

## Genetics Pacing Guide

| 1 <sup>st</sup> / 3 <sup>rd</sup> Quarter | TN Standards  | Lesson Focus  | Additional Notes   |
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| Weeks 1 & 2                               | Evaluate the scientific and ethical issues associated with gene technologies: genetic engineering, cloning, transgenic organism production, stem cell research, and DNA fingerprinting.             | Chapter 1 – Overview of Cells <ul style="list-style-type: none"> <li>• I know that genes are the instructions that manufacture proteins, which determine inherited traits.</li> <li>• I know the genome and its relationship to the human cell.</li> <li>• I can distinguish between the different levels of genetics.</li> <li>• I can distinguish the relationship between genes and their environment.</li> <li>• I can describe the different applications of genetics.</li> </ul>  | Case Studies:<br>“Thomas and Sally: The Interplay of Scientific and Historical Evidence”<br>The Sad But True Case of Earl Washington<br><br>Journal Topic: <i>DNA databases of convicted felons have solved many crimes and exonerated many innocent people. What might be the benefits and dangers of establishing databases on everyone? How should such a program be instituted?</i><br><br>Bioethics Groups: Genetic Testing & Privacy |
| Weeks 3 & 4                               | Trace the historical development of a scientific principle or theory, such as cell theory, evolution, or DNA structure.   | Chapter 9 Section 1 - Experiments Identify and Describe the Genetic Material <ul style="list-style-type: none"> <li>• Students will be able to name and discuss the key players in the discovery of the structure of the DNA molecule.</li> <li>• Students will be able to discover and recognize scientific contributions of the key players discussed.</li> <li>• Students will be able to develop and organize scientific history in relationship to national/world history.</li> <li>• Students will be able to formulate values that integrate and manage their learning.</li> </ul> | PBS – The Secret of Photo 51<br><br>Case Study – Classic Experiments in Molecular Biology<br><br>Lab- DNA Extraction   |
| Weeks 5 & 6                               | Compare the organization and function of prokaryotic and eukaryotic cells.<br><br>Describe how fundamental life processes depend on chemical reactions that occur in specialized parts of the cells | Chapter 2 – Cells and Mitosis <ul style="list-style-type: none"> <li>• I can compare the organization and function of prokaryotic and eukaryotic cells.</li> <li>• Describe how fundamental life processes depend on chemical reactions that occur in specialized parts of the cell.</li> </ul>   | Journal Activity: What abnormality at the Cellular or molecular level lies behind each of the following disorders? A) Cystic Fibrosis, B) Neurofibromatosis, and C) Polydactyly  |

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|             |   | <ul style="list-style-type: none"> <li>Describe the role of ribosomes, endoplasmic reticulum and Golgi apparatus in the production and packaging of proteins.</li> <li>Describe how carbohydrates, proteins, lipids, and nucleic acids function in the cell.</li> <li>I can describe how living systems store, retrieve, transmit, and respond to information essential to life processes.</li> <li>I can determine the relationship between cell growth and cell reproduction.</li> </ul>  | <p>Case Studies:<br/>More Than Just a Cough: Exploring the Role of the Cytoskeleton in Fertility Genetics and Cellular Function</p> <p>Movie: Cracking the Code questions and small group discussion questions.</p> |
| Weeks 6 & 7 | <p>Describe how mutation and sexual reproduction contribute to the amount of genetic variation in a population.</p> <p>Illustrate the movement of chromosomes and other cellular organelles involved in meiosis.</p> <p>Provide a detailed explanation of how meiosis and fertilization result in new genetic combinations.</p> | <p>Chapter 3 – Meiosis and Development</p> <ul style="list-style-type: none"> <li>I can compare and contrast the processes of mitosis and meiosis.</li> <li>I can differentiate which cells undergo the process of meiosis.</li> <li>Illustrate the movement of chromosomes and other cellular organelles involved in meiosis.</li> <li>Provide a detailed explanation of how meiosis and fertilization result in new genetic combinations.</li> <li>Describe how meiosis and sexual reproduction contribute to genetic variation in a population.</li> </ul> | Lab – Mitosis and Meiosis on the Table  |
| Weeks 8 & 9 | <p>Heritable information provides for continuity of life</p> <p>Expression of genetic information is imperfect and is a source of genetic variation</p> <p>Organisms reproduce and transmit hereditary information</p>  | <p>Chapter 4- Single Gene Inheritance</p> <ul style="list-style-type: none"> <li>I can describe the relationship between phenotype and genotype.</li> <li>I can describe the relationship among genes, chromosomes, proteins and heredity traits.</li> <li>I can predict the probable outcome of genetic crosses based on Mendel’s laws of segregation and independent assortment.</li> <li>I can compare the expected outcome with the actual results of a cross in an organism such as a fruit fly or fast plant.</li> </ul>                                | Lab: Penny Genetics   |

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|  |  | <ul style="list-style-type: none"> <li>• I can evaluate data to create and interpret a pedigree to discern various modes of inheritance.</li> <li>• I will be able to construct a Punnett square to illustrate both a monohybrid and dihybrid cross.</li> </ul>   |  |
| <b>End of Quarter</b>                          | <b>District Quarterly CFA</b>  |   |  |
| <b>2<sup>nd</sup> / 4<sup>th</sup> Quarter</b> | <b>TN Standards</b>  | <b>Lesson Focus</b>   | <b>Additional Notes</b>  |
| Weeks 1 & 2                                    | <p>Complete and interpret genetic problems that illustrate sex linkage, co-dominance, incomplete dominance, multiple alleles, &amp; polygenic inheritance.</p> <p>Compare different modes of inheritance: sex linkage, co-dominance, incomplete dominance, multiple alleles, and polygenic traits.</p> | <p>Chapter 5 – Beyond Mendel’s Laws</p> <ul style="list-style-type: none"> <li>• I can differentiate between incomplete dominance and co-dominance.</li> <li>• I can describe pleiotropy and give an example.</li> <li>• I can determine how multiple alleles affect inheritance patterns and show how they differ from the model of inheritance described by Mendel?</li> <li>• I can describe polygenic inheritance? How common is it in organisms?</li> <li>• I can explain how chromosomes determine gender in humans.</li> <li>• I can discuss sex-linked genes and why they are most associated with the X-chromosome in humans?</li> <li>• I can describe the pattern of inheritance of sex-linked traits.</li> <li>• I can describe the structure of mitochondrial DNA and discuss its’ uses in forensic anthropology.</li> <li>• I can describe gene linkage and how it influences recombinant DNA.</li> </ul> | <p>Case Studies:<br/>Hemophilia: “The Royal Disease”<br/>“Bloodline: A Human Genetics Case”<br/>Identical Twins, Identical Fates? An Introduction to Epigenetics</p> |
| Weeks 3-5                                      | <p>Describe the relationship among genes, the DNA code, production of protein molecules, and the characteristics of an organism.</p> <p>Explain how the different shapes and</p>   | <p>Chapter 9.2 &amp; 9.3 - DNA Structure &amp; Replication</p> <p>Chapter 10 - Gene Action: From DNA to Protein</p>   | <p>Central Dogma of Molecular Biology</p> <p>Introduce Genetic Disorders Research Project – 1 day of library research and presentation by librarians</p>             |

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|                        | properties of proteins are determined by the type, number, and sequence of amino acids  | <ul style="list-style-type: none"> <li>• Develop a model to illustrate a DNA replication bubble</li> <li>• Develop a model to illustrate the stages of protein synthesis</li> <li>• Apply the genetic coding rules to predict the sequence of amino acids from a sequence of codons in RNA</li> <li>• Recognize how various types of mutations affect gene expression and the sequence of amino acids in the encoded proteins</li> </ul> | Movie: Gattaca<br>Genetics based movie with questions and discussion |
| Weeks 6 & 7            | The processing of genetic information is imperfect and is a source of genetic information<br><br>Describe the connection between mutations and human genetic disorders. | Chapter 12 – Gene Mutation<br>Chapter 13 – Chromosomes <ul style="list-style-type: none"> <li>• Compare and contrast spontaneous and induced mutations.</li> <li>• Explain how a point mutations or frameshift mutations in a gene may alter the activity of the protein it encodes.</li> <li>• Describe how the accumulation of mutations in a cell may cause cancer.</li> </ul>  | Lab: Cookiease<br><br>Karyotyping Activities                         |
| Week 8                 | Design an informational PowerPoint or brochure to describe a human genetic disorder.  | Disorder Project Presentations   |  |
| Week 9                 | Explain how the genetic makeup of cells can be engineered   | Chapter 19 – GMO'S <ul style="list-style-type: none"> <li>• Assess the scientific and ethical ramifications of emerging genetic technologies.</li> <li>• Conduct research to explore the scientific and ethical issues associated with emerging gene technologies.</li> </ul>  | PBS – Harvest of Fear<br>Discussion questions and role play          |
| <b>End of Quarter</b>  |   |  |  |
| <b>End of Semester</b> |   |  |  |