

DNA basics, Gene Expression, and DNA mutations

Scope and Sequence

DNA Basics

- Introduction
- DNA-the Alphabet of Life
 - DNA Contains the Directions for Building Proteins
 - The Human Genome
- DNA in Living Cells
 - Where is DNA Found?
 - How Much DNA Does a Human Have?
 - DNA Storage Within the Cell: Chromosomes and Chromatin
 - Lab Activity: Isolate Your Own DNA from Cheek Cells
 - Lab Activity: DNA Extraction from Strawberries
- DNA Structure
 - The DNA Double Helix
 - DNA Base Pairing Rules

Gene Expression

- RNA
- Transcription
 - mRNA Splicing and Processing
- Protein
- Translation Part One: Codons, Amino Acids, and the Codon Table
- Using the Codon Table
 - Activity: Practice Using the Codon Table

- **Translation Part Two: Transfer RNA, Anticodons, and the Translational Complex**
- **Translation Part Three: Bringing it All Together**
 - **Activity: Transcription and Translation of a Sample Gene Sequence**
- **Translation Part Four: Mutations During Translation and Their Effects**

DNA Mutations: How They Occur and Their Effects

- **DNA Replication**
 - **Types of DNA Mutations That Occur During DNA Replication**
- **Diseases Caused by DNA Point Mutations: Sickle Cell Anemia**
 - **Activity: Transcription and Translation of the Hemoglobin S Gene Variant**
- **Diseases Caused by DNA Deletion Mutations: Cystic Fibrosis**
 - **Activity: Transcription and Translation of the Mutant $\Delta F508$ Gene**
- **Diseases Caused by DNA Insertion Mutations: Tay-Sachs Disease**
 - **Activity: Transcription and Translation of the Mutant HEXA Gene**
- **The Role of DNA Mutations in Cancer**
 - **The Cell Cycle and Cell Division**
 - **Cell Cycle Checkpoints**
 - **Cancer: Unregulated Cell Growth**
 - **Chemotherapy**

- **Not All DNA Differences are Bad**

- **Conclusion**

- **Non-coding DNA ("Junk DNA")**
- **Tissue-specific Gene Expression**
- **Epigenetics**
- **Conclusion**