

Unit # - 4 – Genetics: DNA, RNA, and Protein Synthesis (4 weeks)

Standards Addressed	Student Learning Objectives For this Unit	Content Skills and Knowledge	Learning Activities and Instructional Strategies
<p>NSES Standards: Life Science Science as Inquiry Science & Technology History & Nature of Science</p> <p>PA STEE Standards: 3.2.10.A (sci. k) 3.2.10.B (app k) 3.2.10 C (meth) 3.3.10.A (liv frms) 3.3.10 B (str/fnc) 3.3.10.C (inherit) 3.3.10.D (evo) 3.6.10.A (biotech) 3.7.10.A (tools) 3.8.10 C (imp)</p> <p>1.2 read crit 1.4 writing 1.8 presentation</p> <p>2.2 comp/estimation 2.3 measurement/est 2.5 prob solving 2.6 data analysis</p>	<p>Students will understand:</p> <ul style="list-style-type: none"> ❑ The work of Gregor Mendel. ❑ The principles of probability, as they relate to genetics and how a Punnett Square is used to predict outcomes that result from a cross. ❑ Meiosis is a process in which the number of chromosomes is cut in half. ❑ Mitosis results in the production of 2 genetically identical cells. ❑ The structure and replication of DNA ❑ The three forms of RNA and their role in the production of a protein, protein synthesis. ❑ Mutations are changes in genetic materials. There are 2 types: gene and chromosomal. ❑ Explore the concepts related to human heredity and human chromosomes. ❑ Examine the Human Genome Project and its current status. <p>Honors classes will explore:</p> <ul style="list-style-type: none"> ❑ The manipulation of DNA, including polymerase chain reaction and other techniques. ❑ Cell transformation, including the use of genetic markers and recombining DNA ❑ The applications of genetic engineering and the bioethical considerations of this work. 	<p>Knowledge</p> <ul style="list-style-type: none"> ❑ Genetics ❑ Fertilization, trait, hybrid ❑ Gene, allele, segregation, gamete ❑ Probability, Punnett Square, homozygous, heterozygous, phenotype, genotype. ❑ Independent assortment, incomplete dominance, codominance, multiple alleles, polygenic traits ❑ Homologous, diploid, haploid, meiosis, tetrad, crossing-over ❑ Transformation, bacteriophage, nucleotide, base-pairing ❑ Chromatin, histone, replication, DNA polymerase. ❑ Karyotype, sex chromosome, autosome, pedigree ❑ Sex-linked gene, nondisjunction ❑ Transgenic, clone <p>Skills</p> <ul style="list-style-type: none"> ▪ Use a Punnett Square to determine phenotype. ▪ Ability to analyze karyotypes. 	<p>Lab or Demonstration: Modeling DNA Replication and Protein Synthesis Modeling Linkage DNA Extraction</p> <p>Reading: Protein Synthesis Chromosome and Inheritance DNA Technology</p> <p>Worksheet: Protein Synthesis and Gene Expression Genetic Engineering The Human Genome Project</p> <p>Technology: DNAi – DNA Interactive http://www.dnai.org/index.htm</p> <p>Cell Biology Animations: http://www.johnkyrk.com/index.html</p> <p>Genetics Science Learning Center http://gslc.genetics.utah.edu/</p>

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Unit Modifications

- Genetics - Science Skills Worksheet
- DNA Structure – Skills Worksheet
- Protein Synthesis – Critical Thinking Worksheet

Unit Enrichments

- Analyzing DNA Using Gel Electrophoresis
- Modeling Post-Transcription Control
- Comparing and Contrasting RNA Types

Suggested Assessment Techniques for Unit

Core 1: Protein Synthesis: Replication, Transcription, and Translation

Core 2: The Origin of Eukaryotic Cells

Core 3: Core Concepts Assessment: Final Exam

Materials/Technology for Unit

- ❑ DNAi – DNA Interactive
<http://www.dnai.org/index.htm>
- ❑ Cell Biology Animations:
<http://www.johnkyrk.com/index.html>
- ❑ Genetics Science Learning Center
<http://gslc.genetics.utah.edu/>