

Thomas S. Wootton High School
Molecular Biology
Objectives & Syllabus

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The Molecular Biology course stresses the concepts, theories, and techniques of molecular biology, classical genetics, modern genetics, DNA technology, bioethics, and biological research. Laboratory investigations parallel those in a scientific research laboratory. This advanced-level course will prepare students for an internship at a scientific research facility.

Grading and Reporting:

A variety of factors and a number of assessment strategies determine the level of student achievement. The MCPS grading and reporting policy will be in effect, including re-teaching and re-assessing. Grades will be posted regularly and can be checked online using edline. Below is the breakdown of the types of activities and the corresponding percentage of grades.

- 50% Summative Assessments: Tests and Lab Reports
- 45% Formative Assessments: Quizzes, Graded Assignments, Journal Club and Project Presentations, MolBio Lecture, etc
- 5% Homework for completion

Grading Specifics:

- Grades will be posted on edline regularly. Saving graded work is important in order to verify grades.
- Additional help is available everyday during lunch. Please check with me for a lunch time help schedule. I am also available after school by appointment.
- Late work- the deadline for all work is **one day** after the due date. Students will lose one letter grade for late work. After the deadline, no work will be accepted. Please see me for absent work. Additionally, once graded work has been returned, that assignment will not be accepted for a grade.
- Field trip policy- Any student leaving school for a field trip or other excused absence is required to turn in any work due that day **before** they leave! It may be placed in my mailbox in the main office or given to me directly. Any work not turned in on time will be marked late.
- Please see department grading policy for more details.

Grading Scale:

- 90 – 100% A
- 80 – 89% B
- 70 – 79% C
- 60 – 69% D
- < 59% E

Attendance:

Student attendance and participation are very important to your overall success in Molecular Biology. Laboratory work constitutes the bulk of this course. Most laboratory activities will be completed in teams and it is important that you participate. Wootton and MCPS attendance guidelines can be found in your agenda book and will be strictly enforced.

Textbook Information:

There are two textbooks for the course. The text *DNA Science, A First Course 2nd ed.*, Micklos & Freyer will be used for all laboratories and supporting information. This text has a replacement cost of \$47. The text *Biotechnology: Science for the New Millennium*, Ellyn Daugherty will be used for all course topics. This text also contains a CD. The replacement cost for this text is \$69.95. If the CD is lost, the replacement cost is \$69.95. The CD cannot be replaced without purchasing another book.

Laboratory Work and Safety:

Students are responsible for working as an active member of their lab group. Results and analysis work must be derived independently and therefore should NOT identically match those of others in the group. All students are expected to abide by the MCPS Science Safety Guidelines. Students are responsible for all materials and the clean up of all lab equipment. No food or drink (including gum and candy) is allowed during labs. Safe practices do not include horseplay.

Course Objectives: Students will:

- Identify contributions of researches and history of molecular biology
- Develop laboratory techniques in DNA technology
- Identify structural and functional importance of proteins.
- Apply scientific methods to solve problems and issues related to molecular biology
- Learn and practice laboratory techniques that support current research and advances in molecular biology
- Apply knowledge of DNA technology and its applications to many fields of science
- Develop knowledge of how molecular biology applies to a variety of fields including medicine, evolution, genomics, law, bioethics, immunology, engineering, and business.

Course Topics:

- Laboratory Safety and Overview of Molecular Biology & Biotechnology
 - a. Practicing safe science
 - b. Journal Club- Historic Experiments
- Basic Skills of Biotechnology
 - a. Micropipetting 101
 - b. Micropipette Challenge
 - c. Making reagents & lab math
 - d. Modification of DNA Science Lab 1: Using the Basic Tools of Molecular Biology
- Review of Biochemical Macromolecules
 - a. DNA Extraction lab
 - b. Central Dogma of Molecular Biology
 - i. DNA replication
 - ii. Transcription & Translation
- Human Genome Project
 - a. Student chromosome project
 - b. History, Background & Significance of HGP
 - c. Chromosome Structure & Function
 - d. Karyotyping & Chromosomal Abnormalities
- Chromosome structure
- DNA Technology & Recombinant DNA
 - a. DNA Science Lab 3: DNA Restriction Analysis
- Microbiology and Sterile Technique
 - a. Modification of DNA Science Lab 2: Bacterial Culture Techniques
- Principles of Transformation
 - a. DNA Science Lab 5: Rapid Colony Transformation of *E.coli* with plasmid DNA
- Gene Transfer
- Plasmid Purifications
 - a. DNA Science Lab 8: Mini-prep
- DNA Sequencing
- Polymerase Chain Reaction
 - a. *Alu* PCR Lab
- Structure and Function of Proteins
 - a. Protein Journal Club Project
 - b. Survey of Protein Diversity
 - c. Western blot
- Human Diseases and Biotechnology in Medicine
 - a. Human Disease Poster Project
 - b. Detecting a Cancer Gene
 - c. Mad Cow Disease and Prions
- Biotechnology and Ethics
- Biotechnology Products
- Careers in Molecular Biology