

**Richmond Public Schools**  
**Department of Curriculum and Instruction**  
**Curriculum Pacing And Resource Guide – Unit Plan**



**Course Title/ Course #: Life Science**

**Unit Title/ Marking Period # (MP): DNA; MP 4**

**Start day: \*See Pacing Guide**

**Meetings (Length of Unit): 2-3 Weeks**

***Desired Results ~ What will students be learning?***

**Standards of Learning/ Standards**

- LS.12 The student will investigate and understand that organisms reproduce and transmit genetic information to new generations. Key concepts include
- a) the structure and role of DNA;
  - b) the function of genes and chromosomes;
  - c) genotypes and phenotypes;
  - d) characteristics that can and cannot be inherited;
  - e) genetic engineering and its applications; and
  - f) historical contributions and significance of discoveries related to genetics.

**Essential Understandings/ Big Ideas**

The concepts developed in this standard include the following:

- DNA is a double helix molecule.
- DNA is a molecule that includes different components — sugars, nitrogenous bases, and phosphates. The arrangement of the nitrogenous bases within the double helix forms a chemical code.
- Chromosomes are strands of tightly wound DNA. Genes are sections of a chromosome that carry the code for a particular trait. An allele is an alternate form of a gene.
- The basic laws of Mendelian genetics explain the transmission of most traits that can be inherited from generation to generation.

- A Punnett square is a model used to predict the possible combinations of inherited factors resulting from single trait crosses. (An investigation of dihybrid crosses, multiple alleles, and incomplete dominance should be reserved for high school Biology.)
- Dominant traits mask the expression (phenotype) of recessive traits. Genotype is the specific combination of dominant and recessive gene forms.
- Traits that are expressed through genes can be inherited. Characteristics that are acquired through environmental influences, such as injuries or practiced skills, cannot be inherited.
- In genetic engineering, the genetic code is manipulated to obtain a desired product.
- Genetic engineering has numerous practical applications in medicine, agriculture, and biology.

### **Key Essential Skills and Knowledge**

In order to meet this standard, it is expected that students will

- recognize the appearance of DNA as double helix in shape.
- explain that DNA contains coded instructions that store and pass on genetic information from one generation to the next.
- explain the necessity of DNA replication for the continuity of life.
- explain the relationship among genes, chromosomes, and alleles.
- demonstrate variation within a single genetic trait.
- distinguish between dominant and recessive traits.
- distinguish between genotype and phenotype.
- use Punnett squares to predict the possible combinations of inherited factors resulting from single trait crosses.
- differentiate between characteristics that can be inherited and those that cannot be inherited.
- identify aspects of genetic engineering and supply examples of applications. Evaluate the examples for possible controversial aspects.
- describe the contributions of Mendel, Franklin, Watson, and Crick to our basic understanding of genetics.

### **Vocabulary**

## **1. Molecular Genetics - Study of the DNA sequences and the**

expression of genes

2. **Nitrogenous Bases** - The part of the nucleotide that is adenine, guanine, thymine, or cytosine
3. **Base Pair** - Part of the nucleotide that makes up the central structure of the DNA molecule, examples are *A-T* and *C-G*
4. **Nucleic Acid** - Macromolecules made of long chains of nucleotides
5. **Nucleotide** - *A building block of DNA and RNA*, consisting of a nitrogenous base, a 5-carbon sugar, and a phosphate group
6. **Oxy-** oxygen
7. **De-** Without
8. **Double Helix** - Structure of the DNA molecule resembling a spiral staircase

9. **Trans-** across

10. **Ribosome** - Site of protein synthesis inside the cell

11. **Protein** - Macromolecule that is composed of long chains of amino acids

12. **Amino Acid** - Any of the 20 building blocks of proteins

13. **Transcription** - *Process* in which **RNA** is made from **DNA**

14. **Translation** - The *process* of *converting* the genetic code in **RNA** into the amino acid sequence that makes up a **protein**

15. **RNA (Ribonucleic acid)** - An organic acid composed of a *single strand of nucleotides* that acts as a *messenger* between **DNA** and the **ribosomes**

16. **Inversion** - A change in DNA in which a piece breaks off and reattaches in reverse order
17. **Deletion** - loss of one or more *base pairs* from DNA
18. **Frameshift Mutation** - An alteration in DNA sequence that results in a change in the reading frame
19. **Point Mutation** - A *change* in a single base pair of DNA sequence in a gene

***Assessment Evidence ~ What is evidence of mastery? What did the students master & what are they missing?***

**Assessment/ Evidence**

TSWBAT: (Choose **ONE** or more to collect evidence of mastery)

1. Demonstrate proficiency on a teacher-generated assessment created on Interactive Achievement
2. Demonstrate proficiency on the Online Quia Quiz
3. Complete GIZMO Assessment with passing score

**Learning Plan ~ What are the strategies and activities you plan to use**

**Learning Experiences/ Best Practice**

- ✓ Construct DNA by completing DNA Origami DNA Project
- ✓ Complete a DNA and Genes Worksheet
- ✓ Complete a DNA Unit Vocabulary Sheet
- ✓ Note-Taking Via History of DNA PowerPoint
- ✓ Watch Jabari Johnson Rap and Write a DNA Academic Rap Project
- ✓ Complete DNA GIZMO
- ✓ Complete related Brainpop Activities

**Technology Integrations**

- ✓ Interactive Achievement;
- ✓ Quia;
- ✓ McGraw Online;
- ✓ GIZMO;
- ✓ Brainpop.

**Resources**

1. DNA and Genes Worksheet (Attached)
2. DNA Vocabulary Page (Attached)
3. DNA Origami (Attached)
4. History of DNA PowerPoint (Attached)
5. Structure of DNA and Replication Worksheet (Attached)
6. Jabari Johnson “Quest for Joules” Rap Lyrics Attached (to be used with DNA RAP Activity below)
7. <https://www.youtube.com/watch?v=959aWmNsjUs> (Jabari Johnson “Quest for Joules” Rap Video)
8. Writing Academic Raps: DNA and Inheritance (Attached)
9. Brainpop: <https://www.brainpop.com/health/freemovies/dna/>
10. Gizmo: <http://www.explorelearning.com/index.cfm?ResourceID=439&method=cResource.dspDetail>

### **Cross Curricular Connection**