

# PRINCIPLES OF GENETICS SYLLABUS

Biol 210 Sect 1 – Fall 2016

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**Required Text:** 1) Brooker, R.J. 2015. *Genetics: Analysis & Principles*, 5<sup>th</sup> ed. For rent in bookstore.

**Course Objective:** To study general principles of heredity and variation in organisms. This course uses a molecular approach to understanding the basis of transmission, cytological, molecular and population genetics.

## **Learning Outcomes:**

**University Level:** *Investigation / Understanding the Physical World:* 1) Infer relationships, make predictions and solving problems based on an analysis of evidence or scientific information, 2) Apply scientific concepts, quantitative techniques and methods to solving problems and making decisions, and 3) Describe the relevance of some aspect of the natural science to their lives and society.

**Biochemistry/Biology Program Level:** 1) Apply the scientific method, using appropriate theoretical and practical skills to design research studies, answer biological questions and/or solve problems. 2) Describe the flow of genetic information, the chromosome theory of heredity, and the relationship between genetics and evolutionary theory. 3) Evaluate and discuss contemporary social and ethical issues related to biology.

**Genetics Course Level:** 1) Compare the basic principles of inheritance at the molecular, cellular and organismal levels, beyond the scope of an introductory course. 2) Compare relationships between molecule/cell level phenomena (modern/molecular genetics) and organism-level patterns of heredity (classical/transmission genetics). 3) Apply this knowledge in a variety of problem-solving situations. 4) Integrate knowledge of DNA with the concepts of cellular function, evolution and biotechnology. 5) Appraise ethical issues involved with the study of genetics, biotechnology and medicine.

**Class Meetings:** TNR 120: Tues, Thur, Fri 11:00 am – 12:00 pm

**Grading:** There will be 5 Exams during lecture time, and 1 comprehensive Final. Each exam will cover about 5 lectures, with the previous lecture not included. All exams must be taken and the lowest grade will be dropped from your average. Each exam is worth 16%. The final is worth 20%. You will also engage in 2 research projects with each worth 10%.

The required lecture guide contains a colored version of the Lecture PowerPoints. Please bring it to lecture, so you can take notes directly on each slide. Although it was printed for your convenience, it could inadvertently be used as a passive way to study; students who just read over the PowerPoint slides before exams typically earn a “C” or below in this course. Therefore, I recommend you read your textbook before or after each lecture to reinforce your understanding of that material. Read especially the paragraphs and captions pertaining to the images shown in lecture while writing your own notes. I also recommend each week to make up study-guide sheets. The final is cumulative, meaning it contains material discussed throughout the semester. The best way to study for this kind of final is to 1) study from your study-guide sheets that you made before each exam and 2) make sure you understand the answers to each question from the 5 exams and those I recommended from the textbook. One of the best ways to study is outlined on page 3. **Grades will be posted on D2L.**

<b>Exams (M/C, Short Answers, Problems)</b>	<b>% Points (out of 100)</b>
<b>Exam I</b>	<b>15</b>
<b>Exam II</b>	<b>15</b>
<b>Exam III</b>	<b>15</b>
<b>Exam IV</b>	<b>15</b>
<b>Exam V</b>	<b>15</b>
	<b>(with 1 exam grade dropped)</b>
<b>Comprehensive Final</b>	<b>20</b>
<b>Research Project A</b>	<b>10</b>
<b>Research Project B</b>	<b>10</b>

**Weekly Problems:** Suggested problems from your textbook will be posted each week on D2L. Answers are in the back of the textbook for you to refer to. Although these problems will not be graded, **some will be used as actual questions on exams.** In addition, you have the option to discuss the genetics problems during lecture, with the instructor during office hours or by appointment, and/or attend weekly tutoring sessions (2 provided per week). Tutoring sessions are a great way to review as well as get help!

**Attendance Policy:** I strongly recommend you attend every lecture. Missing any class will put you at a distinct disadvantage when test taking. The only valid excuses for a student missing an exam are: death in the family, violent illness, or accident. In such cases: (1) you must provide evidence of some kind (eg. note from health center), **and** (2) you must reschedule **within 24 hours** after the deadline.

**E-mail:** Students are expected to check their University e-mail regularly for information from the university and/or instructors. If you are using an e-mail account other than your campus account to contact me, be sure your full name is included in the message

**Electronic Devices:** Cell phones should be turned **off** and **not** be displayed during class, lab or exam. No other communication or musical devices are allowed. Students needing a foreign language dictionary during exams may use one with permission from instructor. No video or audio recording of lectures is permitted without the prior written authorization from instructor.

**Extra Help:** Come see me during scheduled office hours or make an appointment for extra help. Form study groups with your classmates. In addition, tutors are available to help you with lecture material and assigned text problems. Interested students are encouraged to contact the Tutoring-Learning Center. Students with a disability requiring accommodations should register with the Disability and Assistive Technology Center in the Learning Resource Center (the Library) and contact me at the beginning of the course.

**Academic Conduct:** You are responsible for the honest completion and representation of your work and for the respect of others' academic endeavors. Any act of cheating, plagiarism, or academic misconduct is subject to the penalties outlined in UWS Chapter 14. Please refer to this link for more information:

<http://www.uwsp.edu/centers/rights/RRBOOKLET8-2005-06.pdf>

## **Genetics Project A**

### **Paper on a Human Genetic Disorder (Disease or Syndrome)**

The purpose of this research is to discover something about yourself, whether it is a genetic condition that runs in your family or something you may have heard about in your past. The following source is an excellent starting point for deciding on a disorder to pursue. Make sure you choose reliable sources and not websites that include just people's opinions. Also, write your paper in your own words. When taking notes from a source, reword info to help avoid plagiarism later. "Turnitin" will be used; any copied sentences from sources will result in no credit. Grading will be based on the completeness of each topic listed below, grammar and spelling.

#### **Choosing a Genetic Disorder from a Chromosome:**

<http://www.genomics.energy.gov>

- click on human genome project archive Icon
- drag the cursor on Education tab on top, then under Gene Gateway, click on Main
- click on a chromosome number of your choice – located in the yellow box on top
- click in the white space and the chromosome will pop up as a larger version. This is a chromosome map with the names of many genetic disorders next to it. Decide on your genetic disorder to research. Then start with the following website to gather your information.

<http://www.omim.org> (Online Mendelian Inheritance in Man)

- type in the disorder you chose in the search box.

#### **Topics to Include:**

- your reason for choosing this topic
- a human interest story (like describing experiences within a family or from a patient, etc)
- chromosome(s) associated with the disorder
- Definition & frequency (prevalence) of genetic disorder
- When disorder was first described and where the name of the disorder came from
- Natural history (from infancy through adulthood – age of onset and severity of disorder)
- Signs, Symptoms & Diagnosis
- Genetic Testing – what gene(s) are tested if any?
- Molecular, Biochemical &/or Cellular Basis
- Genetics / Mode of Inheritance
- Treatment & Management
- Possible Cure? Gene Therapy? If so, describe in detail
- Which direction should scientific research go in the future?
- Summary (conclusion)
- Reference Section: include at least 2 recent journal articles published within the last 5 years – use NCBI Pubmed to search for those articles. You may also include other sources – do not cite Wikipedia. **You are required to have at least 5 sources (2 of which are recent).**

# **Genetics Project B**

## **Paper on a Current Event in Genetics**

The purpose of this project is to research a topic in genetics that is of interest to you. One of the best ways to learn is through your own discoveries. This will give you opportunity to do so and possibly inspire you to pursue that topic in your future.

### **Topic:**

Select for your report a current topic in Genetics that you have **READ**. Sources can include a **scientific magazine or journal**. This is considered primary literature, not someone else's opinions, but the actual experiment that was published. It has to be recent (**from this year**) and it must pertain to any topic in Genetics. It should be based on biological facts or theories and must be sound scientific information. Assignments that are based on speculation, hoaxes or generalized "stories" will not count. Look at the topics in your lecture guide or textbook to help you know what is considered within the field of genetics. In lecture, we will be discussing different biotechnologies and the newest being "crispr" technology, which you are more than welcome to choose. Once you found your article of choice, **print it out and include it with your report**.

\*\*\*If you are unsure of whether the source you chose is acceptable, don't hesitate to inquire with the instructor, before writing your paper.

Grading will be based on the completeness of each topic listed below, grammar and spelling.

### **Format:**

The following items **MUST** be addressed:

- Must be typed, single-spaced, 12 pt font, **AND at least 2 full pages**.
- **MUST** include a reference to the source of the information. This includes the Title of the story; Origin (source) of the information [name of magazine, journal, newspaper]; Volume; Issue; Chapter; Pages; Time/Date.  
\*\*\*You must include a **copy of the article** with your report.
- Grammar/spelling counts.
- Include statements of the relevant facts, data, experiment, or theories.
- Formulate your own ideas as to the importance of the findings, how this topic impacts the scientific community (other geneticists) and society in general.
- Explain why this topic was of interest to you.

Did you know that you learn:  
10% of what we **read**  
20% of what we **hear**  
30% of what we **see**  
40% of what we **see & hear**  
50% of what we **write**  
60% of what is **discussed**  
70% of what we **experience**, and  
95% of what we **teach**

**Below is a suggested way of studying based on the scientific method:**

*Literature Search:* Read the textbook chapter sections that pertain to the info in the lecture guide (lecture PPTs); while reading, take some notes on the side of each slide from lecture to help clarify info discussed in class.

*Methods:*

- a) Rewrite your notes! On lined paper, prepare study guide sheets the following way... Take each slide and first write the heading (underline it) then next to it write the info learned. Try to describe the image (or table) in the slide in your own words. Try to do this on one or two sheets of paper – front side only – without skipping lines if you can, so that the headings are on the left side and the info next to them on the right side. Do this for each lecture BEFORE the next lecture (by Monday you have two lectures to cover already). Then read it over once to see the whole picture or overall theme of that lecture. Try to look for similarities and differences between the information. When appropriate, make a table of info to help compare concepts.
- b) Come up with 1-2 questions of your own from each slide to either quiz yourself later, or anticipate future exam questions. Definitions, functions, comparisons, prok vs euk for all systems, etc.
- c) At the end of each week you will have study guide sheets already made for the upcoming exam. Before all Mondays' lectures, read over your study sheets and highlight only the information you could not remember.
- d) Rewrite notes again! On a blank sheet of lined paper: write down the info you couldn't remember. This will help reinforce those concepts that were more difficult for you.
- e) Before the exam you will have a set of study sheets of all info AND a smaller set of study sheets containing info you needed reinforcing. Use this second set for studying one or two days before the exam. Reread, highlight info that you are having trouble learning or remembering and say it out loud, to yourself or with another person from class, a friend or study group.
- f) At the end of each chapter, try the practice questions (suggested on D2L) before looking at the answers in the back of the book. Write down the ones you do not understand and ask the instructor (me) to go over those problems.
- g) Try to answer your own questions that you accumulated from each slide. Study with someone in class and try to answer each other's questions.

*Results:*

- a) There will be no need to cram in lots of info right before an exam, so you'll be able to get "good" sleep the night before.
- b) You will feel less stressed, overworked or overwhelmed, and more confident when taking the exam.
- c) Your grade should reflect the amount of cumulative effort you put into your studying – remember – for every hour of lecture, one needs AT LEAST DOUBLE the amount of studying time. In other words, for each exam you should be spending about 10-15 hr of studying! This really isn't possible to do effectively right before an exam.

*Discussion:*

- a) A good grade results, due to **reading** your notes and the text, **hearing** my lectures, **seeing** the words and images, **writing** and **rewriting** notes from class and the text, **experiencing** by trying to answer questions from the back of each chapter or from a suggested list I provide before each exam, and **discussing** topics with another person (saying it out loud). In addition, before each exam, read the summaries at the end of each chapter and chapter section.

If you can teach it to another person, then you know it! **“The best way to learn is to teach!”**

**GENETICS SCHEDULE (exam dates are firm, chapter dates are tentative)**

Week	Date	Topic	Chapter (Slides)
1	Sept 6	Syllabus / Overview of Genetics	1
	8	Transmission (Mendelian) Inheritance	2
	9	Human Genetics & Pedigrees	2
2	13	Cell Cycle / Mitosis	3
	15	Meiosis	3
	16	Gametogenesis / Factors Affecting Inheritance	4
3	20	Factors Affecting Inheritance, X-linked Traits	4
	22	<b>EXAM I</b>	
	23	Non-Mendelian Inheritance & Epigenetics	5
4	27	Variation in Chromosome Structure	8
	29	Aneuploidy & Polyploidy	8
	30	DNA as Genetic Material	9
5	Oct 4	DNA & RNA Structure	9
	6	Chromosome Organization	10
	7	DNA Replication	11
6	11	<b>EXAM II</b>	
	13	DNA Replication	11
	14	Prokaryotic Transcription	12
7	18	Eukaryotic Transcription & RNA Modification	12
	20	Protein Structure & Genetic Code	13
	21	Translation	13
8	25	Prokaryotic Gene Regulation, Lac Operon	14
	27	Eukaryotic Gene Regulation at DNA Level	15
	28	<b>EXAM III</b>	
9	Nov 1	Eukaryotic Gene Regulation at RNA Level	16
	3	DNA Mutation	18
	4	DNA Mutation	18
10	8	DNA Repair, <b>Project A Due</b>	18
	10	Transposons	19
	11	DNA Technologies	20
11	15	DNA Technologies	20
	17	<b>EXAM IV</b>	
	18	DNA Technologies	20
12	22	Biotechnology	21
	24 & 25	<b>Thanksgiving Break!!!</b>	
13	29	Biotechnology	21
	Dec 1	Functional Genomics & Proteomics	23
	2	Bioinformatics, <b>Project B Due</b>	23
14	6	Medical Genetics & Cancer	24
	8	Population Genetics	26
	9	<b>EXAM V</b>	
15	13	Population & Evolutionary Genetics	26 / 28
	15	Evolutionary Genetics	28

**COMPREHENSIVE FINAL** Monday Dec 19<sup>th</sup>, 2:45 – 4:45 pm, TNR 120