if you do not attend a recitation in a given week. If you are unable to attend the recitation for which you are registered one week, you may attend another section with prior permission of the TAs if there is room in another section. There is a maximum capacity for each section so please do not assume that you can attend another section if you miss a recitation.

See Sakai for your TA's syllabus that shows what determines your final grade in recitation.

how do successful students seek out extra practice?

SUPPLEMENTAL INSTRUCTION (S.I)

We offer **GROUP REVIEW** S.I. sessions several times a week, led by undergraduate students who excelled in this class in a previous semester. The SI sessions will allow you to process and actively practice material that was taught in the previous week. Past students referred to SI sessions as one of the most significant tools that improved their learning. This is a great review, but peer mentoring or the learning center may be better for you if you are struggling and need more than a group review.

PEER MENTORING

We offer **ONE-ON-ONE** sessions with some our best students who excelled in this class in a previous semester. They will be happy to assist you both in the classroom during activities and outside the classroom. Each mentor will hold one hour a week, please check Sakai for this schedule. Come with your textbook, your specific questions, and a friend if you need one for moral support!

THE LEARNING CENTER

Still feel like you're not reaching your goals? We suggest seeing a biology specialist at the STEM Hub or an academic coach. Successful students seek help early and often!
https://learningcenter.unc.edu/

PIAZZA

One more way to get everyone involved and getting personalized attention! Interesting research about a "confidence gap" and how this kind of technology ensures women and underrepresented minorities feel more comfortable asking and answering course-related questions. For example, research showed that men answer 37% more questions than women in STEM classes, but being able to ask/answer anonymously, may close this gap. So what are you waiting for? Get on Piazza and start asking and answering questions!

piazza.com/unc/fall2019/biol202

THE FINE PRINT

HONOR CODE: All work done in this class must be carried out within the letter and spirit of the UNC Honor Code. You must sign a pledge on all graded work certifying that no unauthorized assistance has been given or received. You are expected to maintain the confidentiality of examinations by divulging no information about any examination to a student who has not yet taken that exam. You are also responsible for consulting with your professors if you are unclear about the meaning of plagiarism or about whether any particular act on your part constitutes plagiarism. Please talk with us if you have any questions about how the Honor Code pertains to this course.

CHANGES: The professor reserves the right to make changes to the syllabus and schedule, including homework due dates. These changes will be announced as as early as possible. TEST DATES will NOT change unless there is a university closing/emergency coinciding with the scheduled exam).

COURSE LEARNING OUTCOMES

UPON COMPLETION OF THE 202 COURSE IN BIOLOGY, A STUDENT SHOULD BE ABLE TO:

skills:

- Build hypotheses to answer a specific scientific question, design an experiment using an appropriate technique/assay to answer the question, describe positive and negative controls, predict results of their experiment, and interpret data.
- Give examples of how advances in genetics and molecular biology, from the discovery of DNA's structure to sequencing individual genomes, have changed the world (examples include recombinant insulin, personalized medicine, transgenic crops)

concepts:

- Explain the term "allele" for a single gene at a population, organismal, cellular, and molecular level; explain how dominance and recessiveness are expressed at these levels.
- Explain how genetic variation comes from in a population (e.g. from meiosis, mutation, and epigenetic changes).
- Predict genotypic and phenotypic ratios of offspring in defined genetic crosses and work these problems in reverse (when given data about offspring, determine the genotypes and phenotypes of the parents).
- Deduce modes of inheritance (example: autosomal dominance, x-linked recessive) from genetic pedigrees and explain how incomplete penetrance and variable expressivity complicate these analyses.
- Distinguish single gene traits from polygenic traits and the influence of the environment on traits.
- Explain how DNA is replicated normally and abnormally and how these concepts are utilized in the polymerase chain reaction (PCR).
- Compare and contrast the consequences of germline errors during meiosis (such as non-disjunction, and translocations) and somatic errors during abnormal mitosis (such as non-disjunction and cancer)
- Explain the flow of genetic information, based on the central dogma- from DNA to proteins and how mutations are carried through this flow of information.
- Describe the nature of the genetic code
- Describe the general organization of prokaryotic and eukaryotic genomes, including the identification and significance of the different parts of a gene (e.g. regulatory/non-regulatory, exons/introns; transcription start site; translation start site; UTRs)
- Explain how a gene can be regulated transcriptionally and post-transcriptionally and how this leads to limited expression under different conditions (such as in different environments, during the course of development, or disease conditions)
- Predict the outcome of experimental manipulations in genes (e.g. GFP-tagging to investigate gene expression)
- Describe the basic steps in gene cloning (restriction, ligation, etc.)
- Design a transgenic animal/bacteria, where a protein of interest is specifically produced
- Explain the significance of research in genetic model organisms to understand fundamental biological phenomena.

STUDENT CARE

Reach Dr. Hogan or Dr. Shemer through office hours, after class, or by email. We are nice people…nobody to be intimidated by!

See something. Say something. Worried about another student's wellbeing? Let us know.

CAPS is strongly committed to addressing the mental health needs of a diverse student body through timely access to consultation and connection to clinically appropriate services, whether for short or long-term needs. Go to their website: https://caps.unc.edu/ or visit their facilities on the third floor of the Campus Health Services building for a walk-in evaluation to learn more.

We and the Department of Biology value the perspectives of individuals from all backgrounds reflecting the diversity of our students. We broadly define diversity to include race, gender identity, national origin, ethnicity, religion, social class, age, sexual orientation, political background, and physical and learning ability. We strive to make this classroom and this department an inclusive space for all students. Please let us know if there is anything we can do to improve, we appreciate suggestions.

Please let us know if you are a student registered with ARS so we can ensure you have the accommodations you need. UNC-Chapel Hill facilitates the implementation of reasonable accommodations for students with learning disabilities, physical disabilities, mental health struggles, chronic medical conditions, temporary disability, or pregnancy complications, all of which can impair student success. See the ARS website for contact and registration information: https://ars.unc.edu/about-ars/contact-us

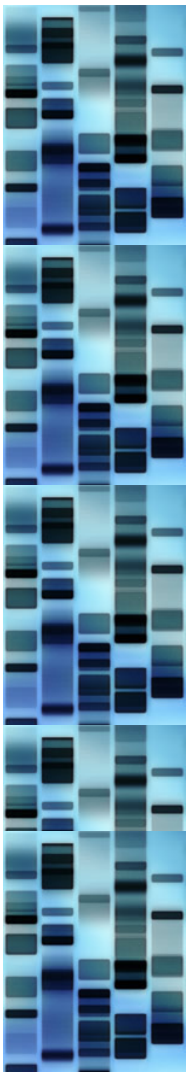
AS PART OF THE GENERAL EDUCATION CURRICULUM, BIOLOGY 202 WILL ENABLE YOU TO: learn how to make and interpret scientific descriptions and explanations of the natural world, practice the skills of scientific inquiry, and evaluate scientific evidence within the contexts of both scientific communities and society.

Questions to consider as a student in a Natural Scientific Investigation General Education course:

1. What rules govern the natural world and how are they discovered, tested, and validated?
2. What is distinctive about the approach to understanding employed in the natural sciences?
3. What challenges are encountered in making measurements of the natural world?
4. What are the limits of investigation in the natural sciences?

General Education Natural Scientific Investigation Learning Outcomes:

1. Demonstrate the ability to use scientific knowledge, logic, and imagination to construct and justify scientific claims about phenomena, including validation through rigorous empirical testing.
2. Analyze and apply processes of natural scientific inquiry as dictated by the phenomena and questions at hand. These include generating and testing hypotheses or theories; using logic and creativity to design investigations to test these hypotheses; collecting and interpreting data; making inferences that respect measurement error; building and justifying arguments and explanations; communicating and defending conclusions; revising arguments and conclusions based on new evidence and/or feedback from peers; and synthesizing new knowledge into broader scientific understanding.
3. Evaluate science-related claims and information from popular and/or peer-reviewed sources by examining the relationship between the evidence, arguments, and conclusions presented and by assessing consistency with existing knowledge from valid and reliable scientific sources.
4. Identify, assess, and make informed decisions about ethical issues at the intersections of the sciences and society.



Students will encounter certain capacities in every general education class to reinforce specific ideas and skills:

• Pose problems and questions that require systematic thinking about evidence, argument and uncertainty. In Biology 202, you will have daily opportunities to examine evidence from data from real experiments and published papers. Notably, in recitation we will be teaching you to read scientific literature to draw conclusions and determine if the arguments the authors claim are sound. You will find uncertainty in data interpretation at times, as well as when we discuss topics at the cutting edge of science. There is a great deal we still do not understand about the human genome, for example. You'll also experience uncertainty through mathematical calculations you will perform, such as probability in inheritance and associations with SNPS and human genetic traits in genetic testing.

• Consider its content in the context of human difference between and within societies; the full range of legitimate debate in its field; and/or change over time. Biology 202 is at its heart, a way to understand human difference at the genetic level. Throughout the course we consider genetic variation between individuals and populations. For example, you will be able to explain how gene expression affects shades of skin color and how some individuals are at greater risk for breast cancer. We won't shy away from both scientific debates that have existed or still exist around certain topics—as a way to show you that scientific ideas thrive with debate and rigorous, repeated testing. Notably, you'll see various perspectives through major historical experiments that helped us learn the nature of DNA, as well as through modern scientific and ethical issues related to genetics and molecular biology.

• Require writing totaling at least 10 pages in length, or the intellectual equivalent. We will not have one long assignment, but a variety of short writing assignments in class and in recitation, as well as daily writing assignments based on reading comprehension (guided reading questions). Many of these will be graded for completion and some will be graded for quality.

•Require presenting material to the class, small groups, or the public through oral presentations, webpages, or other means that enable corroboration of fact and argument. We will not have one large presentation or assignment, but a variety of daily assignments to present your ideas to classmates in small group discussions and to the larger class in lecture and recitation. We believe that students should be pushed to do this, but in a way that feels safe and one in which ideas can be vetted by a small group of peers before being presented to larger groups.

• Require collaborating in pairs or groups to learn, design, solve, create, build, research or similar. Collaboration in this class will be expected daily via pairs and groups in class—many times per class. There will be no graded group assignments.

Detailed SCHEDULE AND ASSIGNMENTS

Date	Class Topic *(Bring class outline, printed, that corresponds to each lesson.)*	Objectives *Indicates material that adds to understanding of human diversity.*	Due BEFORE class by 1:45 PM *(Pages to read listed on GRQs)*
Tues Aug 20	1. Introduction to themes of genetic information and the process of science	Introduce ourselves. List the basic structure and components of the course. Take a short "pre-test" Explain a non-linear model of the process of science. Discuss the five major themes in biology and list the characteristics of the theme of "information".	Guided Reading Questions (GRQs) #1 Mastering Assignments (MA) #1 #and "Introduction to Biol 202 and Mastering"
Thur Aug 22	2. How genetic information is **stored** in the genome	Explain the functional significance of packaging DNA into chromosomes. Compare genomes from different organisms and the relationship between genome size and organism complexity or number of genes. Diagram a typical eukaryotic chromosome and indicate the locations of (i) telomeres, (ii) centromere, (iii) heterochromatin, (iv) VNTRs, (v) euchromatin, and (vi) genes. Discuss the experimental design and significance of a lifestyle study on telomere length. Describe the general organization, possible function, and frequency of genes and non-gene DNA sequences in a typical eukaryotic genome and contrast this with the prokaryotic genome.	GRQs #2, MA #2
Recitation #1 (Aug 22-23)		Welcome activity. Make sure you have been assigned to your "role" for recitation #2 or how to access the assigned roles on Sakai.	No pre-assignment
Tues Aug 27	3. How genetic information **flows** from DNA to RNA to protein 4. Variation in genetic information- from genotype to phenotype	Transcribe and translate a gene into a protein. Differentiate between a gene and an allele. Explain how alleles are related to proteins. Describe the molecular basis of phenotypic variation by using skin color as an example.	GRQs #3, MA #3 and GRQs #4, MA #4
Thur Aug 29	4. Variation in genetic information…continued (SNPs) 5. Process of Science: Discovery of the structure and function of DNA	Explain how variation of linked SNPs helps personalize medicine. Analyze sequence data and group SNPs into haplotypes. Distinguish positive and negative controls. Practice scientific thinking to describe the historical experiments and the methodology used to conclude that DNA was the genetic material. Describe/draw the components of DNA and how they contribute to DNA's overall characteristics. Draw the structure of DNA.	GRQs #5, MA #5
Recitation #2 (Aug 29-30)	A right to her genes: BRCA case study	Collaborate and teach peers to consider the many social, ethical, legal, and financial issues associated with genetic testing.	Pre assignment: Research the "role" you were assigned and bring a print out of your research

Tues Sep 3	6. Process of science: Discovery of how DNA replicates 7. How genetic information is **transmitted** *in vivo*	Describe the differences between conservative, semiconservative and dispersive replication models. Explain and draw how the Messelson & Stahl experiments supported only the semiconservative replication model. Draw a replication bubble with bidirectional replication, labeling the leading and lagging strands and associated proteins. Explain why the ends of chromosomes shorten with each round of replication and how telomerase prevents this.	Submit Sakai Open Ended HW #1 (includes material from Lessons 1-5 as an "exam review") GRQs #6, MA #6 and GRQs #7, MA #7
Thur Sep 5	8. How genetic information is copied *in vitro* 9. How genetic variation arises by gene mutation	Compare and contrast the polymerase chain reaction in vivo DNA replication. Design a PCR reaction and explain how it can be used to detect Huntington's disease. Categorize mutations in four different ways. Explain using diagrams how nucleotide changes result in the alteration of protein activity. Compare/contrast germline and somatic mutations.	GRQs #8 and MA#8; GRQs #9, MA #9
Recitation #3 (Sep 5-6)	PCR and DNA (STR) fingerprinting	Simulate the steps of PCR and use PCR-based data to look at genetic identification data related to conservation biology, paternity testing, and forensics.	Pre-assignment: do short worksheet on STRs
Tue Sep 10	9. How genetic variation arises by gene mutation continued 10. How genetic variation arises by recombination during meiosis	Distinguish between gain and loss of function mutations and their potential phenotypic consequences Describe how specific spontaneous mutations lead to transitions or transversions and how scientists determine if a chemical is a mutagen. Describe differences between mitosis and meiosis. Describe how the movements of chromosomes in meiosis link to the inheritance patterns described by Mendel. Calculate n for various cells and the number of chromatids, chromosomes at various stages of the cell cycle. Explain how meiosis generates genetic variation.	Mastering Genetics Quiz 1 (review lessons 1-9 before; quiz is timed and only one chance per question) GRQs #10, MA #10
Thur Sep 12	11. How errors in meiosis lead to genetic variation	Determine the consequences of non-disjunction in meiosis I or meiosis II. Determine which parent non-disjunction occurred in when given information about offspring. Explain how genetic mosaics arise. Discuss the ramifications prenatal tests for aneuploidy for individuals and for society.	GRQs #11 (Due before class), MA #11 (not due until Tues Sept 17)
Recitation #4 (Sep 12-13)	Meiosis and Exam review	Simulate mitosis and meiosis to produce normal and abnormal outcomes.	No pre-assignment; print and cut chromosomes before attending.
Tues Sep 17	EXAM 1 (Lessons 1-11)		MA#11 due before class

Date	**Class Topic** *(Bring class outline, printed, that corresponds to each lesson.)*	**Objectives**	**Due BEFORE class by 1:45 PM** *(Pages to read listed on GRQs)*
Thurs Sep 19	12. **Transmission** of independently assorting traits 13. **Transmission** of linked traits	Set up two and three gene crosses and determine the phenotypes and genotypes of the offspring. Predict the genotypes of the parents based on the phenotypes of the offspring of two-gene crosses. Interpret the results of chi square analysis for dihybrid crosses. Compare recombination in genes that independently assort vs. genes that are linked. Identify if a dihybrid with linked genes is in the cis or trans configuration based on offspring genotypes or phenotypes. Calculate map distances between two genes from dihybrid x tester crosses. Calculate the genotype/phenotype frequencies when given map distances between two genes. Revisit haplotypes as "completely linked genes"	GRQs #12, MA #12 GRQs #13, MA #13
Recitation (Sep 19-20)		No recitation this week	
Tues Sep 24	14. Pedigrees and human disease	Calculate the probability that an individual in a pedigree has a particular genotype. Argue for the use or non-use of preimplantation genetic diagnosis (PGD). Draw a pedigree based on information in a story problem. Set up crosses with genes inherited with an X-linked mode of inheritance. Recognize X-linked recessive and X-linked dominant traits from pedigrees and calculate probabilities associated with these modes of inheritance.	MA#12.5/13.5: Review Independent Assortment and Linkage GRQs #14, MA#14
Thurs Sep 26	15. Modifications of Mendelian ratios: single gene traits	Predict outcomes of crosses involving traits with incompletely dominant, co-dominant, lethal, multiple, and temperature sensitive alleles. Define polymorphic, monomorphic, wildtype, mutant. Contrast variable expressivity and incomplete penetrance; calculate penetrance in pedigrees.	MA#14.5: Review Pedigrees GRQs #15, MA#15
Recitation #5 (Sep 26-27)	CREATE PAPER I	Apply strategies for breaking down scientific literature into digestible pieces. Explain methods used and interpret data in a scientific paper Evaluate scientific conclusions based on evidence.	Pre-Assignment—see Sakai Recitation folder
Tues Oct 1	16. Gene interactions and Complementation	Interpret phenotypic ratios and assign genotypes when two genes are interacting. Explain what complementation is and when it occurs Demonstrate how a complementation test is performed and how the data is interpreted.	GRQs #16, MA#16
Thurs Oct 3		Catch up/ problem solving practice	Mastering Genetics Quiz 2 and Submit Sakai Open-Ended homework #2
Recitation #6 (Oct 3-4)	CREATE PAPER II	Apply strategies for breaking down scientific literature into digestible pieces. Explain methods used and interpret data in a scientific paper Evaluate scientific conclusions based on evidence.	Pre-Assignment—see Sakai Recitation folder
Tues Oct 8	EXAM 2		

R 10/10	17. The flow of genetic information- Transcription	- Describe the central dogma - Describe the differences between DNA and RNA - Predict why DNA is preferable to RNA in storing the genetic information - Identify trans- and cis- acting components in transcription	GRQ #17; MG (RNA); MG (Promoter)
10/10-11:		Recitation- No recitation this week	
T 10/15	18. Gene Expression- The making of a transcript	- Describe the events taking place during transcription - Predict which strand would be transcribed by RNA polymerase	GRQ #18; MG (The making of a transcript)
R 10/17		Fall break- no recitations	
T 10/22	19. Gene Expression- Translation	- Synthesize and summarize the mechanisms and outcomes of RNA processing - Describe the events that take place during translation	GRQ #19; MG (Translation)
R 10/24	20. Gene Expression- Translation 21. The nature of the genetic code	- Explain how tRNA molecules function as interpreters of the language of RNA to protein - Identify ORFs in mRNA sequences and DNA sequences and translate the ORFs - Characterize the nature of the genetic code - Explain how the code was deciphered	GRQ #20a MG review- Gene expression I (based on lessons 17-19)
10/24-25:		Recitation #7- CREATE paper, figure 3 and discussion - Pre-recitation assignment- complete "Figure 3 pre recitation.docx"	
T 10/29	22. Revisiting alleles and mutations	- Explain the molecular basis for dominant and recessive alleles - Compare and contrast different loss-of-function and gain of function mutations - Predict the effects of mutations on protein function	GRQ #21; MG (Mutations)
R 10/31	23. Regulation of gene expression in prokaryotes I	- Describe how lactose induces the expression of the lac operon - Analyze genotypes and phenotypes of lac mutants	GRQ #22; MG (Regulation of Gene Expression in Prokaryotes) MG review- Gene expression II (based on lessons 17-21)
10/31-11/1:		Recitation #8- Gene expression No pre-recitations assignments	
T 11/05	Regulation of gene expression in Prokaryotes II	- Explain the differences between inducible and repressible systems, positive and negative regulation, mutations in cis elements vs. trans factors, constitutive and uninducible mutations	- MG quiz 3- Gene expression (review lessons 17-22 before; quiz is timed and only one chance per question) - Sakai open-ended HW #3: from mutation to disease - Sakai open-ended HW #4 (GRQ #20b)
R 11/7	24. Regulation of gene expression in eukaryotes I	- Compare and contrast transcriptional regulation in prokaryotes and eukaryotes - Name seven levels of control of gene expression in eukaryotes - Explain how tissues can express different genes from the same genome - Predict what will happen when promoters and genes are recombined in different ways - Define epigenetics and explain how its mechanisms regulate transcription	GRQ #23; MG (Regulation of Gene Expression in Eukaryotes) MG practice- Regulation in Prokaryotes **(not due before 11/11)**
11/7-8:		Recitation #9- Regulation of Gene Expression in prokaryotes- No pre-recitations assignments	
T 11/12		EXAM 3 (Lectures 14-20)	

R 11/14	25. Regulation of gene expression in eukaryotes II- Epigenetics	- Provide examples for epigenetic mechanisms - Discuss the effects of the environment on the epigenome - Explain the role of alternative splicing in gene regulation, and how it is regulated - Predict the factors that confer tissue-specific alternative splicing	GRQ #24
11/14-15:		No recitations	
T 11/19	26. Regulation of gene expression in eukaryotes III- miRNAS	- Explain the functions of miRNA in regulation - Distinguish between properties that affect translation and those that affect mRNA stability - Compare and contrast miRNAs and dsRNAs	GRQ #25; MG (Small RNAs mediate regulation)
R 11/21	27. Recombinant DNA Technology I	- Distinguish between forward and reverse genetics - Design a molecular construct to address biological questions	
11/21-22:		Recitation #10: Problem solving practice	
T 11/26	28. Recombinant DNA Technology II- Cloning a gene	- Explain how to isolate a gene that you want to clone - Describe the steps of inserting a gene into a plasmid and determining if you were successful - Summarize the steps of cloning	GRQ #26; MG (Recombinant DNA Technology) MG review- Regulation of gene expression in (based on lessons 24-26)
R 11/28		Thanksgiving break	
T 12/03	29. Recombinant DNA Technology III- CRISPR	- Design a vector that will allow you to express a human gene in bacteria - Identify the components of the CRISPR machinery - Design ways to use CRISPR to manipulate the genome	MG practice- Molecular (based on lessons 17-28)
S 12/07 12:00 pm		CUMULATIVE FINAL EXAM	