

Case Western Reserve University

Equinox Summer 2008

Genetics & Biotechnology Millis 320

Course Description:

Laboratory and classroom activities will introduce students in this course to the fields of genetics and biotechnology. The course will introduce students to topics in biotechnology, genetics, and molecular biology, as well as some of the modern applications of these subjects used in science today. Classroom activities will focus on DNA structure and function; the manipulation and analysis of DNA, including gel electrophoresis, transformation, conjugative transfer, transduction and engineering; and the analysis of genetic variation. Students will have an opportunity to visit biomedical research laboratories and other places that use molecular biology. Societal issues, such as the risks and benefits of various techniques, decision-making models for bioethical issues, and other pertinent issues will be discussed. This course provides preparation for aspects of AP Biology and is an excellent preparatory course for those contemplating the medical profession.

Prerequisite: One year of honors biology

Credit: 2 semesters of high school credit

Outcomes

Students will

- increase their understanding of complex bio-molecular processes and methods used to isolate, amplify, manipulate, and analyze DNA
- apply their understanding of DNA to human genetics, cancer research, agriculture, medicine, and industry.

Students will be able to

- utilize all equipment properly and safely and become proficient in the use of biotechnology equipment and procedures.
- understand and follow written and verbal instructions in complex laboratory protocols using DNA science technology.

Resources and Materials

- Ricki Lewis, Human Genetics, 7th Edition

Student Evaluation and Grading Policies

A Narrative Evaluation

As this is an academic/enrichment course, a narrative evaluation will be written at the conclusion of the course. The evaluation will be based on participation in activities and discussion, as well as on independent assignments and assessments.

B. Breakdown of Final Grade

Quizzes:	210	Participation:	40
HW:	210	Lab:	200
Bioethics:	75	<u>Portfolio:</u>	175
Trip/Spkr:	50	Presentation:	100
Video:	60	Midterm:	200
Wksht:	60	<u>Final:</u>	<u>200</u>
Journal:	420	Total:	2000

Portfolio Assessment

During the three weeks of the program you will complete various assignments that you will organize into your portfolio. Each type of assignment will have specific guidelines for completion, and you will organize them chronologically into specific categories.

Portfolio Rubric				
*Portfolio is a separate grade from the individual components grades				Date:
Category		Possible Points	% of Grade	Total
Notes and Homework	Class Notes	90	12.9	
	Textbook Assignments	90	12.9	
	Quizzes	90	12.9	
	Journal Entries	210	30	
Class Activities	Worksheets	30	4.2	
	Video Programs	30	4.2	
	Fieldtrips	30	4.2	
Laboratory Work	Worksheets/handouts	60	8.7	
	Lab Reports	10	1.5	
	Ethical Case Studies	30	4.2	
Presentation	Organization	15	2.2	
	Neatness	15	2.2	
Score	Total Points	700	100	

C. Grading Scale

A+ 97-100
 A 93-96
 A- 90-92
 B+ 87-89
 B 83-86
 B- 80-82
 C+ 77-79

C 73-76
 C- 70-72
 D+ 67-69
 D 63-66
 D- 60-62
 F Below 60

Schedule

Date	Topic	Activities	Assignment and/or Assessment	Instructional Strategies
Sunday June 29			<ul style="list-style-type: none"> • Read Chapter 1 in <u>Human Genetics</u> • Do pg 16,# 1,7; pg 17, # 1,3,5. • Preview Ch.19 Genetic Technologies* 	
Monday June 30	<ul style="list-style-type: none"> • Introduction & Lab Safety • Micro-pipeting basics • Overview of Genetics Ch 1-4 	<ul style="list-style-type: none"> • Genes in a Bottle – DNA necklace • Lab: What is PCR and how does it work 	<ul style="list-style-type: none"> • Pretest • Read: pp. 3, 5-6, 12-17, 22, 28,33-37 (Sect. 2.2), 39-43, 58,59, 64-66,70, Total: 31 pps. • Ch1: RQ 1,2 – Journal – Web Act. Choose one • Ch2: RQ 3,4,5acf – Journal – Web Act. Choose one • Ch3: RQ 12, 13 - Journal – Web Act. #9 • Online QUIZ – open book!!! NO CHEATING! • Read lab “In search of my father” before the afternoon session Tues. 	Active Learning
Tuesday July 1	<ul style="list-style-type: none"> • Review Lecture and Notes • Chapters 4 & 5 • Mendelian Genetics 	<ul style="list-style-type: none"> • “If my mom has big feet” • Lab: In search of my father • Punnett Squares & Pedigrees - Puzzle of Inheri-tance • CaseIt: Lamda Digest 	<ul style="list-style-type: none"> • Read: pp. 77 (law segregation), 81,85(ind. Asstmt), 88 (Fig 4.13), 96-108 Total: 16 pps. • Ch4: RQ 3(all), 8 AQ 9, 17 Journal – Web Act. #19 • Ch5: RQ 3,5,6,7 - Journal – Web Act. #13 • Online QUIZ – open book!!! NO CHEATING! 	Active Learning Authentic Instruction Computer Assisted Instruction
Wednesday	<ul style="list-style-type: none"> • Review & Discuss 	<ul style="list-style-type: none"> • Rolling the Dice 	<ul style="list-style-type: none"> • Read: pp. 119 	Alternative

July 2	<p>Ch. 6-8</p> <ul style="list-style-type: none"> • Sex-linkage, multifactorial traits & behavior 	<ul style="list-style-type: none"> • CaseIt: Cystic fibrosis • Game!! 	<p>(Bioethics), 120 (key concepts)(6.2)-129, 126-140 (7.1), 156-158 (Bioethics) Total: 17 pps.</p> <ul style="list-style-type: none"> • Ch.6: RQ 9, 10 – Journal Web Act. 7 • Ch.7: RQ 3,4 – Journal Web Act. 8 • Ch.8: RQ 4, 6 – Journal AQ 6 • Online QUIZ – open book!!! NO CHEATING! • Read Lab “Restriction Methyl-ation of DNA” TONIGHT!! 	<p>Scenarios</p> <p>Active Learning</p> <p>Computer Assisted Instruction</p>
Thursday July 3	<p>Review Discuss Chapters 9 & 10, DNA and Genes</p>	<ul style="list-style-type: none"> • Lab Prep. • Lab: Restriction Methylation of DNA • Turn in Note-books! 	<ul style="list-style-type: none"> • Read pp. 177, 179(Fig 9.14), 179-182, 186-191, 197-200 Total: 14 pps. • Ch.9: RQ 5,7,8,10,12 AQ 1,4 – Journal – Web Act. 7 • Ch.10 RQ 3,5-8,13,18 AQ 2,4,5,8 – Journal Web Act. 13 • Online QUIZ – open book!!! NO CHEAT-ING! 	<p>Active Learning</p> <p>Alternative Scenarios</p> <p>Alternative Assessments</p>
Friday July 4	<ul style="list-style-type: none"> • Review - Recombinant DNA 	<ul style="list-style-type: none"> • Recombinant DNA Simulation Activity : “How do you Clone a Gene” • Discuss digestion, fragments and designing experiments • Video: “Cracking the Code of Life” • CaseIt: Mapping bact. T7 DNA Game ☺ 	<ul style="list-style-type: none"> • Read “Cleavage of DNA with Restriction Enzyme lab” and begin designing your experiment. Get feedback from 2 classmates critiquing your hypothesis and experimental design. • Read Lab: PCR based VNTR 	<p>Agree-Disagree Matrix</p> <p>Audio-visuals</p> <p>Computer Assisted Instruction</p>

			<p>Human DNA Typing for Monday!!</p> <ul style="list-style-type: none"> • Read handout from “A Short Guide to Writing about Biology”. • Begin reviewing for the Midterm on Wednesday and develop 5 questions (with a partner) for the review game. Have fun making new friends! 	
Monday July 7	<ul style="list-style-type: none"> • Discuss 11 & 12, Mutations and Gene Expression 	<ul style="list-style-type: none"> • Lab: PCR based VNTR Human DNA Typing • Review Games • Lab: PCR based VNTR Human DNA Typing 	<ul style="list-style-type: none"> • Read: pp. 205, 210-214, 218(intro), 221-225, 230,231, 233(12.5)-236 Total:17 pps. • Ch.11: RQ 6,7,8,9,11,12 – Journal – Web Act. 10 • Ch12: RQ 6,7,9,18 AQ 12 – Journal – Case Study 16 • Online QUIZ – open book!!! NO CHEAT-ING! • Write up Materials & Methods for your Restriction Enzyme Lab. The method should be specific to your experimental design. Make 2 copies 	<p>Active Learning</p> <p>Authentic Instruction</p>
Tuesday July 8	<ul style="list-style-type: none"> • Review discuss, Chapters 13-15 Chromosomes & Population Genetics 	<ul style="list-style-type: none"> • Turn in a copy of you Materials and Methods!! • Lab: Cleavage of DNA with Restriction Enzymes – document results! • Video: “Cracking the Code” 	<ul style="list-style-type: none"> • Study for your midterm!! (does not include Ch. 13-15) 	<p>Active Learning</p> <p>Alternative Scenarios</p>

<p>Wednesday July 9</p>	<ul style="list-style-type: none"> • Discuss Chapter 17 & 18, Immunity & Cancer 	<ul style="list-style-type: none"> • Lab: Cancer Gene Detection • DVD: “Cancer Warrior” if time allows 	<ul style="list-style-type: none"> • Midterm Exam • Read pp, 245,251-53(to auto aneup), 257(13.4)-64, 272(14.4)-79, 285(in their own words), 298 (fig. 15.4) Total: 22 pps • Ch13: RQ 2,6,9 AQ 4,9 – Journal – Web Act 10: print copy for journal • Ch14: RQ 5,6 – Journal – Web Act 9 • Ch 15: RQ 1,12, 14 – Journal – Case Study 14 • Write your RESULTS section for your Rest. Enzyme lab. Print 3 copies Online QUIZ – open book!!! NO CHEAT-ING! 	<p>Active Learning</p> <p>Audio Visuals</p> <p>Authentic Instruction</p>
<p>Thursday July 10</p>	<ul style="list-style-type: none"> • Review & Discuss Ch. 19 Genetic Technologies; discuss cloning • Go over Rest. Enzyme Results & Discussion sect/intro/conclusion 	<ul style="list-style-type: none"> • Engineer a crop Online! • Fieldtrip/Speaker • Computer Lab: Final Report via CaseIt 	<ul style="list-style-type: none"> • Read pp. 342-351, 355-359, 363-367, 393 Summary, Total: 23 pps • Ch.17: RQ 7,8,9,15 Case Study 15 – Journal – AQ 8 • Ch.18: RQ 4, 6,7,8,11,14 – Journal – Case Study 16 • [Ch.19: RQ 1,3,4,5,8,10 AQ 1,2 – Journal – AQ 3,5c Case Study 16a-e] • Read Cloning of a PCR Amplified Gene • Finish writing Rest. Enzyme Report • Online QUIZ – open book!!! NO 	<p>Agree-Disagree Matrix</p> <p>Computer Assisted Instruction</p>

			CHEAT-ING!	
Friday July 11	<ul style="list-style-type: none"> BIOETHICS 	<ul style="list-style-type: none"> Video: Dead Reckoning Activity: Bioethics Turn in Rest. Enzyme Lab Report Lab: Cloning of a PCR Amplified Gene. 	<ul style="list-style-type: none"> Work on genetic disorder report 	Agreement Circles Active Learning Audio-visual Learning
Monday July 14	<ul style="list-style-type: none"> Reproductive Technology 	<ul style="list-style-type: none"> Discuss Chapter 20-22, Gene therapy, counseling; HGP & Genomics Lab: Count for efficacy and group discussion Lab: How does a doctor test for AIDS Video: 18 ways to make a baby 	<ul style="list-style-type: none"> Read pps 401-405, 417-421 (21.1), 428-429, 441-446, Total: 17 pps Ch.20: RQ 8,9,13,14 – Journal – Case Study 14 Ch.21: RQ 1,5,9 AQ 4,5,10 – Journal – Case Study 15 Ch.22: RQ 9,10 AQ 4 – Journal – Case Study 12 Online QUIZ – open book!!! NO CHEAT-ING! Read Lab for AIDS KIT II 	Active Learning Anecdotes Authentic Instruction
Tuesday July 15	<ul style="list-style-type: none"> CSIs and MDs – Real World Biotech 	<ul style="list-style-type: none"> Fieldtrip/Speaker – TBA Lab: AIDS Kit II Video: Bird Flu: How safe are we? 	<ul style="list-style-type: none"> Partner Report Revisions Finish Portfolio and CaseIt Report & Presentation 	Agreement Circles Active Learning Authentic Instruction
Wednesday July 16	<ul style="list-style-type: none"> CSIs and MDs – Real World Biotech 	<ul style="list-style-type: none"> Lab: Western Blot Completion Presentation Practice Turn in CaseIt Report Video: AIDS: ending the epidemic Video: “Bloodlines” 	<ul style="list-style-type: none"> Review Material for Final Exam. Work on CaseIt report & Presentation 	Active Learning Anecdotes
Thursday July 17	<ul style="list-style-type: none"> Review Games or Video: GATTACA 	<ul style="list-style-type: none"> CaseIt: Thomas Jefferson Presentations 	<ul style="list-style-type: none"> Study for Final & Pack ☺! 	Student

Friday July 18		• Round Table & Games	• Final Exam	
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