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| Students will understand   * Biotechnology is used in the modification of cells or biological molecules for a specific application * How patent law regarding DNA has evolved with technology since the 1970’s and is still changing. * How PCR rapidly replicates a small part of an organism’s genome. * The uses connected to PCR. * Describe and define other nucleic acid amplification technologies that followed PCR. * Reasons for the restrictions on recombinant DNA technology, if the genetic code was not universal. * Bioremediation uses natural abilities to detoxify environmental contaminants. * DNA microarrays enable researchers to track gene expression and DNA variants. * The DNA microarrays reveals patterns and color intensities of spots that indicate which genes are expressed or if gene variants are present. * Genetic testing and counseling. * Genetic testing raises privacy issues when physicians must decide when it is appropriate to breach confidentiality about a test result. * Different approaches to treating genetic diseases. * The causes of infertility among men. * The causes of infertility among women. * Assisted reproductive technologies replace what is missing in reproduction. * The contributions of expresses sequence tag, positional cloning, and automated DNA sequencing technologies led to sequencing of the human genome. | Essential Questions:   1. How is the use of Biotechnology or modification of cells or biological molecules use for monitoring DNA? 2. How has patent law regarding DNA evolved with the technology since the 1970’s? 3. How does PCR rapidly replicate a small part of an organism’s genome? 4. How can genes be isolated from genomic DNA libraries or cDNA libraries? 5. How do researchers use antibiotics to select cells containing recombinant DNA? 6. Why would recombinant DNA technology be restricted if the genetic code were not universal? 7. How does recombinant DNA used to manufacture large amounts of pure protein in single cells? 8. How does Bioremediation use natural abilities to detoxify environmental contaminants? 9. How are genetic tests becoming an increasing part of diagnostic medicine? 10. Why has protein-based therapies replaced gene products and treat the phenotype? 11. How does somatic gene therapy target various types of somatic tissue as well as cancer cells? 12. Early pregnancy loss due to abnormal chromosome numbers may be mistaken for infertility; why is this more common among older women? 13. How has DNA sequencing and computer software aligned DNA pieces essential for the human genome project to proceed? 14. How can species be distinguished using genetic barcodes? 15. Why must several copies of a genome be cut up to sequence it? 16. Why is it easier to detect conserved DNA sequences that control gene expression by comparing the human genome to a fish genome than to a primate genome? |

Sub-Unit Components/Sub-Headings/Objectives

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| Genetic Technologies   * Patenting DNA * Amplifying DNA * Modifying DNA * Monitoring Gene Function | Genetic Testing   * Genetic Testing and Counseling * Treating Genetic Diseases * Three Gene Therapies * Treating Sickle Cell Disease | Reproductive Technologies   * Infertility and Subfertility * Assisted Reproductive Technologies * Extra Embryos | Genomics   * How Genetics Became Genomics * The Human Genome Project * Technology and Sequencing Efforts * The Future of Genetics |  |  |

Knowledge—Students will know…

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| 1. How is the use of Biotechnology or modification of cells or biological molecules use for monitoring DNA? 2. How has patent law regarding DNA evolved with the technology since the 1970’s? 3. How does PCR rapidly replicate a small part of an organism’s genome? 4. How can genes be isolated from genomic DNA libraries or cDNA libraries? 5. How does recombinant DNA used to manufacture large amounts of pure protein in single cells? 6. How does Bioremediation use natural abilities to detoxify environmental contaminants? 7. How are genetic tests becoming an increasing part of diagnostic medicine? 8. Why has protein-based therapies replaced gene products and treat the phenotype? 9. How does somatic gene therapy target various types of somatic tissue as well as cancer cells? 10. Early pregnancy loss due to abnormal chromosome numbers may be mistaken for infertility; why is this more common among older women? 11. How has DNA sequencing and computer software aligned DNA pieces essential for the human genome project to proceed? 12. How can species be distinguished using genetic barcodes? |

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| Standards | Assessments/Evidence |
| *List the standards set used and the individual standards to be taught and assessed. Highlight or Bold the standards of significance.* Example:   * HS-LS1-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. * HS-LS1-2: Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. * HS-LS1-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. | Which assessments will provide the best evidence of meeting the learning objectives? Consider the DOK required.   * Bell-Ringer * Journal Activities * Exit-Slips * Exams * Quizzes * Small Group (Team Activities) * Experiments * Projects * Presentations * Case Studies * Vocabulary |

Reading and Writing Standards (except for English/Language Arts courses)

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| Include at least one CCSS Literacy and one Writing standard that will be taught and assessed. Access them with these links and then list below:   * [CCSS.ELA-Literacy.RST.9-10.8](http://www.corestandards.org/ELA-Literacy/RST/9-10/8/) Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.  * [CCSS.ELA-Literacy.RST.9-10.9](http://www.corestandards.org/ELA-Literacy/RST/9-10/9/) Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. |

Instructional Resources/Materials

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| * Lewis, R. (2008). *Human genetics: Concepts and applications*. Boston: McGraw-Hill Higher Education. * Lewis, R. (2007). *Case workbook to accompany Human genetics: Concepts and applications*. Boston: McGraw-Hill Higher Education. * Brooker, R. J. (2018). *Genetics: Analysis and Principles*. New York: McGraw Hill Education. * Robinson, T. R. (2010). *Genetics for dummies:* Hoboken, NJ: Wiley. * <Http://Wardisiani.com> * WWW.mhhe.com/lewisgenetics7 |