

# Genetics

## CTY Course Syllabus

### Week 1

Day	Time of Day	Content	Method
Day 1	AM	<p><b>Pre-Test</b></p> <p>Icebreaker, Class policies, syllabus,</p> <p><b>Introduction and Brief Review</b></p> <ul style="list-style-type: none"> <li>• Types of Genetics</li> <li>• Mitosis</li> <li>• The Cell</li> </ul>	<p>-Discussion</p> <p>-Interactive PowerPoint</p>
	PM	<p>Lab: Mitosis in Onion Root Tip</p> <p>Activity: Genetics' Workshop</p> <p>Discussion: How to Write Lab Reports</p>	<p>-Lab</p> <p>-Partner Activity</p> <p>-Partner Activity</p>
	SH	<ul style="list-style-type: none"> <li>• Read Chapter 2 pp. 18-26</li> <li>• Complete Reading Guide <b>(Mitosis Reading Guide)</b></li> </ul>	<p>-Individual Reading</p> <p>-Reading Guides will be distributed</p>
Day 2	AM	<ul style="list-style-type: none"> <li>• Meiosis (Emphasis on recombination)</li> <li>• Model Organisms</li> </ul> <p><b>MENDELIAN GENETICS</b></p> <ul style="list-style-type: none"> <li>• Dominance</li> <li>• Segregation</li> <li>• Monohybrid Cross</li> </ul>	<p>-Discussion</p> <p>-Interactive PowerPoint</p>
	PM	<p>Lab: Pipecleaner Meiosis Simulation</p> <p>Activity: Genetics of the Class</p> <p>Activity: Genetics' Workshop</p>	<p>Lab</p> <p>-Partner Activity</p> <p>-Partner Activity</p>
	SH	<p>-Read Chapter 2 pp. 26-33; 33-40</p> <p>-Read Chapter 3 pp. 43-47</p> <p>-Complete Reading Guides <b>(Mendel 1 Reading Guide)</b></p>	
Day 3	AM	<ul style="list-style-type: none"> <li>• Independent Assortment</li> <li>• Dihybrid Crosses</li> <li>• Punnet Square</li> <li>• Mendelian segregation of human traits</li> <li>• Pedigree Analysis</li> </ul>	<p>-Discussion</p> <p>-Interactive PowerPoint</p>

Day	Time of Day	Content	Method
	PM	Lab: Constructing a Pedigree Activity: Connecting the Concepts Activity: Genetics' Workshop	
	SH	-Read Chapter 3 pp. 46-48; 48-53; 53-57 -Complete Reading Guides <b>(Mendel 2 Reading Guide)</b>	
Day 4	AM	<b>Extensions of Mendelian Genetics</b> <ul style="list-style-type: none"> <li>• Incomplete Dominance</li> <li>• Codominance</li> <li>• Multiple Alleles</li> <li>• Testing Mutations</li> <li>• Different Kinds of mutational effects</li> </ul> <b>Genotype to Phenotype</b> <ul style="list-style-type: none"> <li>• Environmental Effects</li> <li>• Penetrance</li> <li>• Expressivity</li> <li>• Gene Interactions</li> <li>• Epistasis</li> <li>• Pleiotrophy</li> </ul>	-Discussion  -Interactive PowerPoint
	PM	Quiz Review LAB: Blood Typing	
	SH	-Read Chapter 4 pp. 67-80 -Complete Reading Guides <b>(Mendel Ext Reading Guide)</b> -Study for Quiz	
Day 5	AM	<b>READING GUIDES 1-4 DUE</b> <ul style="list-style-type: none"> <li>• QUIZ 1</li> </ul> <b>Chromosomes and Genetics</b> <ul style="list-style-type: none"> <li>• Sex Chromosomes</li> <li>• Chromosome theory of heredity</li> <li>• Mendel's theories reinterpreted with chromosomes</li> </ul>	-Discussion  -Interactive PowerPoint
	PM	Lab: Make Your Own Karyotype Genetics' Workshop	
SUNDAY	SH	-Read Chapter 5 pp. 93-101 -Complete Reading Guides <b>(Chromosomes 1 Reading Guide)</b>	

## Week 2

Day	Time of Day	Content	Method
Day 6	AM	<p><b>HOMEWORK PROBLEM SET 1 DUE TODAY</b></p> <p><b>CHOOSE GENETICS PROJECT TOPICS</b></p> <ul style="list-style-type: none"> <li>• Sex Chromosomes</li> <li>• Affects on Mendelian traits</li> <li>• Sex Determination</li> <li>• Dosage Compensation</li> </ul> <p><b>Linkage and Crossing Over</b></p> <ul style="list-style-type: none"> <li>• Chromosome structure</li> <li>• Linkage</li> <li>• Cross Over</li> </ul>	<p>-Discussion</p> <p>-Interactive PowerPoint</p>
	PM	<p>Discuss the Answers to Quiz 1</p> <p>Choose your Research Project Topic(s)</p> <p>Lab: Drosophila Lab Computer Simulation</p>	
	SH	<p>-Read Chapter 5 pp. 93-96; 96-100</p> <p>-Read Chapter 7 pp. 140-146</p> <p>-Complete Reading Guides</p> <p><b>(Chromosomes 2 Reading Guide)</b></p>	
Day 7	AM	<ul style="list-style-type: none"> <li>• Chromosome Mapping</li> <li>• Genetic Distance</li> <li>• Test crosses- two point</li> <li>• Test crosses- three point</li> </ul>	<p>-Discussion</p> <p>-Interactive PowerPoint</p>
	PM	<p>Activity: Genetics' Workshop</p>	
	SH	<p>-Read Chapter 7 pp. 146-153</p> <p>-Complete Reading Guides</p> <p><b>(Chromosomes 3 Reading Guide)</b></p> <p><b>-LAB NOTEBOOK DUE AT END OF STUDY HALL</b></p>	
Day 8	AM	<p><b>DNA &amp; Chromosomes</b></p> <ul style="list-style-type: none"> <li>• Genetic Material</li> <li>• Transforming properties of DNA</li> <li>• Chemical structures of DNA/RNA</li> <li>• Global structures of DNA</li> </ul>	<p>-Discussion</p> <p>-Interactive PowerPoint</p>
	PM	<p>LAB: DNA Extraction from Strawberries</p> <p>LAB: Testing Macromolecules</p>	

Day	Time of Day	Content	Method
	SH	-Read Chapter 9 pp. 210-222 -Complete Reading Guides <b>(DNA 1 Reading Guide)</b>	
Day 9	AM	<b>DNA Replication</b> <ul style="list-style-type: none"> <li>• Semiconservative Nature</li> <li>• Starting the process</li> <li>• Bidirectional Replication</li> <li>• DNA Polymerases &amp; Proofreading</li> <li>• Continuous/Discontinuous Process <ul style="list-style-type: none"> <li>➤ Continuous vs Lagging <ul style="list-style-type: none"> <li>▪ Primosome</li> <li>▪ Okazaki fragments</li> </ul> </li> </ul> </li> <li>• End of Replication</li> <li>• PCR <ul style="list-style-type: none"> <li>➤ Mechanism</li> <li>➤ Comparison to <i>in vivo</i></li> </ul> </li> </ul>	-Discussion  -Interactive PowerPoint
	PM	Review for Quiz Activity: Watch GATTACA	
	SH	-Read Chapter 10 pp. 244-276 -Complete Reading Guides <b>(DNA 2 Reading Guide)</b> -Study for Quiz -Read Watson and Crick Paper	
Day 10	AM	<b>QUIZ 2</b> <b>READING GUIDES 5-9 DUE TODAY</b>  <b>The Central Dogma: Transcription, Translation, and Mutations</b> <ul style="list-style-type: none"> <li>• Genes = proteins</li> <li>• Transcription (Prokaryotes &amp; Eukaryotes)</li> <li>• Prokaryotic gene structure and expression</li> </ul>	-Discussion  -Interactive PowerPoint
	PM	Lab: Codon Game Lab: Tapes to Shapes Activity: Genetics' Workshop	
	SH	-Read Chapter 9 pp. 222-224 -Read Chapter 11 pp. 282-307 -Complete Reading Guides <b>(Central Dogma 1 Reading Guide)</b> <b>-FORMAL LAB REPORT DUE AT THE END OF STUDY HALL</b>	SUNDAY

### Week 3

Day	Time of Day	Content	Method
Day 11	AM	<p><b>HOMEWORK PROBLEM SET 2 DUE TODAY</b></p> <ul style="list-style-type: none"> <li>Eukaryotic gene structure and expression</li> </ul> <p><b>The Genetic Code</b></p> <ul style="list-style-type: none"> <li>Translation</li> <li>Genetic Code</li> </ul> <p><b>Mutation/Inborn Errors of Metabolism</b></p> <ul style="list-style-type: none"> <li>Overview</li> </ul>	<p>-Discussion</p> <p>-Interactive PowerPoint</p>
	PM	<p>Discuss Quiz 2</p> <p>LAB: Polytene Chromosome</p> <p>Activity: Genetics' Workshop</p>	
	SH	<p>-Read Chapter 9 pp. 224-225; 228-232</p> <p>-Read Chapter 12 pp. 312-315; 316-317; 321-339</p> <p>-Read Chapter 12 pp. 316-317; 329-334</p> <p>-Read Chapter 13 pp. 343-363</p> <p>Complete Reading Guides</p> <p><b>(Central Dogma 2 Reading Guide)</b></p>	
Day 12	AM	<p>Genotype to phenotype</p> <p><b>Gene Expression: Prokaryotic</b></p> <ul style="list-style-type: none"> <li>Types of expression &amp; regulation</li> <li>Induction: the lactose Operon</li> <li>Repression: the Tryptophan Operon</li> </ul> <p>LAB: Lac Operon Lab</p>	<p>-Discussion</p> <p>-Interactive PowerPoint</p>
	PM	<p>LAB: Gel Electrophoresis</p> <p>Activity: Genetics' Workshop</p>	
	SH	<p>-Read Chapter 13 pp. 348-353</p> <p>-Read Chapter 20 pp. 568-575; 576-579</p> <p>-Complete Reading Guides</p> <p><b>(Gene Expression Reading Guide)</b></p>	

Day	Time of Day	Content	Method
Day 13	AM	<b>Genetics Research Project Due Today!</b> <b>Viral Genetics</b> <ul style="list-style-type: none"> <li>• Viral Structure</li> <li>• Bacteriophage</li> </ul> <b>Bacterial Genetics</b> <ul style="list-style-type: none"> <li>• Mutant Genes in Bacteria</li> </ul> <b>Mechanism of Genetic Exchange in Bacteria</b> <ul style="list-style-type: none"> <li>• Transformation</li> <li>• Transduction</li> <li>• Conjugation</li> <li>• Biotechnology Applications</li> </ul> LAB: Glow-in-the-Dark Bacterial Transformation	-Discussion  -Interactive PowerPoint
	PM	LAB: Antibiotic Resistance Bacterial Transduction Activity: Genetics' Workshop	
	SH	-Read Chapter 8 pp. 177-204 -Read Chapter 24 pp. 710-718 -Complete Reading Guides <b>(Bacterial Genetics Reading Guide)</b> -Study for Quiz	
Day 14	AM	QUIZ 3 <b>Population Genetics</b> <ul style="list-style-type: none"> <li>• Allele Frequencies</li> <li>• Hardy-Weinberg Principle</li> </ul> <b>Intro to Genomics/Molecular Genetics Techniques</b> <ul style="list-style-type: none"> <li>• Genomics Definition</li> <li>• Terminology</li> <li>• Sequencing Methods (full Genome)</li> <li>• Applications</li> <li>• Molecular Genetics Techniques</li> </ul>	-Discussion  -Interactive PowerPoint
	PM	<b>POST TEST</b>	
	SH	<b>LAB NOTEBOOKS</b>	
Day 15	AM	Discuss Quiz 3 <ul style="list-style-type: none"> <li>• Bioethics</li> <li>• Connections</li> </ul>	-Discussion
	PM	<b>PARENT-TEACHER MEETINGS</b>	