

# RCS D Genetics \* Quick Reference Pacing Guide \* 2024-2025

Genetics is a ½ credit course

This document serves as a suggested sequence for one semester of instruction/assessment for all Genetics standards. For a complete description of the course, standards, and detailed performance objectives, see the [MS College and Career Readiness Standards for Science](#)

<u>1st Nine Weeks of the Semester</u>	<u>Second Nine Weeks of the Semester</u>
<p><i>Classroom Expectations</i> <i>Lab Safety; Tools of Science</i> <i>Science and Engineering Practices</i></p> <p><b><u>Structure and Function of DNA</u></b></p> <p><b>GEN.1A Students will demonstrate that all cells contain genetic material in the form of DNA.</b> <i>GEN.1A.1 Biochemical structure of DNA based on the experimental evidence available to Watson and Crick</i> <i>GEN.1A.2 Importance of the historical experiments that determined that DNA is the heritable material of the cell</i> <i>GEN.1A.3 Structure of DNA as it relates to its specific functions within the cell.</i> <i>GEN.1A.4 DNA extraction protocol.</i> <i>GEN.1A.6 Structural differences between the genomes found in prokaryotes and eukaryotes.</i></p> <p><b>GEN.1B Students will analyze how the DNA sequence is copied and transmitted to new cells.</b> <i>GEN.1B.1 Various proposed models of DNA replication.</i> <i>GEN.1B.2 Model the mechanics of DNA replication.</i> <i>GEN.1B.3 Microscopically observe and analyze the stages of the cell cycle and where the integrity of the DNA code is maintained.</i></p> <p><b><u>Transcription, Translation, and Mutations</u></b></p> <p><b>GEN.2A Students will analyze and explain the processes of transcription and translation in protein production.</b> <i>GEN.2A.1. The structure and function of RNA and DNA.</i> <i>GEN.2A.2 Model the process of transcription in both prokaryotes and eukaryotes.</i> <i>GEN.2A.3 Model translation at the ribosome.</i> <i>GEN.2A.4 Multiple roles of RNA in translation. Compare the structure and function of tRNA, rRNA, mRNA, and snRNA.</i> <i>GEN.2A.5 Enrichment: Development of Central Dogma</i></p> <p><b>GEN.2B Students will determine the causes and effects of mutations in DNA.</b> <i>GEN.2B.1 Factors that cause mutations</i> <i>GEN.2B.2 Mutations and changes in protein structure and function.</i> <i>GEN.2B.3 Cellular mechanisms that can help to minimize mutations.</i> <i>GEN.2B.4 Mutations, cell cycle, cancer</i></p>	<p><b><u>Biotechnological Applications</u></b></p> <p><b>GEN.3 Students will investigate biotechnology applications and bioengineering practices.</b> <i>GEN.3.1 Various tools and techniques of DNA manipulation and their applications in forensics, agriculture, and medicine.</i> <i>GEN.3.2 Genetic transformation, protein purification, and/or gel electrophoresis.</i> <i>GEN.3.3 Enrichment: The process of genetic transformation, protein purification, and/or gel electrophoresis.*</i> <i>GEN.3.4 Enrichment: Ethical concerns regarding biotechnology/bioengineering.</i></p> <p><b><u>Classic Mendelian Genetics</u></b></p> <p><b>GEN.4 Students will analyze and interpret data collected from probability calculations to explain the inheritance of traits within a population.</b> <i>GEN.4.1 Mendel's law of dominance and segregation; predict phenotypic and genotypic ratios.</i> <i>GEN.4.2 Mendel's law of independent assortment; multi-trait cross data sets for patterns and trends.</i> <i>GEN.4.3 Traits that follow non-Mendelian inheritance patterns.</i> <i>GEN.4.4 Pedigrees; patterns of inheritance</i> <i>GEN.4.5 Enrichment: Gene mapping</i></p> <p><b><u>Population Genetics</u></b></p> <p><b>GEN.5 Students will apply population genetic concepts to explain variability of organisms within a population.</b> <i>GEN.5.1 Meiosis and sexual reproduction</i> <i>GEN.5.2 Natural selection; changes in populations over time</i> <i>GEN.5.3 Processes that cause changes in allelic frequencies</i> <i>GEN.5.4 The Hardy-Weinberg formula; changes in allelic frequencies due to natural selection in a population.</i> <i>GEN.5.5 Enrichment: The effects of natural selection on allelic frequencies in a population.</i> <i>GEN.5.6 Enrichment: Variations in human populations</i> <i>GEN.5.7 Enrichment: Genomic databases for sequence analysis; apply the information to species comparisons, evolutionary relationships, and/or the molecular basis of inherited disorders.</i></p>

